

# Access and use of healthcare in pregnancies and term pregnancies

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*with special attention to care-seeking behavior, travel  
time and distance*

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## ABSTRACT

**Background:** Perinatal mortality is an indicator of reproductive health and quality of obstetric healthcare and is one of the adverse outcomes in pregnancies. A European study showed that perinatal mortality was substantially higher in the Netherlands as compared to other European countries. Subsequently a Dutch study showed that the perinatal mortality is significantly higher in the northern part of the Netherlands. Up to now it is not known what causes these differences; it is presumed that travel time & travel distance and culture might have some influence in the decision to seek care and pregnancy outcomes. Therefore this study performed literature research and reviews the current evidence and describes the evidence by using the “Three Delay Framework”.

**Methods:** A literature survey was conducted in PubMed. Two different search strategies has been developed, one for finding information about attitude towards healthcare and one for finding information about travel time and travel distance. Furthermore information about the methodology to determine travel time and travel distances has been explicitly sought.

**Results:** 55 ‘attitude to healthcare’ related studies and 29 ‘travel time’ related studies were included in this review. Of the 84 studies, 49 (58%) studies were performed in the area of gynecology & obstetrics. The majority of the studies performed in the area of gynecology & obstetrics were attitude to healthcare related studies; 45 (92%) studies. Several attitude and cultural factors were identified which caused delays in the decision to seek appropriate care. Some of the travel time related studies reported significant differences in outcomes in relation to travel time and travel distance. Methods that were most frequently used for calculation were straight line distance and actual travel time/distance calculation by using road networks; which could be implemented by using a GIS.

**Conclusion:** Currently there is more evidence for care-seeking behavior which causes delays affecting adverse pregnancy outcomes than evidence for delays caused by travel time and travel distance. The studies which investigated delays due to travel time and travel distance reported conflicting results and had quite the opposite conclusions. For travel time calculation a GIS could be used and actual road distance and its corresponding travel time are more accurate and suitable measures for the research question than straight line distance calculation. Further research should develop even better measures of travel time and more constructive research is needed to determine the influence of travel time and travel distance on adverse pregnancy outcomes.

**Keywords:** attitude, care-seeking behavior, acceptance, healthcare, GIS, rural, remoteness, travel time, travel distance

## 1 INTRODUCTION

Perinatal mortality is an indicator of reproductive health and quality of obstetric healthcare; it is one of the adverse outcomes in pregnancies. The European PERISTAT-1 study [1] showed that perinatal mortality and especially fetal mortality is substantially higher in the Netherlands as compared to other European countries [1-5]. In 1999 Dutch fetal mortality was 7.4 and early neonatal mortality 3.5 per 1,000 births.

Research has shown that regional variation in pregnancy outcomes can be related to population density, access and use of health services, income level and social inequality and excess risk for certain conditions. Recent research at the

department of Medical Informatics on the national perinatal registry database has shown important regional differences in mortality and adverse pregnancy outcomes with worse outcomes in the northern part of the Netherlands [6].

Difference in access to health care could be related to travel time to the hospital/midwife practice and availability of the healthcare services in the region. Besides the aforementioned differences there could also be differences in use of healthcare to cultural attitudes and the beliefs and knowledge of the pregnant women. In other words the lack of care can be related to three factors; (1) delay in making the decision to seek appropriate care, (2) delay in reaching an appropriate facility and (3) delay in receiving adequate and appropriate care

once the facility has been reached. These delays are also known as the “Three Delay Framework” [7] (the “Three Delay Framework” will be elaborated upon in the **Three Delay Framework** section).

A new study has been conducted which focused on these two factors: travel time and cultural attitude/behavior. A literature search has been performed on the risk factors for adverse pregnancy outcomes in pregnancies and term pregnancies (pregnancies with duration of  $\geq 37$  weeks) with a focus on travel times to the hospital and cultural attitudes towards use of care. Adjacent to it methods of both travel time calculation and assessment of cultural attitudes of use of care will be determined and described.

This study tries to answer the following questions:

- (1) What is the current evidence of access to care (travel time), use of care (cultural attitudes, beliefs and knowledge) of women in the explanation of regional differences in perinatal mortality and other adverse outcomes?
- (2) What are the risk factors for adverse outcomes in pregnancies and in term pregnancies with special attention to access and use of healthcare?

## 2 RISK FACTORS IN PREGNANCIES

In this review the effects of attitudes, travel time and travel distance on adverse outcomes in pregnancies are the main focus. However there are also other risk factors that affect adverse outcomes in pregnancies. A lot is known about numerous factors that affect adverse outcomes in pregnancies. In this chapter a quick overview of risk factors is given. One should note that knowledge of the ‘common’ risk factors is required to be able to fully understand the topics of this review.

One of the most used and important adverse outcome is the perinatal mortality. Besides the adverse outcome perinatal mortality; low Apgar score, small for gestational age, congenital anomalies and dysmaturity are also adverse outcomes [8-10].

Several factors influence perinatal mortality; these factors can be divided in demographic & socio-economic, behavioral, pre-existing diseases, previous obstetric problems, problems during pregnancy and care factors [8-10]. The care factors are related to attitudes and care-seeking behavior and reaching the appropriate healthcare facility [7].

Demographic & socio-economic factors are; maternal age, ethnicity, race, SES, marital state. Women who are younger than 18 have an increased chance to deliver small to gestational age babies or stillbirths; women older than 30 have an increased risk to develop complications (such as gestational diabetes and high blood pressure) during the pregnancy, complications during labor and perinatal mortality increases as maternal age increases [8-10]. Also in the Netherlands ethnicity influences the probability of perinatal mortality; African, Hindu, Moroccan and Turkish women have a higher perinatal mortality rate [9]. Somewhat related to ethnicity is SES; women of foreign origin have a higher probability to have a lower SES. Women who have a low SES are more likely to smoke, have insufficient intake of nutrition. When the SES decreases; the chance of perinatal mortality rises [9,10]. Parity has also influence on perinatal mortality; perinatal mortality is higher in first born children and multiparity increases the risk of rapid labor or postpartum hemorrhage [8-10]. Besides all these factors the marital status of the women is also an important determinant of perinatal mortality; unmarried or divorced women have a higher change of preterm mortality [9,10]. Unfortunately women who have a history of obstetric complications have a higher risk to have the same complications during any following pregnancy and delivery [8-10].

Adjacent to the demographic and socio-economic factors there are some behavioral factors that affect perinatal mortality. The five most common influencing factors are smoking, drugs, alcohol, nutrition and (work) stress, the best known factor of these five is smoking [9]. There are some obstetric complications that occur more frequent in pregnant women who smoke. These complications are; spontaneous abortion, placenta praevia, solutio placentae [8] and delivering small

for gestational age babies. Even second-hand smoking could be harmful to the child during pregnancy [9,10].

Evidence of drugs usage and adverse pregnancy outcomes is difficult to collect [9]. However it is known that cocaine causes high blood pressure in woman and child. Furthermore cocaine is associated with congenital disorders, growth disorders and development disorders. Besides cocaine it is known that opium, heroine, and methadone – and drugs similar to opium, heroine and methadone – causes serious problems to the wellbeing of mother and child; death can be caused by these kinds of drugs [8-10].

Alcohol could be harmful for the fetus. Small amounts of alcohol can cause a low birth weight and larger amounts of alcohol can lead to the fetal alcohol syndrome. Pregnant women are advised to not consume any alcohol during their pregnancy [9].

Besides substance usage, nutrition has also influence on adverse outcomes in pregnancies [8-10]. Insufficient nutrition can lead to a wide range of complications for the fetus (like congenital disorders, growth restriction and etcetera). Interweaved in the nutrition are the intake of vitamins, folic acid and iron. Insufficient intake of folic acid can lead to neural tube defects [8-10]. Insufficient iron intake increases the risk of anemia [8-10].

Work is also related to adverse outcomes in pregnancies. Heavy duty can result in shorter pregnancy duration. The shorter pregnancy duration can cause a lot of problems, because the born infant is immature and depending on the pregnancy duration more complications can exist [8-10].

Some pre-existing diseases can increase the risk of adverse pregnancy outcomes. These diseases are obesity, autoimmune disorders, infection diseases, diabetes mellitus, kidney disorders, heart problems, pulmonary diseases (tuberculosis and pneumonia could cause fever and fever can cause premature delivery of the fetus), thyroid gland

diseases, neurological complications and gynecological & surgical complications [8-10].

Women with a low BMI have a higher chance of delivering small for gestational age babies; while obese women are more likely to develop gestational diabetes, preeclampsia and delivering very large babies (which can be very difficult to deliver) [8-10].

Autoimmune disorders can do serious harm to the fetus. One of the most common disorders is related to the Rhesus factor. When women and fetus have different rhesus types, there is a possibility that the fetus' blood will be broken down at a faster rate than the fetus can develop new blood cells. The fetus will develop icterus or when no treatment is provided, the fetus will die [8-10]. Other disorders can produce abnormal antibodies which can pass the placenta and do some serious damage to the fetus [8].

A wide scale of infection diseases can cause serious complications and even death in the pregnancy. Several sexually transmitted diseases can cause complications; these diseases are, syphilis (can lead to abortion or intra-uterine fetal death, at a later stage of the pregnancy it can cause congenital lues in the child), gonorrhea (child can be infected during labor and can cause blindness), Chlamydia (child can be infected during labor and can cause pneumonia), herpes simplex (child can be infected during labor and can cause herpes-encephalitis which can lead to death), hepatitis B (child can be infected during or after labor and can cause acute hepatitis after three months), hepatitis C (child can be infected during labor and causes hepatitis C infection), HIV (child can be infected during pregnancy, labor and breastfeeding), HPV (child can be infected with the virus during labor, but the chance of occurrence is very low), cytomegaly (child has a very low probability to be infected, but in case of infection it can cause disorders to the central nervous system) [8-10].

Besides the sexually transmittable diseases there are other infection diseases that can cause serious complications are; bacterial vaginosis (can cause preterm birth), listeriosis (can cause preterm birth or intra-uterine fetal death), streptococcus group B

(can cause sepsis and meningitis), toxoplasmosis (early in the pregnancy it can cause hydrocephaly and intra-cranial calcification), rubella (early in the pregnancy it can cause vision problems, ear problems, heart and central nervous system disorders and sometimes abortion; later in the pregnancy only hearing disorders can be caused to the fetus) and varicella (in the first months of the pregnancy it can do serious harm to the fetus; hypoplasia of arm and legs, central nervous system disorders and disorders to the eyes and skin) [8-10].

Women with diabetes mellitus could either not produce insulin or their bodies are not sensitive to insulin. Because of the lack of insulin, more glucose can pass the placenta. This increase could cause macrosomia of the fetus (because of the extra glucose the fetus could grow faster). Other problems that can be caused by diabetes mellitus are preterm birth, hypoglycemia (abrupt stop extra supply of glucose, but the insulin levels are still high, it could lead to brain damage due to glucose shortage) and congenital disorders [8-10].

Women with kidney disorders have higher chance of problems during pregnancy; the kidney function may rapidly worsen during the pregnancy and hypertension may also worsen, preeclampsia may develop. Because of reduced kidney function the fetus may not grow as much as expected or may be stillborn [8-10]. Women with severe kidney disorders are discouraged to become pregnant [9].

Pregnancy requires the heart to work harder. Consequently, pregnancy may worsen heart disease. Heart disease can cause serious problems for both the fetus and the women; the fetus may be born prematurely and may have the same defects to the heart as the mother [8-10].

Thyroid gland diseases seldom occur during pregnancy. However if thyroid gland diseases occur it could lead to intra-uterine growth delays in the fetus, fetal death and preeclampsia. When the disease is not treated it could damage the mental development of the child [9,10].

Neurological disorders in the pregnant women could harm the fetus; women with epilepsy have a

higher probability to deliver a child with congenital disorders. During labor the chance of occurrence of brain hemorrhage is elevated [8-10]. The chance of intracranial hemorrhages is slightly increased in pregnant and delivering women, sometimes it is needed to perform a cesarean section to reduce the chance of occurrence of intracranial hemorrhages [8-10].

Sometimes gynecological & surgical complications occur; complications of this order are (but not limited to), ovary tumors, cervix carcinoma and mamma carcinoma. Ovary tumors should be removed as early as possible in the pregnancy, because the probability of premature birth increases. In case of an infiltrating cervix carcinoma a cesarean section should be performed, or abortion should be induced in order to save the life of the pregnant woman. Mamma carcinomas do not have an effect on the fetus, although treatment can harm the fetus (in case of radiation therapy for example) [8-10].

Besides the pre-existing diseases, diseases or complications can also develop during pregnancy. These diseases or complications are; gestational diabetes, anemia, pregnancy induced hypertension (HELLP and preeclampsia; could be related to liver disorders), fever and twin pregnancy. Some of the pre-existing diseases could also develop during pregnancy, while it did not exist before the pregnancy [8-10].

Gestational diabetes could cause hypoglycemia and macrosomia, because of the disrupted balance between the glucose levels and the insulin levels. The terms hypoglycemia and macrosomia are explained under the header of diabetes mellitus [8-10].

Anemia can be caused by iron deficiency (most common cause), folic acid deficiency and blood & circulation disorders (like sickle-cell disorders). Anemia could be life threatening for women and eventually for the fetus. Even in case of iron deficiency nature decided that the fetus' need for iron receives the priority. Ultimately, if the iron deficiency is not resolved both the women and fetus will die [8-10].

HELLP is an expression of preeclampsia; features of HELLP are hemolysis (destruction of red blood cells), coagulation disorders and liver damage. In the fetus it could lead to serious problems and even death [8]. Preeclampsia is a complication in which an increase in blood pressure is accompanied by protein in the urine. The cause is unknown; but preeclampsia is more common among women who are pregnant for the first time, who are carrying two or more fetuses or who have had preeclampsia before. Preeclampsia could cause seizures in the pregnant women and brain hemorrhage [8-10]. Women could also develop hypertension during the pregnancy; pregnancy induced hypertension, it can cause growth problems in the fetus and that should be closely monitored [9].

Disorders that causes temperatures higher than 39.5 degrees Celsius; increases the risk of a miscarriage, defects of the brain or spinal cord in the child in the first trimester. Fever late in the pregnancy increases the risk of preterm labor [9,10].

The incidence of twin pregnancies is dependent of ethnicity (incidence is five times higher in West-Nigeria as compared to Europe), maternal age (incidence increases up to 2% at the age of 35), parity (incidence increases up to 2% after four pregnancies) and family history. Unfortunately many complications occur more often in twin pregnancies than in singleton pregnancies. Complications that occur during the pregnancy (fetal complications) are; premature birth, IUGR, abortion and fetal death, congenital disorders, twin-twin transfusion syndrome and reversed twin arterial perfusion-syndrome. Complications that occur during the pregnancy (maternal complications) are; pregnancy induced hypertension, anemia, gestational diabetes, placenta praevia & solutio placentae. Complications that occur during labor are; fetal death, wrong lay positions, bleeding and solutio placentae. The exact numbers and twin pregnancies are discussed in [8,10].

### 3 METHODS

Common risk factors for adverse outcomes in pregnancies and in term pregnancies were derived from several books in the area of obstetrics and gynecology; for this purpose Williams Obstetrics [8], Practical Obstetrics [9] and Textbook Obstetrics [10] were used. For the other research questions the research database PubMed (MEDLINE) was used. Because of the limited results returned by PubMed regarding to the travel time and distance related studies an additional search in Scopus was performed (only query I of travel time and travel distance).

#### 3.1 CRITERIA

Several criteria were used to get only the most relevant articles. In this section the used criteria have been reported and elaborated upon and subsequently for each criterion the reason for inclusion has been discussed. The criteria have been reported in chronological order; the first criterion mentioned here was the first criterion that has been used to select studies from the search results.

*Language:* the studies that were found had to be written either in Dutch or English.

*Keywords in abstract or title or keywords:* the queries that have been used consisted of keywords. These keywords needed to be included in either the abstract, title or the keywords section; otherwise the study was not presumed relevant. Another reason for this criterion is that PubMed can return results that used the query its keywords in the other sections of the study; the keywords could have been returned in the discussion section for the first time. These studies were not relevant because the subject of this study was not the main topic of the found study.

*Study type:* some study types were not the most reliable, valid and could not be easily generalized. For example; articles which described results derived from one individual or one case have not been included. Comments on articles were also not included.

*Period:* some studies were too old to be included. The criterion for attitude to healthcare related studies was that found articles had to be published in the last 30 years (cultural background may not change that much over the years; but behavioral, political and cultural attitudes were prone to changes, therefore a timeframe of 30 years has been added). For travel time related studies the criterion was defined as studies published in the last 20 years. Road networks, remoteness, distance, accessibility could have been significantly changed in 20 years and studies published 20 years ago could have been based on no longer existing situations and therefore no longer be relevant.

There was no criterion to include only studies that were systematic reviews, evidence based guidelines or randomized clinical trials. Not many studies were found when applying this criterion. In order to find more articles the criterion systematic reviews was dropped.

Because of the limited timeframe it was not possible to extensively assess the quality of the selected articles. Therefore it might be the case that studies were included with flawed methods. Adjacent to this problem was that the criterion to exclude studies with flawed methods was dropped.

Travel time related queries were not restricted to gynecology or obstetrics; the initial queries A till E, resulted into zero articles that were included for this review. Other terms besides MeSH terms were used to produce even more results (queries D till I). In the search for attitude to healthcare related studies only MeSH terms were used, because the used queries produced enough results.

## 3.2 ATTITUDES AND CARE-SEEKING BEHAVIOR

**Table 1** (on the next page) gives an overview of the queries that were used to find studies which performed research on attitudes, care-seeking behavior and utilization of healthcare.

## 3.3 TRAVEL TIME & DISTANCE

**Table 2** (on the next page) gives an overview of the queries that were used to find studies which performed research on travel time and travel distance. The studies preferably used an outcome measure (like mortality) or proxy outcome measures (like number of primary care visits).

## 3.4 SELECTION PROCESS

In case articles passed the criteria, a selection process has been executed in order to find the most relevant studies. The selection process was an additional strategy to find the most relevant studies. Studies that passed the criteria underwent a selection process in which several aspects of the study were examined. When the study passed the entire selection process the study was included for review.

*Abstract:* when studies passed the criteria, the abstract has been read. It was possible that all keywords were present, but the overall study could have had another topic and did not discuss the topic of this study. When the abstract has been read it was quite clear what the article is about; when the topic of this study was not the main subject in the abstract of the found study, the study was not included for review. Furthermore it was possible that some of the articles are not available (either electronically or paper-based), the abstracts of these articles has been read and when these articles deemed important enough they would be bought.

*Additional value:* it was still possible that the found study did not discuss the topic of this study and that it was only mentioned as a side-step and the article itself had another topic as main focus. If the topic of this study was not the main topic of the article which has been entirely read; the article was not included for review.

*Referenced by others:* articles referred to other articles which had not been included yet and these referred articles could have been important; therefore the references were scanned for additional relevant articles.

| # | Query   |
|---|---|
| A | ("Health Behavior"[Mesh] OR "Attitude to Health"[Mesh]) AND ("Pregnancy"[Mesh] OR "Labor, Obstetric"[Mesh]) AND "Mortality"[Mesh]                 |
| B | ("Health Behavior"[Mesh] OR "Attitude to Health"[Mesh]) AND ("Pregnancy/mortality"[Mesh] OR "Delivery, Obstetric/mortality"[Mesh])                |
| C | "Patient Acceptance of Health Care"[Mesh] AND ("Pregnancy"[Mesh] OR "Labor, Obstetric"[Mesh]) AND "Mortality"[Mesh]                               |
| D | ("Healthcare Disparities"[Mesh] OR "Culture"[Mesh]) AND ("Pregnancy"[Mesh] OR "Labor, Obstetric"[Mesh]) AND "Mortality"[Mesh]                     |
| E | "Utilization"[Subheading] AND "Patient Acceptance of Health Care"[Mesh] AND ("Pregnancy"[Mesh] OR "Labor, Obstetric"[Mesh]) AND "Mortality"[Mesh] |
| F | ("Health Behavior"[Mesh] OR "Attitude to Health"[Mesh]) AND ("Pregnancy"[Mesh] OR "Labor, Obstetric"[Mesh]) AND Netherlands[Mesh]                 |

**Table 1 – Overview of queries used in order to find attitude to healthcare related studies**

| # | Query  |
|---|--|
| A | "Health Services Accessibility" [Mesh] AND ("Pregnancy/mortality"[Mesh] OR "Delivery, Obstetric/mortality"[Mesh])                            |
| B | "Health Services Accessibility" [Mesh] AND "Time Factors"[Mesh] AND ("Pregnancy/mortality"[Mesh] OR "Delivery, Obstetric/mortality"[Mesh])   |
| C | "Health Services Accessibility" [Mesh] AND "Mortality"[Mesh] AND "Time Factors"[Mesh] AND ("Pregnancy"[Mesh] OR "Delivery, Obstetric"[Mesh]) |
| D | distance AND "Mortality"[Mesh] AND "Time Factors"[Mesh] AND ("Pregnancy"[Mesh] OR "Delivery, Obstetric"[Mesh])                               |
| E | "travel time" AND "Mortality"[Mesh] AND ("Pregnancy"[Mesh] OR "Delivery, Obstetric"[Mesh])   |
| F | "travel time" AND "Mortality"[Mesh]  |
| G | "time factors"[Mesh] AND "Mortality"[Mesh] AND distance  |
| H | remoteness AND "mortality"[Mesh]   |
| I | remoteness AND mortality   |

**Table 2 – Overview of queries used in order to find travel time & travel distance related studies**

## 4 RESULTS

In this section the results of the literature study were elaborated upon. The result section was divided in two subsections; in the subsection search results details about the number of articles found were given, how many articles did not meet the inclusion criteria and how many articles were included for each query. In the subsection "Three Delay Framework" the findings will be discussed and the literature regarding to the research questions of this study was reviewed. The third delay factor (receiving adequate care when a facility is reached) lied outside the scope of this study and was just mentioned for overview.

### 4.1 SEARCH RESULTS

For each topic the search results were chronologically presented in a table and graphically represented in the flowchart, see **Figure 1**. The tables can be found in **Appendix A – Literature Search Results**. **Table 3** described the chronological selection of articles for the attitude to healthcare related studies and **Table 4** described the same procedure for the travel time related studies. Tables should be read from top to bottom,

in which the criterion mentioned at the top of the table was the first criterion on which the articles have been checked. This procedure was identical for the selection process. In **Appendix B – Study Characteristics** (see **Table 5** till **Table 9**) some characteristics of the included studies were reported. **Appendix C – Attitude to Healthcare related studies** gave an overview of short summaries of the included attitude to healthcare related studies and **Appendix D – Travel time related studies** provides a similar overview for the included travel time related studies.

First the selection process of the attitude to healthcare related studies were described and subsequently the selection process of the travel time related studies were described.

#### 4.1.1 ATTITUDES AND CARE-SEEKING BEHAVIOR

Because of the language criterion a total of 56 articles were not included. Most articles were not included because of the absence of keywords in the abstract, title and/or keywords (285 articles, 33%).

Another 43 (5%) articles did not make it to the final set; because of their study types. Most of these studies were either comments, vague editorials or a single case study. Case studies or case-record studies were only included when a large study sample was used. Once more another 59 (7%) articles were excluded because they were published over 30 years ago, reason for using this criterion has been discussed in the previous section.

Besides the criteria for inclusion a selection process has been executed. The majority of excluded articles were the result of exclusion after reading the abstract; 297 articles (35%). Some articles passed all the criteria, but their abstracts were not about the main topic of this review or did not even mention the topic of this review. In other words; the keywords in the abstract had no relation to the topic of this review, they were mentioned in a different context or not related to the other keywords of the query.

Another 50 (6%) articles were not included after the entire article was read. The main reason for exclusion was that articles did not elaborate on the topic of interest of this study; the topic was mentioned quite a lot in the abstract (and therefore included) and for the remaining part of the article the topic was only mentioned in the discussion and/or recommendation. Because of the latter some of the articles were excluded. Even one of the articles performed a study in Ghana where the researchers investigated the ghost child; this study was absolutely not relevant and was excluded.

After checking the articles for useful references another 13 articles were included and some of the articles were found by one or more queries; therefore duplicate removal was required. The final set of attitude to healthcare related studies existed of 55 (6%) articles.

Of the 55 articles 45 (82%) were in the area of gynecology & obstetrics [11-55]. Other areas that were studied were cardiology [56-58], nursing [59,60], public health [61,62], oncology [63], pediatrics [64] and psychiatry [65]. These areas are also reported in Table 5 of Appendix B – Study

**Characteristics.** Other characteristics about the included studies can be found in Appendix B – Study Characteristics and has been elaborated upon in the “Three Delay Framework” section.

Most of the attitude to healthcare related studies were qualitative studies (28 studies – 51%); many studies used interviews, surveys, questionnaires or a combination of these to gather the information. The other studies were either quantitative (4 studies – 7%) or a combination of both (23 studies – 42%). These characteristics can be found in Appendix B – Study Characteristics.

#### 4.1.2 TRAVEL TIME & DISTANCE

Initially the all the travel time related queries resulted in 209 articles. Some of these studies were not in English or in Dutch and therefore 13 (6%) articles were excluded from the final set. Again, most of the articles were excluded because of the absence of keywords in the abstract, title and/or keywords in the article (66 articles, 32%).

4 (7%) articles were not included because of their study types. Most of these studies were comments, vague editorials or a single case study. Some of the single case studies reported a case in which the patient had to travel far and had an adverse outcome afterwards. Unfortunately single cases had low evidential value. Adjacent to it another 11 (5%) articles were excluded because research was performed over 20 years ago.

Besides the criteria for inclusion a selection process has been executed. Another 61 (29%) of the articles were excluded as the topic was only mentioned as a side-step in the abstract or only the keywords were mentioned in the abstract but were not coherent to each other; in other words, the keywords had no relation to each other or were mentioned in a different context (for example, the keyword distance was often related to the 6-minute walking distance regarding to cardiac-related problems).

Unfortunately 21 (10%) of the articles were not interesting enough to include them in the final set. The articles were read and they mentioned the topic of travel time (or a closely related term) only

as a side-step or as a recommendation of which topic should be covered by future research. 29 articles passed the selection criteria.

Of the 29 articles only 4 (14%) were in the area of gynecology & obstetrics [49,53,66,67]. The major part of the articles (12 articles, 41%) were in the area of public health [62,68-78]. These studies have investigated the role of travel time and/or distance over a general population (and not one particular disease or disorder) regarding to an outcome (for example mortality), a proxy-outcome (for example number of healthcare visits) or concluded that additional research was required. Some of the studies that were included have done research in the area of cardiology [72,79,80] and/or emergency care [80-82]. This seemed logical, because events in these two areas were most likely life-threatening and every second counts. Other study areas were reported in **Table 5** of **Appendix B – Study Characteristics**. Other characteristics about the included studies can be found in **Appendix B – Study Characteristics** and has been elaborated upon in the “Three Delay Framework” section.

## 4.2 THREE DELAY FRAMEWORK

As mentioned before the study consisted mainly of two parts; attitude to healthcare related studies and the travel time & travel distance related part. In the first part care-seeking behavior in pregnancies has been discussed and associated attitudes, behavior, culture and politics were discussed. The second part discussed the travel time & travel distance and outcomes that have been used by several studies and which methods of travel time & travel distance calculation were used. The third part was only mentioned to give a complete overview of the “Three Delay Framework”. The third part lied outside the scope of this review, therefore research in this area had not been conducted and it was discussed briefly in this review.

Besides the perinatal mortality, maternal mortality is also an indicator of reproductive health and quality of obstetric healthcare [7]. One study performed a literature review and gathered information that could guide programmatic effort

in the prevention of maternal mortality. The study especially looked at the factors that were influencing in the interval between the onset of an obstetric complication and its outcome. The “Three Delay Framework” was introduced to identify obstacles to the provision and utilization of high quality, timely obstetric care [7].

The “Three Delay Framework” – as the name implies – introduced three phases of delay. The researchers viewed ‘delay’ as it had three phases. Phase I delay was the delay in deciding to seek care on the part of the individual, family or both. Factors that shaped the decision-making process to seek appropriate care included the actors involved in the decision-making, status of the women, illness characteristics, distance from the health facility, financial and opportunity costs, previous experience with the healthcare system and perceived quality of care. Phase II delay was the delay in reaching an adequate healthcare facility. Factors that shaped this delay included physical accessibility factors; such as, distribution of facilities, travel time from point A to B, availability and cost of transportation and condition of roads. Phase III delay was the delay in receiving adequate care at the facility. The study also identified several factors which were relevant for this type of delay; such as, adequacy of the referral system, shortages of supplies, shortages of equipment, shortages of trained personnel and competence of available personnel [7].

In **Appendix E – Illustrating the “Three Delay Framework”** the “Three Delay Framework” has been illustrated. **Figure 2** gives an illustrative overview of the “Three Delay Framework” and **Figure 3**, **Figure 4** and **Figure 5** give an illustrative overview of the three phases of the “Three Delay Framework”. This review has used the same setup as the “Three Delay Framework” study; the attitude and care-seeking behavior related studies have been discussed at first and the travel time & travel distance (and its methods) related studies were discussed thereafter.

#### 4.2.1 PHASE I – ATTITUDES AND CARE-SEEKING BEHAVIOR

At first a short introduction about the decision to seek appropriate care was given (factors that affected utilization and outcome were introduced). Second; the “Three Delay Framework” has been used to discuss the first phase. The first phase has been elaborated upon by using the information derived from the studies that have been included in this review.

The actual decision to seek appropriate care for an obstetric problem has been divided into three parts; these parts were social-economic/cultural factors (recognition of complications, perceived severity, perceived etiology, socio-legal issues, women’s status, economic status and educational status), perceived accessibility (distance, transportation and cost) and perceived quality of care (reputation, previous experience, satisfaction with outcomes, satisfaction with service) [7], **Figure 3**.

Before women would seek appropriate care it is needed to recognize the complications and therefore understanding the risk factors and these complications had to be severe enough to decide to seek appropriate care. Besides the recognition of the complications it is needed that socio-legal issues allow women to seek appropriate care (in some countries abortion is not an option). Furthermore the women’s status can influence the decision to seek appropriate care, the same holds for the economic and educational status.

##### SOCIAL-ECONOMIC/CULTURAL FACTORS

Before care would be sought it is needed to grasp the risk factors and the severity of the complications that women experienced. Many studies reported that women often underestimated the common risk factors or did not even know them; these women appeared to be less educated [17,20,22,23,33,35,36,42,43,50,54,56-58,63]. Women who underestimated the risk factors were less likely to attend an antenatal care program [33,35].

Besides the underestimation of the risk factors, the complications were also frequently

underestimated. Women simply did not know that some of the complications could be life threatening; in some cultures pregnancy and delivery were not seen as a disease, but as a natural process which was guided by nature and did not need interference by medical treatment [25]. Another reason for under recognition of the complications, was simply caused by the fact that women did not knew they were pregnant [29-31,45,55].

When the complications were correctly recognized by the pregnant women another barriers appeared on the horizon; socio-legal issues and the women’s status. In some cultures the women could not decide for themselves and every decision was made by community leaders, household leaders, husband or grandmother [16,27,35,40,53]. In other words, these women were not empowered. As many studies have shown that empowerment of women positively influences pregnancy and maternity outcomes. The more women were empowered the more independent decision could be made by the women for their own and they could seek care in an earlier stage of the pregnancy and they could have saved time, because they did not have to persuade other people of their needs [12,20,35,36,40,41,48,50,56].

Empowerment of women could be greatly improved by educating women about their health – and in this case pregnancy and delivery – and complications that can occur. When these complications occur women should be explained in what they should do in these situations [11,20,23,35,36,49]. Unfortunately in many countries and cultures women were undereducated or not educated at all [17,20,22,23,33,35,36,42,43,50,54,56-58,63]. In case women did not receive any education they may have had wrong ideas and associations with medical care. Some studies reported that undereducated or non-educated women had non-legitimate ideas about the healthcare and perceived the healthcare as unsafe, or women relied on self-care (think they could handled it themselves without medical interventions) and knowledge of their mother [23,28,35,36,45,53,54]. Furthermore when relatives/friends were not

supportive women were less likely to attend pregnancy programs [16,27,35,45,53].

Adjacent to it were the above mentioned socio-legal issues. In many countries abortions were illegal and in many cultures it was not accepted to be pregnant before marriage. These issues could form a huge barrier to seek appropriate care when needed. Women might have hesitated to point out their problems or hid their pregnancies even in case of problems, because many of these women feared sanctions of the community or country in which they live in [23,35,36,45-47].

If the aforementioned – perceived – barriers did not apply another barriers might be present; like the economical status of the women (or family). Women with a low SES had less favorable outcomes than women who had a high SES [16-18,22,35,36,51,52,55-57,62,64]. In some countries women had to pay the obstetrician directly for treatment (fees, facility fees and/or medications), when costs were too high women would not go to the hospital to get appropriate treatment and the risk of adverse outcomes increased dramatically [22,51,52]. Next to these costs were the costs of transportation and for some families these costs were too high and these families would wait to the last moment when the only option would be the transportation to a healthcare facility [20,21,31-33,35,36,42,43,46,50,57].

These factors all influenced the decision to seek appropriate care. However, the evidence of some factors was not well understood or a factor could only partially be explained with the current evidence at hand [7,19,35,36]. All the aforementioned factors combined form the socio-economic & cultural factors. Besides these factors there were two other factors which have been elaborated upon in the next two sections of this subsection.

#### **PERCEIVED ACCESSIBILITY**

Adjacent to the socio-economic & cultural factors was the factor of the perceived accessibility; this accessibility was the perception of the individual. It was possible that women could pay for public transport, but they perceived otherwise. These

kinds of perceptions could also influence the decision to seek appropriate care.

Some studies have performed research to investigate this factor [17,20,25,35,36,62]; next to it were studies that performed research to investigate other factors, but found also some interesting results about this factor [15].

The perceived accessibility was mainly about the distance, transportation and cost [7]. The common hypothesis was that people would wait longer in proportion as they lived further away from a healthcare facility; people who were living further would not go to the hospital unless it was absolutely required and there was no other option [20,21,31-33,35,36,42,43,46,50,57]. Although this was not the case in an American study in which participants said – by means of a questionnaire – that distance was not a barrier to seek appropriate care for their children when needed [64]. Distance was also related to the – perceived – quality of care, the severity of the current condition and costs; people were more vacant to travel when the condition was severe than when it was not [19,35,36].

Distance was – as aforementioned – also related with costs, the longer the perceived (and actual) distance the higher the costs of the perceived (and actual) transportation would be. Studies which investigated the effect of cost of services on utilization commonly assessed this effect by using surveys, questionnaires or interviews [17,35,48,51,52]. Main reason given by participants was the financial barrier.

Another important part of the perceived accessibility was the quality of care. Some studies have performed research in this area. The information was gathered by using surveys, questionnaires or interviews showed that women who had a negative attitude towards healthcare, or to a healthcare provider they were less likely to seek appropriate care when needed or did not attend healthcare programs [13,15,16,19,22,26,34,35,65].

### PERCEIVED QUALITY OF CARE

The most influencing factors that determined the perception of quality of care were the previous experiences and reputation of the facility and healthcare provider [19,25,26,34,36]. Patients who had positive previous experiences (an intervention was well executed, it was fast executed, staff attitude was good and etcetera) were more likely have a more positive picture of healthcare and perceived that the overall quality of care was high. On the other hand patients with negative experiences were less likely to have a positive image about the healthcare and were less likely to attend any healthcare program or seek appropriate care when needed [19,28,34,36,51,63].

Other important factors that influenced the perceived quality of care were satisfaction with the outcomes and satisfaction with the service. As mentioned earlier a positive outcome resulted in a higher probability that patients will seek appropriate care in the future or were more likely to attend any healthcare related program in the future.

Satisfaction with the service encompassed staff attitudes, hospital procedures, availability of supplies, waiting time, efficiency, consistent with local beliefs, privacy and possibility of relative/friend support. Two studies reported a lot of problems with the perceived quality of care by Russian immigrants. Russian immigrants found that the quality of care, of hospitals they visited, was below acceptable levels. These two studies found out that the American methodology of care giving was quite different compared to the Russian methodology of care giving. For example; in America (as it is in Europe) it was normal that a patient had input in the treatment plan, in the Russian Federation a physician who asked a patient for his/her opinion about the treatment plan was considered incapable. This caused that the Russian immigrants did not trust the healthcare system and avoid it as much as possible. This problem and many others (like the ones mentioned at the begin of this paragraph) were solved by providing a more cultural acceptable health care path [59,60].

Other studies which investigated the perceived barriers reported fear of treatment

[16,35,42,46,52,54], the attitudes of the staff [19,25,27,34,51,52] and costs [51,52]. Many studies which have been performed in the third world found that the availability of supplies, privacy and consistent with local beliefs influenced the care-seeking behavior of patients [7,19,35,36].

One study explicitly investigated the effect of waiting time and found a decline in utilization was caused by the long waiting times; 86% of women reported the waiting times as a reason to reduce – and even cancel – their visits to maternity care services [51]. That these problems not only occur in the developing world was supported by an American study which conducted seven in-depth interviews. These women reported that family support and waiting times negatively influenced the decision to seek care or participation in prenatal care programs [28].

Communication between healthcare providers and women were also important as one study pointed out. Unfortunately poor communication between provider & patient and provider & provider could result in serious injury for the (un)born child. A proportion of stillbirths and infant deaths were caused by communication failure; studies reported a proportion of 24% to 29% [19].

### PHASE I IN TOTAL

Most of the studies did not make differences between the socio-economic & cultural factors, perceived accessibility and perceived quality of care. Many of the studies which research all three factors conducted surveys, questionnaires and/or interviews [11-18,26,28-31,37,39,40,42-45,46,48,49-54,55,57,58,62-65]. In case of the questionnaires and surveys many questions were based on the Likert-scale and women had to indicate the level of agreement or disagreement. In case of semi-structured, structured and in-depth interviews women had to indicate the level of agreement or disagreement regarding to statements given by the interviewer. In order to reduce bias as much as possible, all studies had developed guidelines and protocols for conducting interviews.

Studies performed in the Netherlands were mainly interested in the reasons why women decided to deliver at home or at the hospital; outcome

measure that was used the actual place of birth. Questionnaires and/or interviews were used to gather information about the reasons for home delivery and hospital delivery [11-16].

Women who preferred home delivery perceived home delivery more relaxed, comfortable, privacy and relatives relatively close (these factors were also mentioned by women who have been surveyed in Nepal [52]); while women who preferred hospital delivery perceived hospital delivery safer, medical assistance was directly available, more convenient [11] and the good cooperation between the midwife and obstetrician [13]. One study reported also the disadvantages of hospital births according to women; people walk in and walk out, many rules, scared of hospital and husband did not like hospitals. The study concluded that women with a higher educational level or with a low SES gave birth at home [16]. Another study pointed out that woman feel more empowered when delivering at home [12]. Adjacent to this, women who were technology rejecting were more likely to deliver at home. The study concluded that attitudes to obstetric technology were an important predictor with respect to the intended place of delivery and women who would like to deliver at home, had less obstetric interventions [15].

Besides the actual place of birth and reasons for delivering at home or at a healthcare center; one study of the Dutch population showed that antenatal care seeking is subject to cultural background and women who felt responsibility. Women who felt more responsible were more likely to seek antenatal care [14]. This was quite the opposite of a study performed in Ghana; which reported – after conducting a controlled trial – that women preferred to deliver in the hospital. They found the hospital environment much safer and convenient [37].

One study in the area of oncology reported that 25% of the patients had waited for over three months, mainly due to a lack of perceived health competence [63]. Although the area of oncology was quite different than the area of obstetrics; in both areas the educational level of the patient was

mentioned as an influencing factor which could cause delays.

Some of the foreign studies used case records to determine the outcomes of the pregnancy, maternity outcomes (maternal mortality was used most of the time) and infant outcomes [19-21,24-26,29-31,37,40,41,43,44,47,49,50,53]. Other studies used proxy-outcomes; like, number of healthcare visits (prenatal care visits, antenatal care visits, healthcare visits in the last year) and accessibility obstacles [18,21,33,35,38-40,45,48,51,62,64]. The hypothesis was when people did not attend healthcare programs or did not often visit healthcare programs; they delayed their decision to seek care. The reason for delay was – in most cases – the main research topic of the studies.

As one Finnish study showed that the number of antenatal care visits is related to several adverse birth outcomes. Case records of women were used to determine the number of antenatal care visits and used to determine the outcome of each pregnancy. It appeared that the women who did not attend or under-attended had a higher risk of delivering a child with a low birth weight and more neonatal and fetal death occurred in the non-attending and under-attending group of women [21]. An American cohort (follow-up) study used the prenatal care visits as outcome measure; women who did not attend had a higher risk of adverse pregnancy outcomes [26]. Attitudes of non-attendance were also discussed in another American study [27].

The major factor that influenced the attendance in antenatal care programs in the developing world was the educational status of the women [35,36,39,49]. Many studies that were included in these two (systematic) reviews [35,36] pointed out that woman who were better educated were more likely to attend. Besides the educational status of the women the accessibility also played a role in attending antenatal care; the same remark can be made for the religion and ethnicity [35,36,38,55].

A European study in the area of obstetrics used case-controls to determine factors that influenced the adequacy of prenatal care. Two groups – over a

thousand participants each – were created; one group received inadequate prenatal care and one adequate care. Interviews were conducted in both groups. Results of the study were that women with lack of insurance and women younger than 20 years were less likely to receive adequate prenatal care. These women were also more likely to be foreign nationals, unmarried, unplanned pregnancy, no income (related to ‘cost too high for treatment’), less education and different cultural background [17]. An Indian study supported this finding – by conducting surveys and usage of case records – the demand of prenatal care services increased when women had a role in the household decisions and had control over resources [40].

Although Europe could be seen as a developed part of the world, barriers to prenatal care still existed [17]. Quite similar studies performed in the Russian Federation [18], in the United States of America [22-24,33,64] and in the developing world [41,46-48,51,55] supported the findings of the European study. Another study performed in the United Kingdom showed that Pakistani immigrants experiences difficulties to actually decide to seek appropriate care. Adjacent to the factors reported by the European and Russian Federation study there were also barriers reported in communication, discrimination and culture blaming [20]. This was also reported in an American study on Mexican immigrants [25]. In Australia unhelpful care-givers and no influence on decision support were also mentioned as barriers to prenatal care and mentioned as reason to under-attend or attend not at all [34].

Other factors that played a role in under-attending or even non-attending were feelings about the pregnancy; women who denied their pregnancies, unhappy about their pregnancies or had unwanted pregnancies were more likely to have inadequate care. These results were acquired by using a developed survey which data was supplemented with interviews and a mailed questionnaire [29]. The same study setup was used to determine influencing factors on low birth weight. Adjacent to the previous study stress and major accident or illness were also reported as factors that increases the probability of low birth weight [30]. Another

study – which used the same setup as the previous two – reported that when women did not receive adequate advice during pregnancy and delivery, the women had an increased chance to deliver a low birth weighted baby [31]. The findings of these three studies were supported by the findings of a study performed in Jamaica and Mexico; interviews were conducted and women reported the same factors [45,55].

A factor that positively influenced the usage of healthcare services was the acceptance of obstetric interventions and technologies. A Bangladeshi study – used case records and interviews – reported that women who believed in regular examinations were more likely to use healthcare services [39]. Furthermore women who did less fear the possibility of obstetric interventions were more likely to attend healthcare services [39,42,52,54].

Although cultural background was reported as a possible barrier to seek appropriate care [14,17,20,22-26,35-38,54-56,58]; there were American reviews that showed that less acculturated Mexican women had a higher educational status, better nutritional status, were less likely to be adolescent or unmarried and had a large social network. Because of all these factors the incidence of adverse perinatal outcomes was lower in less acculturated women than culture adopting women. However Mexican women might have delayed the decision to seek appropriate care because pregnancy was not seen as a disease in these cultures [25,32].

Some of the studies used the results of the questionnaires, surveys and interviews combined with the case record information were used to find the cause of maternal deaths in the population. Sometimes it was not possible to question the woman who had delivered (because she died) and proxy-interviews were conducted instead. Proxies were most likely relatives of women who died or healthcare personnel [43,44,50,53]. Some of the deaths were caused by a delay in care-seeking; because family, community and the woman were not aware of the problems at hand [43,53]. Besides the understanding of the problems, some deaths were caused by transportation problems and lack

of confidence of equipment available in the facility. Lack of confidence caused that women under-attend healthcare services [44,50,53].

Several included studies for this review have been performed in other areas. Although cardiology was a quite different area than gynecology & obstetrics some of the barriers to seek appropriate care were not restricted to a specific area. As one review reported the knowledge of myocardial infarction was limited and the care-seeking process was therefore delayed. Other factors that influenced the care-seeking behavior were ethnicity and SES [56].

Another study in this area compared the factors influencing care-seeking behavior of North Americans and Australians. Respondents and case records showed that people who delayed had a lower educational level, lower SES, underestimated the symptoms and Australians were embarrassed to seek care, while Americans tried to wait until the pain was over [57]. A Britain study used a case scenario and asked participants what they would do in case they underwent the scenario. The study showed that European people were less likely to seek care as compared with Hindu and Sikh people [58]. Research in other areas has shown that cultural barriers also existed in the area of public health [61,62] and psychiatry [65].

#### 4.2.2 PHASE II – TRAVEL TIME & DISTANCE

At first a short introduction about reaching the appropriate facility was given (factors that affected utilization and outcome have been introduced). Second; the “Three Delay Framework” will be used to discuss the second phase. The second phase has been elaborated upon by using the information derived from the studies that have been included in this review.

##### DISTRIBUTION & LOCATION OF HEALTH FACILITIES

In many countries existing facilities were located in the urban areas. Rural areas did have less existing facilities which increased the distance and travel time towards a facility when care was needed. In developing countries differences between the urban and rural areas were huge and many of the studies reported higher risks of adverse outcomes

in the rural populations compared with the urban populations. Many studies reported significant differences after adjusting for socio-economic and socio-demographic variables [49,62,66,68,74].

Distribution & location of health facilities was closely related to distance; a very wide spread distribution of health facilities resulted in an increased distance and time to travel to reach an appropriate facility. Another problem – which has been introduced in the previous section – was the availability of resources. Many rural and smaller healthcare facilities did not have all the resources available to be able to help the care-seeking population. This also resulted in an increased distance and time to travel to reach another appropriate facility [62,70,74].

##### DISTANCE

As mentioned earlier the distance was closely related to the distribution & location of health facilities. One of the factors which negatively influenced the decision to seek care was distance. As mentioned earlier women reported to delay because of the distances were perceived too long.

Many studies have reported that distance increased the possibility of an adverse outcome [53,65,66,69,73,75,77,79,83], but on the other hand there were also studies that reported that distance was not a main influencing factor or not even a factor that influenced the possibility of an adverse outcome [68,71,85]. One should proceed with caution; because the influence of distance depended on the complications or illness at hand, distance could have been a more influencing factor in emergent/acute complications (cardiac arrest, obstructed delivery, trauma care, transplantation and etcetera) than for chronic complications (cancer and etcetera). Although a study in the area of liver transplantation reported no relation between distance and survival [89].

Besides the travel distance, travel time could also be an influencing factor. It might have been an even more important factor than travel distance itself. Whether someone had to travel five kilometers on the highway or travel five kilometers at a small one-lane road would definitely result in considerably different travel times

[72,73,76,79,80,82,84,85,90]. Again there were studies that had identified travel time as an influencing factor on adverse outcomes [49,53,66,67,73,80,88,90], while others reported no significant effect and determined that travel time was not an important influencing factor on adverse outcomes [64,72,82,85,87,89].

#### TRANSPORTATION

A closely related factor with distance was the availability of transportation. Especially low SES populations did not have the availability of private transport and were depending on public transportation. Some studies reported that if public transportation services were not available, people would delay in seeking appropriate care when needed or would not reach the facility when they had decided to seek appropriate care [66,70,74,78,82,84]. Besides the availability of public transportation services was the aspect of cost; some delays were caused by the inability to pay for transportation and the probability to reach an appropriate facility in time was diminished even further. However the evidence on cost of public transportation services and outcomes was scarce [7].

Problems of transportation were mainly apparent in rural areas and in the developing world (as described in the previous section). A couple of studies had identified a relation between the availability of transportation options for patients and a particular outcome of interest (e.g. mortality and etcetera) [49,53,66,78].

#### PHASE II – IN TOTAL

Phase II delays had important programmatic implications. For instance, it was of little use to identify high-risk pregnant women who should deliver in a healthcare center and raise the community's awareness of risk factors if the women were unable to reach the hospital [7].

Two main methods – which were found in the included studies – were identified. Travel distance and travel time could be calculated by using straight-line distance or actual road distance and actual travel time. Road distance and actual travel time can either be determined by using a route planner of any kind or a geographical information

system in which a road network has been implemented [7].

Both methods needed a starting point and an end point. Most studies which used either one of the travel time/distance calculation methods or both used of post codes as start and end point [72,73,76,79-82,84,85,90]. Only one study used GPS coordinates as start and end point of the calculation [75]. The information needed to calculate travel time were derived from a database [72,82] and have been calculated with a GIS [73,76,79,81,84,85], Microsoft Autoroute Express [72,80] or Yahoo Maps [90]. The working of a GIS lied outside the scope of this review and was extensively discussed in several articles [92-95].

A British study in the area of cardiology and public health reported no relationship between travel time to the nearest hospital and survival rate. Data was gathered from residents of West-Sussex and case records were selected [72]. Another British study performed in the South-West of England calculated the straight-line distance to the general practitioner and drive time to the nearest hospital; data was derived from case records. The study found great differences in distances in the rural costal region [73]. An American study used data of women of the WISEWOMEN program who agreed to participate, coordinates of women's location and healthcare center were used to calculate straight-line distance. It appeared that travel time plays an important role in the probability of attendance [75]. Another American study performed research to determine geographical and racial differences in distance traveled and time spent during travel. The study used a GIS and calculated travel time and travel distance by using the road network and additional restrictions (speed limits and etcetera). Differences in travel time and distance were found for race and geographical region. Rural patients and African Americans traveled longer and further. Unfortunately no outcome measure was used and the impact of these differences on adverse outcomes is not known [76].

Some studies were performed in the area of cardiology [72,79,80]. One study tried to estimate out-of-hospital deaths due to myocardial

infarction. Data was collected from patient records from hospitals and travel time was calculated by using post codes of patients' residence and nearest hospital. The result of the study was; the risk of out-of-hospital death was related with the increased hospital distance [79]. A Scottish study used outcome and demographic data of out-of-hospital cardiac arrests and calculated response time and distance traveled to the scene, it appeared that survival rates were lower when response time increases and patients did not survive when distances exceeded 12 miles. Survival rates were examined by postcode district [80].

In the area of emergency care studies are performed which studied the influence of distance on mortality. One study calculated straight-line distance of 10,315 cases and used logistic regression for determining a possible relationship between travel distance and mortality. It appeared that increased distance is associated with mortality (OR 1.02 per kilometer,  $p < 0.001$ ) [81]. The other study in emergency care showed quite the opposite results. In Sweden a study was performed to investigate the survival rate of patients that were transported to a tertiary hospital and calculated the transport time (data derived from patient records). No relationship was found [82].

A study performed in the area of oncology supported the evidence of the Swedish study. 117,097 cases of cancer were studied. Patients were diagnosed in Northern England between 1994 and 2002. Travel times were estimated to the general practitioner and hospitals attended by using a GIS. The GIS was also used for measures of access to public transport. Only the patients with prostate cancer living further from their general practitioners had a worse change of survival ( $p < 0.05$ ). Risks associated with travel time to primary care were small [84].

Another study performed in the area of pediatrics supported the evidence of the previous two studies. The study was performed in the United Kingdom and used data of the CBD comprising 278,993 births. Road networks and hospitals were captured in GIS. Logistic regression was used to determine the risk of death in relation to accessibility. No evidence was found to suggest

that living further from hospitals increased the risk of infant death or stillbirth [85]. A quite similar study was performed in a population of eligible liver transplantation patients. The study used a GIS to map the road network and logistic regression was used to determine the independent effects of travel time. No statistical differences were found between the two groups [89].

Another study which included data of asthma patients studied the effect of travel time on mortality. By using information derived from patient records postcodes were extracted and used for both travel time calculation to the nearest hospital and travel time calculation to the nearest general practitioner. Asthma mortality was increased when travel time to hospital increased, relative risk of 1.07 for each ten minutes increase in travel time [90].

Some studies did not use direct travel time calculation, but used interviews, questionnaires or surveys to determine the impact of travel time and travel distance [49,53,59,62,64,67,70,77,78,88]. As one study conducted interviews with relatives of recently died women; 47.1% could not get transportation in time and 33.3% of the cases could not have cesarean section in the reached facility [66]. A study which conducted interviews with 20,649 women found a relationship between distance living away from a healthcare facility and live births; living one kilometer away resulted in 79.1% live births, while living seven kilometer away resulted in 73.3% live births [49]. Another follow-up study of 117 maternal deaths was performed in order to find influencing factors (proxy-interviews and case-records were used); besides the cultural aspects of delay there were delays reported in transportation, long distances and lack of transportation options. 25% of the maternal deaths lived more than four kilometer away [53]. An Afghan study reported that maternal risks were high in remote areas; data was gathered by using a survey [67]. These four studies all used second-hand information and self-reported travel time and distance, no actual measurement was performed.

Three Australian studies used a remoteness index; also known as ARIA [68,69,83]. More information about ARIA can be found on this website [91]. One

of these two studies investigated whether or not there was a relationship between mortality and the grade of remoteness in the Tasmanian area. The mortality data was acquired from the ABS. The study did not find a significant relationship between mortality and grade of remoteness [68]. The other study reported quite the opposite; the study found a correlation between mortality and the grade of remoteness ( $p=0.002$ ). The same study setup was used although this study used the data of the entire Australian population [69]. Both studies also investigated the effect of SES (acquired by using SEIFA) on mortality; the Tasmanian study found no effect, while the other Australian study found a significant effect. A study in the area of oncology – performed in New South Wales – reported that grade of remoteness was related to the survival rate of several cancers; dataset comprised all patient data from patients diagnosed with cancer between 1992 and 1996 [83].

Another Scottish study defined its own remoteness index and reported that the travel time for rural patients were longer ( $p<0.001$ ), however no significant differences were reported by travelling by air or land. The study derived its data from almost 4,000 patients but no relationship with adverse outcomes has been investigated [86]. A quite similar study has been performed in Canada the travel time over ground was longer ( $p<0.001$ ), but again no relationship with adverse outcomes has been investigated [87].

As mentioned previously some studies did not use direct travel time calculation and used interviews, questionnaires or surveys to determine the impact of travel time, distance and remoteness. One Australian study performed a survey and identified possible barriers in rural care seeking; women were questioned about possible barriers and one of the most prominent barriers was lack of transport to a healthcare facility, other barriers reported were in the area of obstetrics & gynecology [70]. Again another Australian study reported almost no effect of remoteness on healthcare utilization. The study used hospital data on morbidity and mortality [71]. Another survey-study of 1,059 adults performed in North Carolina; identified several geographic and spatial behavioral factors in rural healthcare utilization.

Participants reported lower utilization when not having a driver's license could not use provided rides and distance for regular care [62]. A quite similar study was also performed in North Carolina. Surveys were used to assess the determinants of healthcare visits. No apparent geographical access barriers existed according to this study [64]. An American study used a mail survey to explore the relationship between utilization of healthcare and distance. People who had to travel more than ten minutes had reduced utilization of healthcare [88]. A study performed in Ghana conducted 14 in-depth interviews with older mothers, 45 semi-structured interviews with mothers, 28 case histories and 32 expert interviews and financial and transportation problems were mentioned as reason for delayed care seeking [78].

One study used a questionnaire instrument to determine reported healthcare barriers and its relationship with the self-rated health. It appeared that travel time and transportation were reported as healthcare barriers for people with a decreased self-rated health and they were as important as age, race, gender and education [77].

The previously mentioned studies which calculated travel time and/or distance use either or both direct measures (like physical distances, travel times and public transport travel time/schedules) or indirect measures (like population density/sparsity and nearest neighbor distances). As explicitly put into words in a review which studied the problem of deriving realistic access measures between population demand and health service locations. Car and bus travel times modeled were much more strongly related to actual transportation barriers than proxy measures (like straight-line distance and population density) [74].

#### 4.2.3 PHASE III – RECEIVING ADEQUATE AND APPROPRIATE TREATMENT

When people finally arrived at the healthcare facility barriers that can cause delays still existed. However while the first phase of delay was at a more individual level, the third phase was at a more population based level (second phase delays were a combination of the individual level and population based level). In other words; an

individual patient could have hardly influenced the possibility of delay.

The actual quality of care could be negatively influenced by the poorly staffed facilities. Poorly staffed facilities often resulted in delays; which can be caused by insufficient numbers of healthcare personnel at a facility. Besides the staff numbers it was also a matter of competence. When there were not enough competent qualified and trained personnel available, inevitably delays would occur [7,35,44].

Another problem could be the poorly equipped facilities, which was often a problem of the third world facilities or the more remote facilities [35]. Sometimes people arrived and the treatment was delayed because of unavailability of equipment, drugs or blood. These delays could result in severe complications and even death. In most third world countries even the most essential drugs – such as antibiotics – were often not available [7,35,43,44]. However in the developed world problems of equipment might appear in the more remote areas of a country.

Adjacent to these problems also another problem could have also resulted in delays; the problem of inadequate management. When a patient arrived at a hospital the cause of problems had to be determined (the diagnosis); the diagnosis could have been wrong and precious time was lost and this incorrect diagnosis caused further delay. Besides the incorrect diagnosis a wrong treatment or action plan could be initiated which – in turn – caused even longer delays [35].

Although the “Three Delay Framework” was originally developed in a third world country (Malawi), it can certainly be used in the developed world. This subsection of the results gave an overview of delays (could be caused by numerous barriers) that could occur from the initial onset of symptoms and complications in the pregnancy up to and including receiving the appropriate treatment; for the symptoms and complications at hand. It gave an overview about what has been investigated in this area. In the **Discussion** the presented results will be reviewed and areas require additional research will be mentioned.

## 5 DISCUSSION

A literature study has been performed to gather information about the research questions. More specific; to find information about common risk factors in pregnancies, current evidence of attitudes & care-seeking behavior, use of care (and which method is suitable for the research question) in the explanation of differences in perinatal mortality.

First, the answers of the research questions will be provided. Second, the limitations of this study are elaborated upon. Third, the additional value of this study is discussed and possible directions for future research are provided.

### 5.1 RESEARCH QUESTIONS

In this subsection the research questions will be answered and discussed one by one.

**WHAT IS THE CURRENT EVIDENCE OF ACCESS TO CARE (TRAVEL TIME), USE OF CARE (CULTURAL ATTITUDES, BELIEFS AND KNOWLEDGE) OF WOMEN IN THE EXPLANATION OF REGIONAL DIFFERENCES IN PERINATAL MORTALITY AND OTHER ADVERSE OUTCOMES?**

#### **Attitudes and care-seeking behavior**

In the Netherlands it is quite normal to deliver at home and that is unique compared to the rest of the world. The reasons given for delivering at home was that women felt more at home in their homes, feared the hospital, felt more empowered and disliked the hospital in terms of place of birth. Reasons were that people walk in and out, there is no privacy and there are many rules. However these Dutch studies only investigated the reasons for the place of delivery and did not examine the effect of place of delivery and outcome of the pregnancy [11-16]. In the Netherlands it was also the case that women with a low SES or a higher educational level give birth at home [16]. As pointed out by foreign studies; positive attitudes towards, ideas and no fear about obstetric interventions and facilities resulted in a higher utilization of healthcare facilities [39,42,52,54].

The results of the Dutch studies were quite the opposite of the results of a study performed in

Ghana; which reported that women preferred to deliver in the hospital. The hospital was perceived much safer and more convenient. This might be explained by the poor living areas of the women in the developing world [37].

Several studies reported that educational status and knowledge about complication and diseases were important factors influencing the decision to seek appropriate care, or to attend care programs [17,35,36,39,40,49,56-58,63]. As one study in oncology pointed that 25% of the patients waited for more than 3 months to seek care, because they did not understand their complications [63]. Women who are better educated were more likely to seek care [17,35,36,39,49]. Other important factors influencing the decision to seek and receive appropriate care were religion (Muslim women were less likely to seek care), ethnicity, empowerment, embarrassment and the perceived accessibility [17,35,36,38,40,55,57,58]. A European study found that not only education and SES were important factors in receiving adequate care; but also the marital status of the women, unwanted pregnancy and cultural background [17,35,36,54,56]. However several American studies reported better outcomes in Mexican immigrants that were less acculturated [25,32]. However in many cases these women do not seek appropriate care when needed; because pregnancy is not perceived as a disease, but as a natural process [25,32].

Barriers to healthcare do not only exist in the developing world, but – as the previous paragraph also mentioned – also in the developed world. Findings of the European study were supported by studies performed in the Russian Federation [18], in the United States of America [22-24,33,61,62,64], Australia [61], United Kingdom [65] and in the developing world [41,46-48,51,55]. Other study performed in the developed world reported some additional barriers like communication problems, culture blaming, unhelpful providers, no role in decision support and discrimination. When people experience one or more of these barriers they were less likely to seek and receive adequate care [20,25,34].

Some studies showed that the number of care visits was closely related to delivering a low birth weighted child [21,26,27]. Even one study was able to find a relation between the number of care visits and neonatal and fetal death [21].

Related to the number of care visits were feelings about the pregnancy; more negative feelings (unwanted pregnancy, unplanned pregnancy and pregnancy denial) about the pregnancy resulted in less healthcare visits or under-attending healthcare programs which could result in adverse outcomes like delivering low birth weighted children [29-31,45,55].

Besides the problems that can cause adverse outcomes for the fetus; there are also factors that can do serious harm to the pregnant women. Several studies had tried to identify causes of maternal deaths; case records were used and proxy interviews were conducted [43,44,50,53]. Some found that delays in care-seeking were responsible for maternal deaths [43,53]. Other causes were related to transportation and lack of equipment in the healthcare facilities [44,50,53].

It might be possible to explain regional differences in adverse outcomes in pregnancies. The studies that have been included showed some promising results that might explain (or already have explained) regional differences in adverse outcomes in certain – geographical – areas. The Dutch studies that have been included in this review already investigated the reasons to deliver at home. The next step will be to investigate the relationship between the reasons to stay at home and place of delivery and birth outcome.

#### **Travel time & distance**

There are studies that have performed research in factors that influence reaching the appropriate healthcare facility in time [49,53,62,64,66-90].

The evidence of the effect of travel time on adverse pregnancy outcomes is inconclusive. Only four studies in the area of gynecology & obstetrics were included and they all were performed in the developing country. However these four studies reported that travel time and/or distance was an

important influencing factor in the decision making and had influence on adverse outcomes in pregnancies [49,53,66,67].

Some studies reported no significant differences in travel times to the hospital and survival [72,85]. Even a study performed which investigated the relation between travel time and liver transplantation survival; found no significant effects [89]. However another study found great differences in distances in the rural region [73]. An American study found a relation between out-of-hospital risk of death and the increased hospital distance [79]. A similar relation was found in studies performed in the area of emergency care [80,81] and deaths from asthma seem to increase when the travel time increases [90]. Nevertheless a Swedish study performed in the area of emergency care did not find any relationship between travel time and survival [82]. It seemed that travel time and travel distance have less impact on outcomes in chronic condition, as one study performed in the area of oncology pointed out [84].

Several studies have studied the effect of travel time and travel distance on the probability of attendance. According to one study there was a relation between travel time and the probability of attendance [75]. While another study reported fewer live births when living further away from a healthcare facility [49]. Remoteness seems also to affect maternal deaths as reported in two other studies [53,67].

In Australia a remoteness index has been developed; ARIA. Several studies have used this instrument (or a derivative) to study the effects of remoteness on mortality. Two studies reported no effect [68,71], while two other studies reported a significant relationship between remoteness and mortality or survival [69,83].

According to another study the amount of time spent in reaching an appropriate facility is also dependent of race and ethnicity. African-American people travelled longer and further [76].

Besides the longer travel time and travel distance, obtaining transportation in time could also play a role in reaching a facility in time. Some of the

pregnant women died because of the inability to obtain transportation [53,66].

Two studies performed reach on which type of transportation is faster; over land or through the air. The Canadian study found that travel time over ground was longer [87], the other study found no effect [86]. The outcomes of the studies were not used to explain possible differences in outcomes of any kind.

Other studies have performed surveys, questionnaires or conducted interviews to identify possible barriers of accessing healthcare [62, 64,70,78,88]. The most prominent mentioned barriers were lack of transportation, or living further away from the facility [62,70,78,88]. Another study did not identify any geographical access barriers [64].

As the included studies show there is no concrete evidence that travel time, travel distance or remoteness can explain regional differences in adverse outcomes in pregnancies. Some of the studies reported that it is possible to explain regional differences by using travel time, travel distance, remoteness or a combination; while others reported that it is not possible.

### Travel time calculation methods

Two main methods – which were found in the included studies – were identified. Travel distance and travel time can be calculated by using straight-line distance [73,75,81] or actual road distance and actual travel time [72,73,76,79,80,82,84,85,88, 90]. Road distance and actual travel time can either be determined by using a route planner of any kind or a geographical information system in which a road network has been implemented [7]. Most studies which used either one of the travel time/distance calculation methods or both, make use of post codes as start and end point [72,73,76,79-82,84,85,90]. Only one study used GPS coordinates as start and end point of the calculation [75]. The information needed to calculate travel time were derived from a database [72,82] and have been calculated with a GIS [73,76,79,81,84,85], Microsoft Autoroute Express [72,80] or Yahoo Maps [90].

The previously mentioned studies which calculated travel time and/or distance use either or both direct measures (like physical distances, travel times and public transport travel time/schedules) or indirect measures (like population density/sparsity and nearest neighbor distances).

Car and bus travel times modeled are much more strongly related to actual transportation barriers than proxy measures (like straight-line distance and population density) [74].

Other studies did not use direct travel time calculation, but used interviews, questionnaires or surveys to determine the impact of travel time and travel distance [49,53,59,62,64,67,70,77,78,88].

The method of using a road network could be further improved by implementing restrictions for every road (like speed limits, urban and rural roads).

Although road distances are a more accurate reflection of the real world travel time people with a lower SES are dependent of public transport. This method is only used in one study [84]. The study implemented the public transport tables in a GIS, however the tables were simplified.

Many studies used postcodes of patients and nearest hospital (or hospital in which patients have been treated) [72,73,76,79,80,82,84,85,90]. In all these cases postcodes of home residence is used, while almost all patients do not stay at home 24/7. However in case of pregnancy and the possibility of delivery women will not make many journeys, if there is a high probability that they will deliver shortly.

Besides the limitations of road travel distance, the real world travel time and travel distance is also dependent of walking from residence to the transportation vehicle (car, bus, tram, emergency vehicle and etcetera) and transportation from the vehicle to the care facility (walking from the parking lot, transfer in the hospital and etcetera). These times and distances have not been incorporated in the studies that have been found. However the travel time and travel distance calculation used in the studies is relatively easy to calculate and is not that labor intensive when using

a GIS. It would be difficult to determine the pre-transportation time and post-transportation time for each patient in a large population [72,73,76,79,80,82,84,85,90].

Although there are some limitations; the preferred method for travel time and travel distance calculation is the actual road distance and the travel time that is related to the actual road distance.

#### **WHAT ARE THE RISK FACTORS FOR ADVERSE OUTCOMES IN PREGNANCIES AND IN TERM PREGNANCIES WITH SPECIAL ATTENTION TO ACCESS AND USE OF HEALTHCARE?**

##### **Attitudes and care-seeking behavior**

Besides the numerous 'common' risk factors for adverse outcomes in pregnancies and in term pregnancies (which were introduced in the section about **Risk factors in Pregnancies**); there is also evidence that there are also risk factors that are related to access and use of healthcare.

Educational status was mentioned by numerous studies as a risk factor [17,20,22,23,33,35,36,42,43,50,54,56-58,63]. Women who have a lower educational status appeared to delay the decision to seek appropriate care or under attend healthcare programs [34,36].

Closely related to education are the aspects of empowerment and the underestimation of complications (pregnancy was unknown, not recognizing the symptoms). The more empowered women are, it is more likely that women attend healthcare programs [12,20,35,36,40,41,48,50,56]. Women, who do not underestimate the complications at hand, are more likely to attend healthcare programs [29-31,45,55]. Women who have friends and/or relatives who are not supportive are less likely to attend healthcare programs [16,27,35,45] or even die [43,44,50,53].

Negative socio-legal issues are also risk factors in attending healthcare programs or even causing adverse outcomes like maternal mortality [45,47]. If abortion is illegal or pregnancy in unmarried women is not accepted women would delay the care-seeking process; women do not attend or

under attend healthcare programs [23,35,36,45-47].

Economic status of the family and woman is also an influencing factor. Women who have a lower SES have a higher risk of having adverse outcomes in pregnancies [16-18,22,35,36,51,52,55-57,62,64].

The perceived accessibility of care and perceived quality of care are also factors that influence the decision to seek appropriate care when needed. Women, who perceived that they have to travel further [20,21,31-33,35,36,42,43,46,50,57] or pay more [17,35,48,51,52], have an increased risk to under attend healthcare programs. Payment is closely related to the SES of the family of the women and the women herself. Risk factors in the area of perceived quality are; previous negative experience, negative attitude to healthcare [13,15,16,19,22,26,34,35,65], fear of treatment [16,35,42,46,52,54] and unfriendly (or negative or bad) attitudes of the staff [19,25,26,28,34,36,51,63]. Women who experience one or more of these risk factors are less likely to attend healthcare programs.

Other more commonly known factors that influence the decision to seek appropriate care are; maternal age (closely related to education; women of a higher maternal age are more likely to attend healthcare programs and are better educated), ethnicity (foreigners are less likely to seek appropriate care) and discrimination (discriminated groups or women are less likely to seek appropriate care) [18,19].

As become apparent in this review is that many studies examined the effect on the outcome measure healthcare visits or healthcare program attendance. As several studies show that under attendance or less healthcare visits increases the risk of adverse pregnancy outcomes [22,27,28].

#### **Travel time & distance**

Travel time and travel distance are closely related with the distribution and location of health facilities. Travel time and travel distance are increased when there are less health facilities in the area [49,62,66,68,74]. Besides the distribution in numbers; the distribution in equipment is also a

risk factor that increases travel time and travel distance (rural facilities cannot perform every treatment as urban facilities can) [62,70,74].

Distance itself is an important risk factor for adverse outcomes [53,65,66,69,73,75,77-79,81,83]. However there are studies that showed no relationship between distance and adverse outcomes [68,71,85]. Depending on the severity of the complication at hand increasing distance could be a risk factor for adverse outcomes. It is also depending on having a driver's license; utilization of healthcare decreases when someone does not have a driver's license [62].

Besides travel distance, travel time itself has been identified as an important risk factor for adverse outcomes [49,53,66,67,73,80,88,90]. Again there were also studies that reported no significant relationship between travel time and the risk of an adverse outcome [64,72,82,84,85,87,89].

Travel distance and travel time are correlated with the degree of remoteness. Several studies have used remoteness indexes to determine relationships between the degree of remoteness and adverse outcomes. Remoteness was a risk factor for increased adverse outcomes [69,83]. However remoteness was reported not as a risk factor in several studies [68,71,86,87].

The economic status could be a risk factor for adverse outcomes; because people with a low SES are sometimes dependent of public transport and in some regions for public transport is not available; these people will therefore not reach the facility or will not even seek appropriate care [66,70,74,78,82,84]. The availability of transportation options is related to an increased risk of several adverse outcomes [49,53,66,78].

## **5.2 LIMITATIONS**

One of the reasons to include a quick overview of the 'common' risk factors is that knowledge of the 'common' risk factors is required to be able to fully understand the topics of this review. For these risk factors three books were used. However the most recent developments in research of risk factors in pregnancies might have been missed. Nevertheless this study interest was emphasized on travel time,

travel distance and attitude to healthcare. Therefore the 'common' risk factors were derived from several books.

The literature search has been performed in PubMed only; it is possible that more studies could have been found in other databases. However references of articles were checked to find studies that were not found by the queries that have been used. This action reduced the chance that studies have been missed for review.

Another possible limitation of this research is the usage of MeSH terms. MeSH terms are used for indexing, cataloging and searching for biomedical and health related information and documents. MeSH terms are allocated by experts and it could take a while to index studies accordingly. By using MeSH terms recent studies could be missed. One major advantage of MeSH terms (and that is one of the reasons to use them) is that the search includes the alternative spelling, terms and synonyms of a specific MeSH term.

Because of the criteria that have been used in this study; studies might have been missed. The language criterion excluded some studies and these studies might have had some important information. Furthermore the keywords, abstract and title criterion was accountable for exclusion for many studies. However this criterion was loosely used when less than 50 articles were found.

A common used criterion is the appearance of the main topic of interest in the abstract. When the topic of interest is not mentioned or not elaborated upon, it is presumed that the study is not interesting enough. In this study this criterion was used and it is possible that some interesting studies have been missed.

Besides the limitations of this study, the included studies did report limitations of their study. The following paragraphs will briefly recap on some of the limitations reported by these studies. Study specific limitations can be found in **Appendix C – Attitude to Healthcare related studies** and **Appendix D – Travel time related studies**.

The results of this study also relied on the outcomes of studies were performed in the developing world [35-55,66,67,78]. These studies used valid methods, although the results cannot easily be generalized to the developed world.

Generalization could a problem in some of the studies; either a very specific (sub)population was used or a very small sample size was used. In these cases the findings should be very carefully interpreted [12-16,18,29,33,44,45,47,50,51,53-55,62,64-66,71,77,78,80,82].

Besides the problems with generalization, in many studies bias could have been introduced. Several studies used interviews and interviews – as mentioned by these studies – could easily be steered and interviewees could be easily influenced [12,14,26,28,39,43,44,46,49,50,53-55,59,63,65,67]. Furthermore most of these interviews were performed long after a specific event had occurred; recall bias may have been introduced to the results. Adjacent to these possible biases, a bias might also have been introduced by interviewing only relatives of a patient. Relatives might think different about the situation or they could provide a more positive picture of the situation. Recall bias could have also been introduced in studies which used questionnaires or surveys [11,13,15-18,29-31,37,40,42,45,48,49,51,52,57,58,62,64,67,70,77,78,88]. However interviews, questionnaires and surveys could provide valuable insights; definitely to acquire insights in behavior, culture, attitudes and care-seeking behavior. These insights could not be easily provided by case-records and databases alone.

Unfortunately not many reviews were performed in both areas, there were 11 reviews included on a total of 84 articles. Because of ethical reasons many studies could not perform RCT's and to the author his knowledge there are no EBM guidelines regarding to travel time, travel distance, attitude and care-seeking behavior.

Not many studies were found in the area of travel time and travel distance. Only 29 articles were found. Only four of the included studies were performed in the area of gynecology & obstetrics

[49,53,66,67]. Therefore no direct answer could be provided to the second research question.

The travel time related studies that were included used different methods to calculate travel time, travel distance or both. Unfortunately many studies used proxy measures like remoteness indexes, straight-line distance or even self-reported travel time.

There are several studies that relied on proxy measures (like the number of visits to a healthcare facility); while it would be even more interesting if actual outcomes were used (like mortality).

### 5.3 ADDITIONAL VALUE

This study gives a more coherent overview of possible delays that can occur from the onset of symptoms and/or complications to actually arrive at the healthcare center for treatment. Although the “Three Delay Framework” has been developed 14 years ago, it is rarely known in the Netherlands.

The study gives an overview of the current information projected on the “Three Delay Framework”; more importantly the absence of evidence on several issues became clear.

Although some of the Dutch studies performed research to determine factors that influencing the choice of the place of delivery; this is the first study which combines information about care-seeking behavior & attitudes and travel time.

Future studies should be performed on travel time and travel distance in the Netherlands; currently these kind of studies are not performed in the Netherlands. There is a possibility that travel time and travel distance could – partially – explain the regional differences in perinatal mortality in the Netherlands.

It might also be very interesting to investigate the entire “Three Delay Framework” and see what factors causes the most delay in care-seeking

behavior and reaching a healthcare facility and resulted in adverse outcomes. Results of these kinds of studies can be used to reduce delays in healthcare and prevent adverse outcomes from occurring in the first place.

## 6 SUMMARY

A literature study has been performed to determine the current evidence of access to care, use of care in explaining regional differences in adverse outcomes. Furthermore the most suitable method for travel time calculation has been determined.

Currently there is more evidence for socio-cultural factors, attitude and patient’ perceptions affecting adverse pregnancy outcomes than evidence for delays in (or increased) travel time and travel distance. The studies which investigated delays in travel time and travel distance reported conflicting results and had quite the opposite conclusions and a very few were conducted in the area of gynecology & obstetrics. Although these different conclusions extra research in the Netherlands is required, because the results and conclusions of the included studies could not be easily generalized. Furthermore the number of studies that actually studied the influence of travel time and travel distance is quite low.

It appeared that the road distance and related travel time was the most suitable method that can be used to determine travel distance and travel time. This is also the preferred method, because it is a more exact representation of the real world travel distance and travel time (compared to straight-line distance and remoteness indexes). However this method has also its limitations.

Future research should focus on the effects of travel time and travel distance on adverse pregnancy outcomes in the Netherlands. Travel time and travel distance calculation methods can still be improved.

## APPENDIX A – LITERATURE SEARCH RESULTS

In the subsequent table the search results of this review are shown; under the header 'queries' the totals of all queries are shown, each character is corresponding with a query. Consult the legends of the tables to see which character corresponds with which query. The reason to use these criteria is mentioned in the **Methods** section of this report. These criteria are mentioned in a chronological order; in other words, the language criterion is checked first and the study period will be checked at last. The number in each table row presents the amount of articles/studies that passed a specific criterion.

When studies passed the four criteria; it did not mean that these studies were relevant. Of these studies the abstracts were read and subsequently – when the abstract seemed to be relevant – the additional value of each study was determined.

When the topic of this study was the main topic of the found study; the study was included for the purpose of this study.

**Table 3** is about the attitude to healthcare related studies and **Table 4** is about the travel time & travel distance related studies.

The following abbreviation is used to describe a criterion; ABS/TIT/KEYW stands for keywords in the abstract, title or keyword section of a study. The following abbreviations are used to describe selection processes; ABS topic stands for the topic of an abstract of a study, Ref. by others stands for the study that has been included by selecting it from another included study. The same abbreviations are used in the flowchart.

| Criteria/Selection | Queries | A   | B  | C   | D   | E  | F  |
|--------------------|---------|-----|----|-----|-----|----|----|
| Initial Results    | 857     | 361 | 16 | 171 | 174 | 38 | 97 |
| Language           | 801     | 338 | 13 | 157 | 160 | 37 | 96 |
| ABS/TIT/KEYW       | 516     | 212 | 10 | 113 | 107 | 35 | 39 |
| Study Type         | 473     | 194 | 10 | 99  | 101 | 34 | 35 |
| Period             | 414     | 165 | 10 | 90  | 84  | 33 | 32 |
| ABS Topic          | 177     | 59  | 6  | 55  | 30  | 18 | 9  |
| Additional Value   | 67      | 25  | 1  | 17  | 7   | 13 | 4  |
| Remaining          | 67      | 25  | 1  | 17  | 7   | 13 | 4  |
| Ref. by Others     | 13      |     |    |     |     |    |    |
| Duplicates         | -25     |     |    |     |     |    |    |
| Total              | 55      |     |    |     |     |    |    |

**Table 3 – chronological search results of attitude to healthcare related studies**

|          |   |
|----------|---|
| <b>A</b> | ("Health Behavior"[Mesh] OR "Attitude to Health"[Mesh]) AND ("Pregnancy"[Mesh] OR "Labor, Obstetric"[Mesh]) AND "Mortality"[Mesh]                 |
| <b>B</b> | ("Health Behavior"[Mesh] OR "Attitude to Health"[Mesh]) AND ("Pregnancy/mortality"[Mesh] OR "Delivery, Obstetric/mortality"[Mesh])                |
| <b>C</b> | "Patient Acceptance of Health Care"[Mesh] AND ("Pregnancy"[Mesh] OR "Labor, Obstetric"[Mesh]) AND "Mortality"[Mesh]                               |
| <b>D</b> | ("Healthcare Disparities"[Mesh] OR "Culture"[Mesh]) AND ("Pregnancy"[Mesh] OR "Labor, Obstetric"[Mesh]) AND "Mortality"[Mesh]                     |
| <b>E</b> | "Utilization"[Subheading] AND "Patient Acceptance of Health Care"[Mesh] AND ("Pregnancy"[Mesh] OR "Labor, Obstetric"[Mesh]) AND "Mortality"[Mesh] |
| <b>F</b> | ("Health Behavior"[Mesh] OR "Attitude to Health"[Mesh]) AND ("Pregnancy"[Mesh] OR "Labor, Obstetric"[Mesh]) AND Netherlands[Mesh]                 |

|                  | Queries    | A        | B        | C        | D        | E        | F        | G        | H        | I         |
|------------------|------------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|
| <b>Criteria</b>  |            |          |          |          |          |          |          |          |          |           |
| Initial Results  | 209        | 5        | 1        | 9        | 10       | 0        | 11       | 108      | 19       | 46        |
| Language         | 196        | 3        | 1        | 9        | 10       | -        | 11       | 102      | 18       | 42        |
| ABS/TIT/KEYW     | 130        | 2        | 1        | 6        | 7        | -        | 10       | 59       | 14       | 31        |
| Study Type       | 126        | 2        | 1        | 6        | 7        | -        | 10       | 55       | 14       | 31        |
| Period           | 115        | 2        | 1        | 6        | 6        | -        | 10       | 47       | 14       | 29        |
| ABS Topic        | 54         | 0        | 0        | 2        | 2        | -        | 6        | 20       | 8        | 16        |
| Additional Value | 33         | -        | -        | 0        | 0        | -        | 4        | 9        | 5        | 15        |
| Remaining        | <b>33</b>  | <b>0</b> | <b>0</b> | <b>0</b> | <b>0</b> | <b>0</b> | <b>4</b> | <b>9</b> | <b>5</b> | <b>15</b> |
| Ref. by Others   | <b>13</b>  |          |          |          |          |          |          |          |          |           |
| Duplicates       | <b>-17</b> |          |          |          |          |          |          |          |          |           |
| <b>Total</b>     | <b>29</b>  |          |          |          |          |          |          |          |          |           |

**Table 4 – chronological search results of travel time related studies**

|          |  |
|----------|--|
| <b>A</b> | "Health Services Accessibility" [Mesh] AND ("Pregnancy/mortality"[Mesh] OR "Delivery, Obstetric/mortality"[Mesh])                            |
| <b>B</b> | "Health Services Accessibility" [Mesh] AND "Time Factors"[Mesh] AND ("Pregnancy/mortality"[Mesh] OR "Delivery, Obstetric/mortality"[Mesh])   |
| <b>C</b> | "Health Services Accessibility" [Mesh] AND "Mortality"[Mesh] AND "Time Factors"[Mesh] AND ("Pregnancy"[Mesh] OR "Delivery, Obstetric"[Mesh]) |
| <b>D</b> | distance AND "Mortality"[Mesh] AND "Time Factors"[Mesh] AND ("Pregnancy"[Mesh] OR "Delivery, Obstetric"[Mesh])                               |
| <b>E</b> | "travel time" AND "Mortality"[Mesh] AND ("Pregnancy"[Mesh] OR "Delivery, Obstetric"[Mesh])   |
| <b>F</b> | "travel time" AND "Mortality"[Mesh]  |
| <b>G</b> | "time factors"[Mesh] AND "Mortality"[Mesh] AND distance  |
| <b>H</b> | remoteness AND "mortality"[Mesh]   |
| <b>I</b> | remoteness AND mortality   |

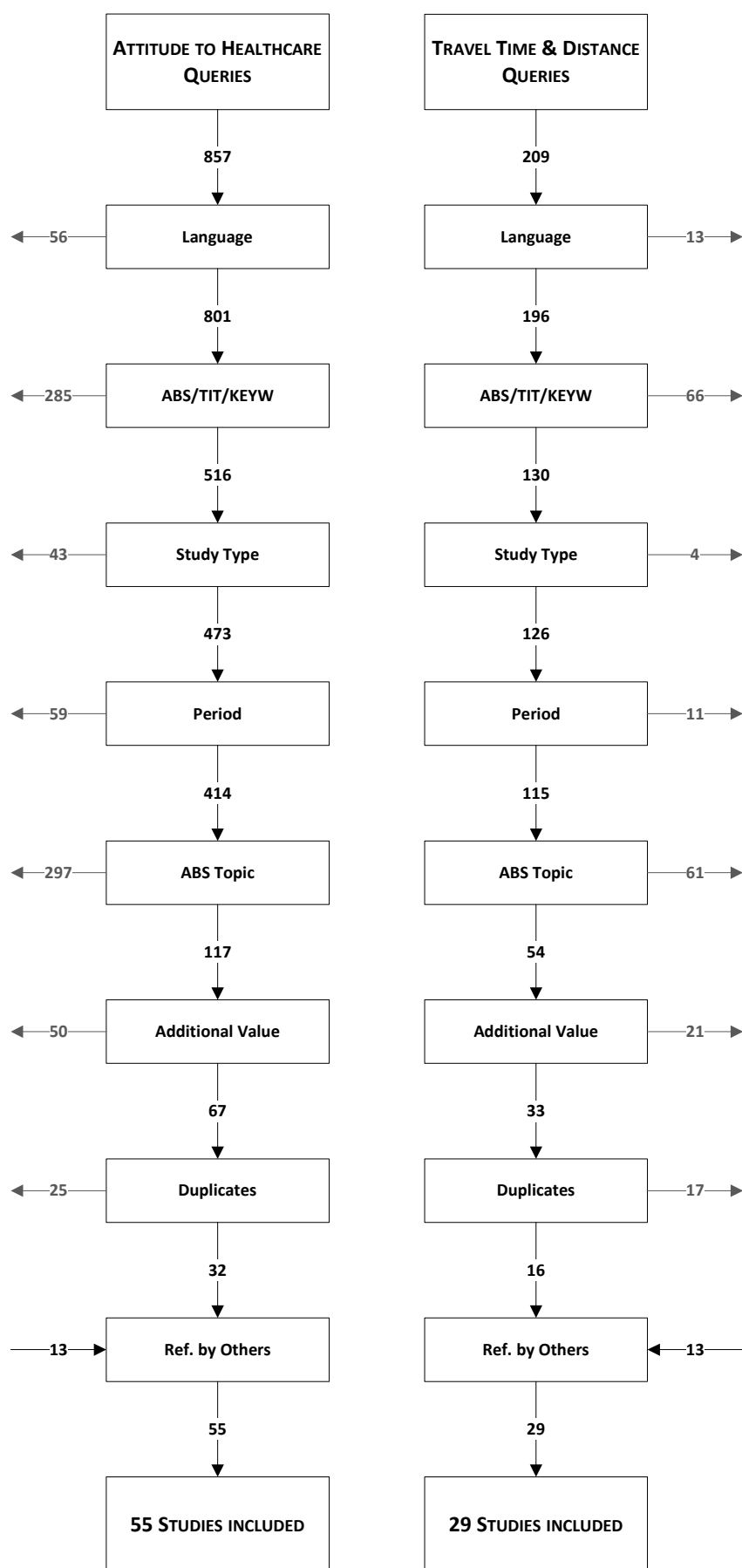


Figure 1 – Flowchart of the search results

## APPENDIX B – STUDY CHARACTERISTICS

In this appendix the studies will be described according to several characteristics. Results of the studies will be elaborated upon in the **Results** section. This appendix serves as an overview of study characteristics. Each table gives an overview of the attitude to healthcare related studies and the travel time related studies; the numbers in the column of references refer to the **References** section and amount refers to the number of studies which fit the description. Specific remarks for each table are reported on this page.

**Table 5** gives an overview of all the studies that have been included in this study. For each study the area of research is reported. The clinical area in which research has been conducted will be reported. Some of the travel time related studies are performed in multiple areas and therefore the total amount is not 29 (which is the total number of travel time related studies).

**Table 6** gives an overview of the study types of the included studies. Several study types are; cohort study, systematic review, case study and etcetera. Some of the included studies used multiple study types; therefore the total amount of study types can exceed the number of articles included for this study.

**Table 7** gives an overview of the methods that have been used to gather information in order to find an answer on their research questions. In the

**Results** section I will elaborate upon the methods that have been used. The (systematic) reviews used the method literature research, they do not describe in detail how and which methods have been used in the studies that were included in the review. For each study the main methods are reported. Some of the used methods require extra explanation; the explanation can be found in the legend of this table.

**Table 8** gives an overview of the outcome measures that have been used by the included studies. Some of the studies will appear more than once in this table, because researchers have used multiple outcome measures. On the opposite; some studies that have been included have not used any outcome measure, therefore the term 'none used' appears in this table.

**Table 9** gives an overview of the origin of the study population. The origin of the population is – in this study – defined as; the nation in which the study has been performed and above all, it is the nation in which the studied population is living. The developing world is – in this study – defined as; nations situated in Asia (except for Japan and South Korea), South-America, Latin-America and Africa. Some studies were (systematic) reviews of studies therefore the total amount exceeds the number of found articles; adjacent to it some studies have studied multiple populations.

| ATTITUDE TO HEALTHCARE |                         |        | TRAVEL TIME   |                         |        |
|------------------------|-------------------------|--------|---------------|-------------------------|--------|
| References             | Area                    | Amount | References    | Area                    | Amount |
| [11-55]                | Gynecology & Obstetrics | 45     | [62,68-78]    | Public Health           | 12     |
| [56-58]                | Cardiology              | 3      | [49,53,66,67] | Gynecology & Obstetrics | 4      |
| [59,60]                | Nursing                 | 2      | [72,79,80]    | Cardiology              | 3      |
| [61,62]                | Public Health           | 2      | [80-82]       | Emergency Care          | 3      |
| [63]                   | Oncology                | 1      | [83,84]       | Oncology                | 2      |
| [64]                   | Pediatrics              | 1      | [64,85]       | Pediatrics              | 2      |
| [65]                   | Psychiatry              | 1      | [86,87]       | Trauma Care             | 2      |
|                        |                         |        | [72]          | Epidemiology            | 1      |
|                        |                         |        | [88]          | Geriatrics              | 1      |
|                        |                         |        | [89]          | Hepatology              | 1      |
|                        |                         |        | [82]          | Intensive Care          | 1      |
|                        |                         |        | [89]          | Internal Medicine       | 1      |
|                        |                         |        | [90]          | Pulmonary               | 1      |

Table 5 – Study area in which studies have been performed

| ATTITUDE TO HEALTHCARE                   |                   |        | TRAVEL TIME                        |               |        |
|--|-------------------|--------|------------------------------------|---------------|--------|
| References                               | Study Type        | Amount | References                         | Study Type    | Amount |
| [13,15,16,18,21,26-31,38-49,57,58,62,65] | Cohort            | 29     | [49,62,64,66-73,75-81,83-85,87,89] | Cohort        | 23     |
| [20,32-34,50,51,58,59]                   | Descriptive       | 8      | [49,74,82,90]                      | Descriptive   | 4      |
| [22-25,36,56,61]                         | Review            | 7      | [74,88]                            | Review        | 2      |
| [12,14-16,54,55]                         | Interview         | 6      | [82,86]                            | Observational | 2      |
| [11,17,52]                               | Case Control      | 3      | [53]                               | Follow-up     | 1      |
| [19,35]                                  | Systematic Review | 2      |                                    |               |        |
| [53]                                     | Follow-up         | 1      |                                    |               |        |
| [37]                                     | RCT               | 1      |                                    |               |        |

Table 6 – Study type that has been used in the studies that have been selected

| ATTITUDE TO HEALTHCARE                   |   |        | TRAVEL TIME                     |  |        |
|--|---|--------|---------------------------------|--|--------|
| References                               | Methods   | Amount | References                      | Methods  | Amount |
| [19,20,22-25,32,34-36,56,59-61]          | Literature research   | 14     | [68,69,72,76,81,82,84-87,89,90] | Database with outcome measure                              | 12     |
| [11,15,16-18,37,42,45,48,49,51,58,62,64] | Questionnaire with outcome measure                                  | 14     | [72,73,76,79,80,82,84,85,90]    | Drive time (using postcode or coordinates)                 | 9      |
| [26,39,43,44,50,53]                      | Case records/database and interviews with outcome measure           | 6      | [73,76,79,81,84,85,90]          | GIS  | 7      |
| [12,14,28,54,63,65]                      | Interview without outcome measure                                   | 6      | [76,79,80,85,88]                | Road distance  | 5      |
| [21,33,38,41]                            | Case records/database with outcome measure                          | 4      | [62,64,77,78,88]                | Questionnaire/survey with outcome measure                  | 5      |
| [29-31,52]                               | Survey and questionnaire with outcome measure                       | 4      | [68,69,83]                      | ARIA (Accessibility Remote Index of Australia)             | 3      |
| [13,40,57]                               | Case records/database and survey/questionnaire with outcome measure | 3      | [73,75,81]                      | Straight-line distance                                     | 3      |
| [27,47]                                  | Focus group discussion  | 2      | [49,59]                         | Interview with outcome measure                             | 2      |
| [46,55]                                  | Interview with outcome measure                                      | 2      | [72,80]                         | Microsoft Autoroute Express                                | 2      |
|  |   |        | [53]                            | Case records/Databases and interviews with outcome measure | 1      |
|  |   |        | [74]                            | Literature research  | 1      |
|  |   |        | [84]                            | Public transport table                                     | 1      |
|  |   |        | [86]                            | Remoteness index defined                                   | 1      |
|  |   |        | [67]                            | Survey & interview with outcome measure                    | 1      |
|  |   |        | [70]                            | Survey with outcome measure                                | 1      |
|  |   |        | [89]                            | Yahoo Maps   | 1      |

Table 7 – Methods used by included studies

Remarks – some of the travel time related studies require extra explanation

| Reference | Remark   |
|-----------|--|
| [75]      | In order to calculate the straight-line distance GPS coordinates are used instead of postcodes           |
| [84]      | This study implemented the public transport network into a GIS, more details can be found in the article |
| [86]      | Because there was no remoteness index available, these researchers defined one of their own              |
| [87]      | Travel time has been calculated using the date & time info from the database                             |
| [88]      | This study relies on the self-reported road distance   |

[90] In this study both the drive time to the nearest hospital is calculated as well as the drive time to the nearest general practitioner

| ATTITUDE TO HEALTHCARE                         |                                       |        | TRAVEL TIME            |   |        |
|--|---------------------------------------|--------|------------------------|---|--------|
| References                                     | Outcomes                              | Amount | References             | Outcomes  | Amount |
| [12,14,22,23,27,28,32,34,36,54,56,59-61,63,65] | None used                             | 16     | [68,69,72,79,81,86,90] | Mortality   | 7      |
| [18,21,33,35,38,40,45,48,51,62,64]             | Usage of healthcare (visits etcetera) | 11     | [80,82-84,89]          | Survival  | 5      |
| [20,21,24-26,29-31,41,49]                      | Pregnancy outcomes                    | 10     | [62,64,75,88]          | Usage of healthcare (visits etcetera)               | 4      |
| [43,44,47,49,50,53]                            | Maternal mortality                    | 6      | [49,53,66,67]          | Maternal mortality                                  | 4      |
| [11,13,15,16,38,52]                            | Place of birth                        | 6      | [64,77,78]             | Travel time/ distance barriers                      | 3      |
| [19,21,37,40,49]                               | Infant mortality                      | 5      | [72,86]                | Admission to hospital                               | 2      |
| [17,42,55]                                     | Accessibility obstacles               | 3      | [73,74]                | None used   | 2      |
| [39,57,58]                                     | Care-seeking during delivery          | 3      | [70]                   | Access to service                                   | 1      |
| [40,49]  | Education                             | 2      | [89]                   | Adverse outcomes                                    | 1      |
| [39]   | Antenatal care-seeking                | 1      | [49]                   | Education   | 1      |
| [26]   | Complications (birth/pregnancy)       | 1      | [49]                   | Healthcare center distance                          | 1      |
| [49]   | Healthcare center distance            | 1      | [49]                   | Infant mortality                                    | 1      |
| [49]   | Maternal morbidity                    | 1      | [49]                   | Maternal morbidity                                  | 1      |
| [52]   | Presence of trained birth assistant   | 1      | [49]                   | Pregnancy outcomes                                  | 1      |
| [46]   | Reasons to stay at home               | 1      | [76]                   | Race/ethnicity                                      | 1      |
|  |                                       |        | [77]                   | Self-rated health                                   | 1      |
|  |                                       |        | [87]                   | Travel time differences between land & air vehicles | 1      |

Table 8 – Outcome measures used by included studies

| ATTITUDE TO HEALTHCARE    |  |        | TRAVEL TIME            |                          |        |
|---------------------------|--|--------|------------------------|--------------------------|--------|
| References                | Nation   | Amount | References             | Nation                   | Amount |
| [35-55]                   | Developing World   | 68     | [62,64,75-77,79,88,89] | United States of America | 8      |
| [22-33,56,57,59,60,62,64] | United States of America   | 18     | [72-74,81,84,85,90]    | United Kingdom           | 7      |
| [11-16,63]                | Netherlands  | 7      | [68-71,83]             | Australia                | 5      |
| [19,20,58,65]             | United Kingdom   | 4      | [49,53,66,67,78]       | Developing World         | 5      |
| [34,57,61]                | Australia  | 3      | [80,86]                | Scotland                 | 2      |
| [17]                      | Austria, Denmark, Germany, Greece, Hungary, Ireland, Italy, Portugal, Spain and Sweden | 1      | [87]                   | Canada                   | 1      |
| [57]                      | Canada   | 1      | [82]                   | Sweden                   | 1      |
| [21]                      | Finland  | 1      |                        |                          |        |
| [18]                      | Russian Federation   | 1      |                        |                          |        |
| [14]                      | Scotland, Switzerland  | 1      |                        |                          |        |





Table 9 – Living area of the population that has been studied

## APPENDIX C – ATTITUDE TO HEALTHCARE RELATED STUDIES

| Authors  | Year | Type | Area | MI | Results   | Conclusion  | Limitations   | Recommendations  |   |
|--|------|------|------|----|---|---|---|--|---|
| Borques HA et al. [11]<br><i>Midwifery</i><br>                                      | 2006 | CA   | G, O |    | A questionnaire was used to compare the labor and birth experiences of women who delivered at home with the experiences of women who delivered in a birth centre both without complications.                    | 193 participants of which 129 delivered at home. Women who gave birth at home rated their setting higher than the birth centre group (mean score 4.70 vs. 4.01). Birth-centre group emphasized safety, medical help available and convenience; home birth group placed importance on home being trustworthy and dependable, own place & belongings and feeling comfortable and relaxed. | Having understanding of women experiences allows for continuation to improve the quality of maternity care. The environment can have a positive effect on women birth experiences.  | Survey approaches can lead to recall bias, participants need to have adequate reading and writing skills. Devotion to the survey is also needed.                                   | Provide tours of the birthing setting; enhance comfort, intimacy, control and calmness. |
| Johnson TR et al. [12]<br><i>The American Journal of Maternal Child Nursing</i><br> | 2007 | I    | G, O |    | Data obtained by using 14 audio-taped interviews with Dutch women to explore the lived experience of childbirth who had given birth at home in the Netherlands.   | Advantages of giving birth at home were; women felt more in control of their environment, had feelings of fulfillment and empowerment and the importance of the supportive role of the midwife.   | Women who gave birth at home felt fulfilled and empowered by the experience.  | The study sample was very small; only 14 interviews were conducted, results could hardly be generalized.   | Repeat study in a larger study sample.  |
| Wiegers TA et al. [13]<br><i>Midwifery</i><br>                                      | 2000 | C    | G, O |    | Multi-level analysis of client and midwife associated, case-specific and structural factors in relation to planned and actual home or hospital births to examine reasons for the variation in home-birth rates. | Higher home-birth rates were associated with a positive attitude to home birth, a critical attitude to hospital birth for non-medical reasons for hospital birth and good cooperation between midwifery practices and hospital obstetricians. Distance to hospital had also influence on home birth rates.  | The proportions of planned hospital birth and of referral to specialist care are the most important predictors of the actual hospital birth rate of women receiving midwifery care. It can be influenced by good cooperation, positive attitude to home birth and influence of midwife. | Study is performed in Gelderland; results may be difficult to generalize.  | None mentioned.   |
| Luyben AG et al. [14]<br><i>Midwifery</i><br>                                     | 2005 | I    | G, O |    | To determine important aspects of ANC from a woman's perspective by using semi-structured interviews.   | Three main categories emerged; responsibility (feeling confident and feeling autonomous), establishing a sharing trust relationship and support me to be responsible. Cultural differences were mainly visible within the subcategory feeling   | Responsibility is the main reason why women seek ANC. Feelings of confidence and autonomy are substantial attributes of this responsibility. Cultural background seems to cause differences within the categories.  | Only 23 women participated; the study sample was very small. It was organizationally not done to fly to another country to interview one person, linguistic problems also existed. | Future research should concentrate on exploring the differences reported in this study. |

| Authors   | Year | Type | Area | MI  | Results  | Conclusion  | Limitations   | Recommendations  |
|---|------|------|------|---|--|---|---|--|
| Van der Hulst LAM et al. [15]<br>  | 2004 | C, I | G, O | 625 low-risk women enrolled in 25 midwifery practices. Course of labor measured by frequency of interventions by midwives and obstetricians. A questionnaire was used to get information from the pregnant women. | 70% of the women opted for home birth. Women that were technology rejecting (or indifferent about technology) were more likely to deliver at home ( $p \leq 0.01$ ). Technical interventions by midwives were more likely in nulliparas who opted for home delivery ( $p = 0.031$ ). Multiparas in the hospital group experienced an episiotomy more often.  | When women are offered a choice a large desire for home birth exists. Attitudes toward obstetric technology are an important predictor with respect to intended place of delivery. Women who opt for home delivery are less likely to be referred and have fewer obstetric interventions. | Women who do not speak Dutch were excluded; some of the results might change when other cultures and/or languages were included.              | None mentioned.  |
| Kleiverda G et al. [16]<br><i>European Journal of Obstetrics &amp; Gynecology and Reproductive Biology</i><br> | 1990 | C, I | G, O | 170 nulliparous women were included. At 18th week of gestation interviews were held.  | Reasons most mentioned for home delivery fit in two categories; advantages pertaining to home environment (97%) [home is cozier, feel at ease and relax at home, more privacy at home and can make own decisions] and disadvantages noted concerning hospital environment (86%) [unknown people walk in and out, many rules, no friends at delivery, scared of the hospital, confinement is more expensive and husband does not like hospitals]. | In urban area the educational level of women was the main predictor for the location of confinement (higher education; preferred to deliver home). Women with low SES give birth at home.   | Sample size of 170 women is not large; a larger sample size has to confirm the findings of this study.  | Study the relationship of the actual location of confinement and the obstetric outcomes in relation to the preferred place of birth. |
| Delvaux T et al. [17]<br><i>American Journal of Preventive Medicine</i><br>                                  | 2001 | CA   | G, O | Postpartum interviews were conducted between 1995 and 1996. 1,283 women with inadequate PNC and 1,280 controls with adequate PNC were included.   | Lack of insurance is an important risk factor for inadequate PNC ( $OR = 30.1$ ). Women with inadequate PNC were more likely aged <20 yrs (16.4% vs. 4.8%) and with higher parity than controls. They were also more likely to be foreign nationals, unmarried, unplanned pregnancy, have less education and no regular income. Cultural barriers were present.  | Personal, socio-economic, organizational and cultural barriers to PNC exist in Europe.  | Sample sizes among countries differed. Formulation of questions might have differed from one interviewer to another. Recall bias might occur. | None mentioned.  |
| Ivanov LL et al. [18]   | 1999 | C    | G, O | Aday and Andersen's   | Women who believed it was  | Predisposing characteristics of   | The study sample could be   | This study needs to be   |

| Authors  | Year | Type | Area | MI   | Results   | Conclusion  | Limitations   | Recommendations   |  |
|--|------|------|------|--|---|---|---|---|--|
| Western Journal of Nursing Research<br>                         |      |      |      |  | conceptual model was used to investigate use of and satisfaction with prenatal care services. A survey was created to get information from women.   | important to start prenatal care were more likely to use the service (p<0.001). Women who had depression were less likely to start (p<0.01). Marital status and employment were also statistically relevant (p<0.05).   | women contributed the most to explaining use of prenatal care services. These characteristics contributed far more than the need characteristics of women.  | characterized as a small sample (397 participants). It was adequate for this research; but only low-risk, uncomplicated pregnancies and deliveries were included. | replicated with women who have complicated pregnancies and deliveries. |
| Rowe RE et al. [19]<br>Journal of Public Health Medicine<br>    | 2001 | SR   | G, O | A structured review was conducted; studies about sub-optimal care in stillbirth or infant death and studies about litigation in perinatal care were included. MEDLINE, PsycLIT, Cochrane Library, BIDS Science and Social Science Citation Indexes, CINAHL and EMBASE were searched. | 104 studies were identified; 52 did not meet inclusion criteria. 11 of 52 studies (21%) considered communication failure as a factor in sub-optimal care. 75% of the studies that presented findings in terms of numbers of cases; communication failure was noted in 24% to 29%of cases. | Poor communication may contribute to a proportion of stillbirths and infant deaths. The relationship between maternal non-compliance and poor communication is difficult to assess.   | Lack of comparative information about the overall prevalence of communication problems in maternity care. Assessors were not blind to the outcome of the case. Small sample of papers that explicitly looked at poor communication as a factor. Only one reviewer assessed the studies included in this review. | There are areas where communication could be improved and where further research is required.   |  |
| Proctor SR et al. [20]<br>Midwifery<br>                         | 1992 | D    | G, O | Literature research has been conducted to find out which factors affecting birth outcome in Pakistani women.   | Factors affecting birth are complex and interrelated; socio-economic/ environmental (education level & employment), genetic and biological factors all contribute to adverse birth outcome. They are complicated by discrimination, communication barriers and culture blaming.           | A number of initiatives have been taken across the UK; liaison offers help to design health promotion materials, genetic counseling clinics for those at risk (cultural tact is needed), Local Maternity Service Liaison Committees have been set up to develop links with ethnic minorities and professionals are encourages to view Asian women as individuals without cultural-stereotyping. | No method section reported.   | Management of adverse birth outcomes should recognize all the factors that are complex and interrelated (and also confounding factors).                           |  |
| Raatikainen K et al. [21]<br>BioMed Central Public Health<br> | 2007 | C    | G, O | Data from the hospital register is used; pregnancy outcomes of women having low numbers of antenatal care visits and no antenatal care visits were compared with women having high numbers of antenatal care visits.   | Significant more LBW infants in under- and non-attendees (OR=9.18 and 5.46), more fetal deaths (OR=12.05 and 5.19) and more neonatal deaths (OR=10.03 and 8.66).  | Non- or under-attendance at antenatal care carries a substantially elevated risk of severe adverse pregnancy outcome.   | Because of the tertiary level hospital some adverse outcomes may be overly present. Number of antenatal visits was not adjusted probably causing higher risks of prematurity, NICU-treatments and perinatal death.  | The role of domestic violence as an etiological factor and ideological reasons for refusing antenatal care need further investigation.                            |  |
| Temple P et al. [22]   | 2008 | R    | G, O | Literature research has  | Poor women with no prenatal   | Enhancing clinic services with  | Methods are not clearly   | Ongoing research is   |  |

| Authors  | Year | Type | Area | MI  | Results  | Conclusion   | Limitations  | Recommendations  |
|--|------|------|------|---|--|--|--|--|
| <i>Clinical Obstetrics and Gynecology</i><br>   |      |      |      |   | care are most likely uninsured, low education, prenatal care not perceived as important (also to relatives), unmarried, unplanned pregnancy and no support person identified during pregnancy. When home visitors were available in the population there were fewer adverse outcomes in pregnancy.   | home visitors is a cost-effective strategy for addressing many of these important psychosocial issues and barriers to accessing care.  | described and research questions were not stated, these could be derived from the results presented in the review.   | needed to develop, refine and evaluate systems of care that integrate home visiting components and different service delivery models that address pregnancies complicated by various psychosocial and medical complications. |
| <b>Tiedje LB [23]</b><br><i>MCN: the American Journal of Maternal Child Nursing</i><br>     | 2005 | R    | G, O | Outcomes, indicators and challenges for building EBP in community MCH are reviewed in this article. A literature search has been performed. | Infant mortality rate among African Americans and American Indians/Alaska natives is more than double that of whites. Achieving equity means promotion of communities that are safe, educated, have job opportunities and access to healthcare.  | The power of healthier mothers and children lies in the power of lifestyle change; which is in its infancy. Health promotion must also be built into national health policy.   | Methods are not clearly described. Author does not mention any limitations of her own study.   | More evidence is needed about the cultural factors driving the way how to give birth and their outcomes.   |
| <b>Lu MC et al. [24]</b><br><i>Maternal and Child Health Journal</i><br>                    | 2003 | R    | G, O | Literature review was conducted for longitudinal models of health disparities.  | Disparities in birth outcomes are the consequences of differential developmental trajectories set forth by early life experiences and cumulative allostatic load over the life course.   | Future research on racial disparities in birth outcomes needs to examine differential exposures to risk and protective factors [...] over the life course of women.  | Life-course literature is still in its infancy. Existing life-course factors still tell little of women's life history and focus too much on individual-level factors. | Eliminating disparities requires interventions and policy development that are more longitudinally and contextually integrated. More research in life course factors is needed.  |
| <b>Callister LC et al. [25]</b><br><i>Journal of Perinatal &amp; Neonatal Nursing</i><br> | 2002 | R    | G, O | The review addresses socio-cultural factors postulated to influence the incidence of LBW in Mexican immigrant children.                     | Less acculturated Mexican women enjoy better nutritional status and possess a high degree of knowledge of health promotion strategies. They are less likely to be adolescent mothers or single parents. Families are also more involved. Barriers reported to seek care are; financial, language, non-supportive providers, transportation, long waiting times and lack of child care. In Mexican culture pregnancy is | Acculturation to the North American culture and lifestyle correlates with [...] less favorable perinatal outcomes. Preservation of native cultural values and family support contribute to ameliorate risk factors for adverse perinatal outcomes. | Selection of studies not reported. No inclusion or exclusion criteria are reported.  | Culturally appropriate healthcare and research must be promoted for culturally diverse populations (professionals who understand the culture and speak a language, etc.).  |

| Authors   | Year | Type | Area | MI   | Results   | Conclusion  | Limitations   | Recommendations   |
|---|------|------|------|--|---|---|---|---|
| Shiao SYPK et al. [26]<br><i>Biological Research for Nursing</i><br>   | 2005 | C    | G, O | Prospective observational follow-up of high-risk pregnancies and births. 354 participants. Complications, infant outcomes were examined in conjunction with maternal factors (health problems & behaviors).  | 37 (12%) of mothers did not have prenatal care. Predictors of newborn resuscitation included poor maternal health behaviors (no prenatal care, drinking alcohol and smoking).   | Health disparities exist among white and non-white women experiencing high-risk pregnancies and births. Access to healthcare could still be problematic due to cultural differences, language barriers and intimidating facilities. | Samples of Asian and American Indian people were very small. These very small sample sizes could affect the outcomes.   | Future studies are needed to develop interventions targeted to different racial/ethnic groups during pregnancy to reduce preterm and high-risk births.  |
| Milligan R et al. [27]<br><i>BioMed Central Public Health</i><br>      | 2002 | C    | G, O | This qualitative study used focus groups with four distinct categories of people, to collect observations about prenatal care from various perspectives.   | Barriers and motivators to prenatal care were identified in focus groups. Pervasive issues identified were drug lifestyle, attitude of staff and role of the father.  | Designing prenatal care relevant to vulnerable women in urban communities takes creativity, thoughtfulness, and sensitivity. There must be interaction with mothers, fathers and healthcare workers.                                | There was no verification of subjects' actual prenatal care experiences.  | Changes recommended include increased attention to substance abuse prenatal care interaction, focus on staff attitudes, and commitment to inclusion of partners.                                |
| Savage CL et al. [28]<br><i>Journal of Transcultural Nursing</i><br>   | 2007 | C    | G, O | 7 women participate in the research; life histories were collected and analyzed. These histories were obtained by using a semi-structured interview. A second interview was held for validity. Results were encoded in software.                                       | All of the women understood that prenatal care was related to a positive pregnancy outcome and find their family important when they need support. Because of waiting times women were reluctant to get care.   | Both environmental and social factors are associated with health disparities. Furthermore social support received from other women was very important in prenatal care.   | However, these data were not sufficient to understand the underlying cultural contexts that could further explain why not all of them had preterm infants. The study sample was very small.         | The findings point to the need for a reevaluation of how prenatal care is delivered.  |
| Sable MR et al. [29]<br><i>Maternal and Child Health Journal</i><br> | 1998 | C    | G, O | Database of the Missouri Maternal and Infant Health Survey was used; data was supplemented with a mailed questionnaire, face-to-face interviews and questionnaires in hospital, to examine the relationship between pregnancy intention and adequacy of prenatal care. | Women who were unhappy about the pregnancy (OR=1.44), unsure that they wanted to be pregnant (OR=2.81) or denied their pregnancies (OR=4.82) were more likely to have inadequate prenatal care. All three groups (OR 1.86, 3.44 and 6.69) were more likely to have inadequate initiation of care. | The study suggests that attitudes about pregnancy may be a psychosocial barrier to women obtaining early and continuous prenatal care.  | Results are not easily generalized; weighting of samples might have introduced errors. The questionnaire was retrospective in nature; women's attitudes about their pregnancies might have changed. | The new attitudinal measures are potent for predicting prenatal care utilization. These items should be included in psychosocial assessments of prenatal clients as well as in survey research. |
| Sable MR et al. [30]<br><i>Family Planning Perspectives</i><br>      | 2000 | C    | G, O | Data from a statewide case-control study of 2,378 Missouri mothers are used to examine the relationship of perceived   | Risk of LBW is 1.5 times greater if mother perceived almost always stress during pregnancy. Other factors that increased risk of LBW were   | Interventions with pregnant women have the potential to improve pregnancy outcomes.   | Retrospective studies are prone to recall bias. Some questions lack a time frame, therefore extreme feelings might not be   | Additional prospective research with pregnant women on the origins and effects of stress is needed.   |



| Authors   | Year | Type | Area | MI   | Results  | Conclusion  | Limitations   | Recommendations   |
|---|------|------|------|--|--|---|---|---|
|   |      |      |      |  | stress, pregnancy attitudes and major life events on very low birth weight.  | pregnancy denial (OR=1.4-1.6), unhappiness about the pregnancy (OR=1.3) and experiencing a major injury, accident or illness (OR=1.7).  |   |   |
| Sable MR et al. [31]<br><i>Public Health Reports</i><br>                 | 1997 | C    | G, O | Data from a state wide control study frequency distributions for different types of prenatal health behavior advice were examined. Subsequently interviews were conducted. | Only 10.4% of mothers report receiving all seven types of health behavior advice recommended by the Expert Panel. Women who did not receive all seven types of advice were 1.5 times more likely to deliver a very LBW infant than a normal birth weight infant.   | Women who did not receive all of the advice recommended by the Public Health Service Expert Panel have an increased risk of giving birth to very LBW infants.   | This was a retrospective study, based on the self-reports of mothers and recall bias may have affected perceptions of the prenatal advice they received. Many didn't know who provided the advice. Comparison between private and public providers could not be made. | Further research is needed to better understand the relationship between health education and birth weight.   |
| McGlade MS et al. [32]<br><i>American Journal of Public Health</i><br>   | 2004 | D    | G, O | By studying the literature a description of the Latina paradox is given.   | Latina mothers in the US have favorable birth outcomes despite their social disadvantages. Social and cultural factors that contribute to this paradox are maintained by community networks (with friends, family etc).  | Protective factors include a strong cultural support for maternity, healthy traditional dietary practices and the norm of selfless devotion to the maternal role. Cultural factors are also related to the low mortality rates. Acculturation has a negative effect on mortality. | None mentioned.   | Integrating these informal systems of care with formal perinatal services has the potential to improve prenatal care access and improve birth outcomes. |
| Park JH et al. [33]<br><i>Midwifery</i><br>                              | 2007 | D    | G, O | Medical records used to describe the disparity in prenatal care among women of color in timing of initiation of prenatal care and total number of prenatal visits.         | 439 healthy women at term were included. Non-Hispanic white women, with high school or college degrees and insurance or Medicaid were more likely to visit prenatal clinics. Association between timing of initiation of prenatal care and demographic variables showed differences in race and education. | Women of color face difficulties in access to care. Another study showed an increase in the frequency of women receiving late care or no care.  | Only one healthcare setting (439 participants) was studied. Women with risk factors were excluded, only healthy women were included.  | Special attention to promote early prenatal care for these populations is needed.   |
| De Costa CM et al. [34]<br><i>The Medical Journal of Australia</i><br> | 2004 | D    | G, O | Describing the short time history of labor in Australia and incorporating the women's beliefs about care during pregnancy and delivery.                                    | Meta-analyses have shown that women are most satisfied with care by a midwife or GP. Main sources of dissatisfaction are; no involvement in decision making, having obstetric interventions and unhelpful health of mothers and babies.  | Women are most satisfied when they have input in decision making and receive care from one practitioner. Although maternal satisfaction is important, it should not be promoted at the expense of the health of mothers and babies.   | Methods are not clearly described, no search strategy mentioned, no information given about inclusion or exclusion of articles.   | More realistic antenatal education and preparation should be available for all pregnant women.  |

| Authors  | Year | Type  | Area | MI  | Results   | Conclusion   | Limitations   | Recommendations   |
|--|------|-------|------|---|---|--|---|---|
| Simkhada B et al. [35]<br><i>Journal of Advanced Nursing</i>                       | 2008 | SR    | G, O | Studies published between 1990 and 2006 in English were searched in Cochrane Collaboration, CINAHL, MEDLINE, Science Direct, EMBASE, ASSIA, Web of Science, Scopus, PubMed and JSTOR. 28 papers were included in the review.                            | 16 studies found that women's education was the best predictor of ANC use. 9 studies showed that ethnicity, caste and religion played a significant role. 10 studies found that ANC use is influenced by accessibility of the services. 21 studies found that economic factors influence ANC use. 7 studies showed that exposure to mass media increases ANC use. Women's perceptions of the risk factors were related to the probability of seeking ANC. | Adequate utilization of antenatal care cannot be achieved merely by establishing health centers; women's overall (attitude, cultural, social, political and economic) status needs to be considered.   | Cultural beliefs differ among countries and even states within countries. Furthermore this study looked only at the developing countries; it would be interesting to see whether or not there are differences with developed countries. | ANC and preventative services in general, should be higher on the healthcare agenda. The study further recommends (qualitative) research into women's perceptions of, and satisfaction with ANC and other maternity services. |
| Geller SE et al. [36]<br><i>International Journal of Gynecology and Obstetrics</i> | 2006 | R     | G, O | By performing a literature study the study discusses the challenges related to identification, management and treatment of PPH in low-resource areas, as well as solutions and technologies that have proven feasible and effective.                    | Several studies have identified that birth location (transportation problems, physical & economical access) and culture & environment (norms, customs, lack of education and decision-making power) could cause problems in accessing/attending care.   | Cultural, societal and political factors often limit the value that western technology can contribute if deliveries occur. Effective interventions are community education, trained TBA's, training unskilled attendants and emergency care. Depending on each culture it has to be determined which solution proves to be the best. | Methods are not clearly described and no search strategy mentioned.   | Other interventions like; breastfeeding, herbal remedies and etc.   |
| Gloyd S et al. [37]<br><i>Journal of Midwifery &amp; Women's Health</i>            | 2001 | (R)CT | G, O | TBA's and pregnancy outcomes were compared to (1) communities with good access to trained TBAs, (2) randomly selected communities with no access to TBAs and (3) communities with good access to functioning maternities. 4,149 women were interviewed. | In group 1; 33% reported giving birth attended by TBA & 43% gave birth at a health facility. Group 2; 58% gave birth at a health facility, 42% gave birth attended by an untrained person. Group 3; 77% reported giving birth at a health facility, 22% gave birth attended by an untrained person. Women preferred to deliver in health facilities, because conditions were better and interventions could be performed if needed.                       | The study demonstrated that women preferred to deliver in healthcare facilities even when they are far away. The preference for health facility birth over home birth with a TBA may have been related to difficulties with TBA neighbors and their families or fear of potential witchcraft.  | None of the experiences reported could be independently confirmed; bias might occur.  | Efforts to promote TBA training should be balanced with support for birthing services based in health facilities.   |
| Gyimah SO et al. [38]  | 2006 | C     | G, O | Use recent and  | Traditionalists are 80% less  | Moslem and traditional women   | Due to data constraints it  | Education services  |

| Authors   | Year | Type | Area | MI  | Results   | Conclusion   | Limitations   | Recommendations  |
|---|------|------|------|---|---|--|---|--|
| <i>Social Science &amp; Medicine</i><br>   |      |      |      |   | likely to use professional PNC compared with Catholics. Similar findings are reported on the effect of religion on health facility delivery and antenatal visits.   | were less likely to use maternal health services compared with Christians.   | was not possible to answer all research questions. They were unable to determine why women of religious groups are more likely to use services. | should be improved and differences between rural and urban populations should be reduced by health policy workers.   |
| Rahman MH et al. [39]<br><i>Journal of Biosocial Science</i><br>                         | 2008 | C    | G, O | A multi-level logistic regression method is employed to examine the socioeconomic differentials of maternity care seeking and thereby the influence of health accessibility of health services. | 25.7% of the women seek any antenatal care at the time of enrolment. 12.9% seek care from a specialist during delivery. Women's belief in regular examinations increases the odds of delivery care seeking by 2.3 times.                  | The study finds significant socioeconomic disparities in both antenatal and delivery care seeking. Service accessibility reduces the socioeconomic differentials in delivery care seeking.   | 1,019 women were included a bigger sample size may found even more significant relations.   | Programmes should put more emphasis on building awareness about the seriousness of maternal morbidities and seeking appropriate care.                            |
| Maitra P [40]<br><i>Journal of Health Economics</i><br>                                  | 2004 | C    | G, O | For analysis data from NFHS2 from India is used, consisted of a sample of 18,614 children and 13,284 women. Interviews were taken to determine the status of women.                             | When women have control over resources (p=0.01) or if the women has a role to play in the household decisions regarding healthcare (p=0.05) the demand for prenatal care increases.   | Prenatal care and hospital delivery reduces the hazard of child mortality. (Educational & cultural) empowered women have a positive effect on demand for prenatal care.  | None mentioned.   | None mentioned.  |
| Muthir JT et al. [41]<br><i>Journal of Obstetrics and Gynaecology</i><br>                | 2007 | C    | G, O | Medical records of all women who had no form of antenatal care but delivered in the maternity unit were evaluated. Other women were excluded.   | 36.7% of 297 women were non-literate. Housewives with no income accounted for 81.2%. 92.9% were married. Mean age of unbooked patients were 26.7 years compared to 28.8 years of the booked patients (p<0.05).                            | Unbooked patients remain a problem. Unbooked patients were younger and many were teenage students and unmarried, who would avoid antenatal care. They would hide their pregnancy, because it is culturally unacceptable to be unmarried. | This retrospective study was not able to determine physical, economic and cultural barriers to antenatal care.                                  | Community health education is needed to reduce the number of unbooked patients. More research is required to determine physical, economic and cultural barriers. |
| Onah HE et al. [42]<br><i>International Journal of Gynecology &amp; Obstetrics</i><br> | 2002 | C    | G, O | A questionnaire was used to investigate the relationship between formal education, personal beliefs and the acceptance of cesarean section.   | 1,148 women were interviewed. Education was significantly related to a more favorable attitude to cesarean section. 658 women had a negative attitude; due to fear of death (39.4%) and strong belief in having vaginal delivery (42.6%). | Pregnant Nigerians' beliefs about cesarean section are more important than formal education in determining whether or not they accept it.  | The study did not state whether or not the questionnaire was validated. Direct interviewing the women could bias the outcomes.                  | Quality of care to women during cesarean section should be improved. Education to women should correct beliefs about cesarean section.                           |
| Olsen BE et al. [43]<br><i>Acta Obstetrica et Gynecologica Scandinavica</i><br>        | 2002 | C    | G, O | Audit of case series on maternal deaths. Health facility data collected. Verbal autopsies, health facility and antenatal records and oral   | 45 maternal deaths were identified. 14 were possibly avoidable; with delay in seeking help being most common (50%), directly followed by not recognizing  | Increased community, family and women awareness of when to seek help could be important factors in reducing maternal deaths.   | The number of cases identified was inevitably limited. Some interviews have been conducted after 4 years; interviewees may have forgotten some  | Because many of the deaths were caused by malaria, it is important to have prevention and treatment programs. Education programs for                             |

| Authors  | Year | Type | Area | MI   | Results  | Conclusion  | Limitations  | Recommendations   |
|--|------|------|------|--|--|---|--|---|
| Barnes-Josiah D et al. [44]<br><i>Social Science &amp; Medicine</i><br>             | 1998 | C    | G, O | Information were used to assess each maternal death.<br>A framework was used to analyze 12 maternal deaths. Family and friend interviews were used to obtain additional information surrounding each death.  | Inadequate care at a medical facility was a factor in 7 cases (58%). Delays in transportation appeared in 2 cases (17%). Multiple delays were relevant in deaths of 3 cases (25%). Lack of confidence in available medical options was a crucial factor in delayed decisions to seek care.                                 | Lack of confidence in healthcare contributed to a delayed or never-made decision to seek hospital care in a majority of the 12 cases. Functioning referral networks should be expanded; the understanding of women, their families should be improved and the ability to deliver effective care by institutions should be improved. | A major limitation of this study is the small number of verified cases produced by the follow-up phase.  | Improvements should focus on reducing the third delay; improving the quality and scope of care available at existing medical facilities.  |
| McCaw-Binns A et al. [45]<br><i>Social Science &amp; Medicine</i><br>               | 1995 | C    | G, O | Mothers were interviewed at delivery. Information collected on social, economic, demographic, environmental and obstetric history as well as health service utilization. Logistic regression was used to determine independent associations between variables. | Teenagers do not attend (OR=1.7) or attend late (OR=1.5). Mothers with many children alive do most likely not attend (OR=12.4); the same holds for unplanned pregnancies (OR=2.8), not knowing the date of last menstruation (OR=3.0) and when friends/relatives are not supportive during pregnancy (OR=2.0).             | Non-attendees were often teenagers, in unstable unions. Pregnancy was often unplanned and friends and relatives has been unsupportive during pregnancy. Variables are suggestive of women with very low autonomy.   | The interpretations of these findings need to be viewed with caution and suggest the need for further research to clarify the interplay of social, economic and behavioral factors and health service utilization. | Media and community education programmes need to be geared to reach the non-attendees.  |
| Berry NS [46]<br><i>Social Science &amp; Medicine</i><br>                          | 2006 | C    | G, O | This study used data of a larger project on maternal mortality involving 2 years of fieldwork in Solola. Random interviews with Kachikel mothers were conducted, 122 women were interviewed.   | Problems in births were also attributed to difficulties in familiar relationships. Most women fear operations. Indigenous people oppose blood transfusions, and these transfusions may be required during c-section. Religions may forbid women from seeking outside help or being involved in non-religious institutions. | Most women rather wait until a problem manifests to be referred to the hospital, than to sacrifice the quality of their birth experience.   | None mentioned.  | Guidelines must be fitted into already existing systems of knowledge. Guidelines promote preventative referrals, encouraging women to go to the hospital before a problem develops. |
| Okolocha C et al. [47]<br><i>Journal of Epidemiology and Community Health</i><br> | 1998 | C    | G, O | To understand community based or socio-cultural factors that determine maternal mortality interviews were conducted and focus groups established.  | Women do understand their complications; however some causes cannot be treated by obstetric care (will of good, evil forces or enemies and taboos). Therefore women prefer traditional medicine; it  | A fuller understanding of maternal mortality and morbidity can only be accomplished by considering factors outside the hospital and formal medical practice.  | Results from focus groups are not always able to be transferred to larger populations. The interview was not standardized and therefore not easy to compare.   | Development of an effective program for obstetric care is needed.   |

| Authors   | Year | Type | Area | MI   | Results   | Conclusion   | Limitations  | Recommendations   |
|---|------|------|------|--|---|--|--|---|
| Anwar I et al. [48]<br><i>Bulletin of the World Health Organization</i><br>                              | 2008 | C    | G, O | Data from community survey were analyzed to examine inequities in use of SBA's, caesarean sections and postnatal care services according to key socio-economic factors.      | is more accessible and available, cheap and no delays.<br>Significant differences were found for; poor & rich people (OR=2.51), skilled attendance (OR=2.58), use of caesarean sections (OR=1.53). Complications influenced these 3 differences. Number of ANC visits was a significant predictor for use of SBA's and PNC. | A tremendous use inequity persists in the use of maternity care services. Inequities in use of SBA's were due to education, area of residence, wealth quintile, and distance to the hospital.                            | None mentioned.  | Interventions to overcome financial barriers are recommended to address inequity in maternal health.  |
| Van den Broek NR et al. [49]*<br><i>BJOG: an International Journal of Obstetrics and Gynaecology</i><br> | 2003 | C, D | G, O | Interviews with women in 20,649 households using structured questionnaires. To assess pregnancy maternal outcome, mortality and health-seeking behavior.                     | Assistance with delivery was related to education levels of the woman and to distance to the hospital. Education and proximity to the healthcare centre were both associated with improved outcome.   | Many women in this rural community suffer the consequences of high pregnancy loss. Proximity of any household to a health centre has an effect on outcomes.  | Perinatal mortality could be different, because of cultural practice and language difficulties especially with regard to definitions it is likely that some deaths are differently recorded. | The education of the women population should be improved. Furthermore healthcare programs should involve more skilled assistance to pregnant woman. Better infrastructure is also required. |
| Ozumba BC et al. [50]<br><i>Public Health</i><br>  | 2008 | D    | G, O | Case records of maternal deaths were studied to identify [...] avoidable factors for maternal mortality.   | 49 maternal deaths. Avoidable factors include delay in seeking care (19.1%) and delay in recognizing the problem (6.4%).  | Avoidable factors are still prevalent in maternal deaths in Nigeria.   | Very small study sample. Only one healthcare center. No research has been performed to identify the causes of the avoidable factors.   | There is a need to strengthen the relevant regulatory departments in the Ministry of Health to enable the enforcement of appropriate standards of practice.                                 |
| Gharoro EP et al. [51]<br><i>International Journal of Gynecology &amp; Obstetrics</i><br>              | 1999 | D    | G, O | 450 patients [...] were studied using a structured questionnaire to identify factors which may have contributed to the decline in the utilization of the maternity services. | Patients complained about the cost of services and lack of personal attention. Furthermore the delay in services for 2 – 3 hrs was another reason for decline in the utilization (86.6%).   | High cost and delay in service purchase are major contributory factors to the decline of utilization of maternity services at the UBTH.  | Small sample size and tested in one healthcare center only. Not all the results are displayed.   | A new appointment system could shorten the waiting times. When the antenatal care service organization is improved more un-booked patients can be found.                                    |
| Bolam A et al. [52]<br><i>Health Policy and Planning</i><br>   | 1998 | CA   | G, O | Delivery patterns of mothers were identified in a cross-sectional survey. Using structured baseline household questionnaire and detailed follow-up, (semi-)structured        | Reasons for not going to the hospital were; worries about costs, easy previous delivery, fear of hospital, no caretaker for other children, precipitate labor and no transport when in labor.   | Poor education and multiparity rather than poverty per se increase the risk of a home delivery in Kathmandu. Reasons given for planned home delivery were cost-related, easy previous delivery and fear of the hospital. | The study did not explore why women chose an institutional delivery nor how the decision process was made within the household. The question of who decides about place                      | Women should be better educated. For home delivery it could be effective to extended training for TBA's.  |

| Authors   | Year | Type | Area | MI   | Results  | Conclusion  | Limitations  | Recommendations   |
|---|------|------|------|--|--|---|--|---|
| Urasa E et al. [53]*<br><i>Health Policy and Planning</i><br>                                  | 1997 | F    | G, O | A follow-up was done of all 117 cases of maternal deaths to identify main operational factors within and outside the healthcare system. Interviews were held and records reviewed. Of each hospital available resources were assessed. | 79% received some medical care and 11% arrived too late for treatment. In most cases the husband (29%) or the mother (31%) decided on the care of the woman. 25% of deceased women lived more than 4km away. Lack of equipment, drugs and staff increased mortality.   | Wrong decision at the district level and lack of equipment at the referral centre were the main reasons for inadequate care. The women must culturally and economically be empowered to seek medical care. Relatives do not always realize the seriousness of the illness. Delay in arrival and poor transport facilities were also two important factors.                      | Second-hand information (obtained by interviewing relatives and healthcare workers) may bias the results. The sample size was small; only 117 cases were included. | The Ministry of Health must improve the working conditions and continued training of its staff.   |
| Rööst M et al. [54]<br><i>BJOG: an International Journal of Obstetrics and Gynaecology</i><br> | 2004 | I    | G, O | Interviews with semi-structured, thematic, open-ended questions. Topics were TBA's experiences & conceptions with regard to attitudes towards hospital care and referral.  | Pregnant women rather than TBA's make the decision on how to handle complications. Women feared hospitals and rely heavily on own knowledge (like using herbs) and it is important what families think. Sometimes hospital delivery is seen as a weakness.   | Barriers towards seeking care are; women do not like to seek care (also influenced by family and cultural habits) and TBA's refused to recommend hospital care.   | Second hand information about the experiences of pregnant women (information received via TBA's) and only 13 TBA's were interviewed.                               | Education of TBA's also demands increased connections and cooperation with obstetric facilities.  |
| Ojanguren RT et al. [55]<br><i>Social Science &amp; Medicine</i><br>                           | 2008 | I    | G, O | 45 open-ended interviews were held about 3 approaches (risk screening, emergency obstetric care and combined approach) to reduce maternal morbidity & mortality.   | Interviews suggest that none of these 3 approaches is effective; clinical care was often perceived as expensive, distant or non-existent, doubtful quality, frightening, unethical discrimination, slow and disrespectful. Rural residents also cited poor infrastructure and distance to facilities. Social factors also play a role (unwanted pregnancy, financial problems, father drinking etc). | People who do not seek care have a very poor image of clinical practice. When people do seek care it is often not available, accessible, affordable or acceptable. Awareness of local perceptions of risk and complications among the population and practitioners is crucial in conceptualizing strategies aimed both encouraging risk screening and promoting emergency care. | Only 45 individuals were interviewed (16 women, 10 with partner, 8 with women's mother and/or father and 11 with mother-and/or father-in-law).                     | It is fundamental to identify perceptions of risk and complications, identify groups in which more effort should be concentrated and it is necessary to address the larger social factors that are the root causes. |
| Zerwic JJ et al. [56]<br><i>American Journal of Nursing</i><br>                              | 2004 | R    | C    | An overview of delay in seeking care in myocardial infarction is given.  | Women seem to delay through responses such as self-treatment. African Americans are more likely to be delayed, may be due to SES and differences in symptoms.  | Knowledge of and response to symptoms are important pre-hospital delay factors. In-hospital delays can also occur.  | Methods are not clearly described. No clear discussion or conclusion.  | None mentioned.   |

| Authors   | Year | Type | Area | MI   | Results   | Conclusion  | Limitations   | Recommendations  |
|---|------|------|------|--|---|---|---|--|
| Mc Kinley S et al. [57]<br><i>Heart &amp; Lung</i><br> | 2000 | C    | C    | Compare North American and Australian patients' socio-demographic, clinical, emotional and social factors associated with behavior in seeking treatment. Data were obtained with the Response to Symptoms Questionnaire. | <p>Furthermore knowledge of myocardial infarct symptoms is limited or denied. The response to symptoms can also lead to delay.</p> <p>Patients who delayed longer (p&lt;0.05) had lower incomes and symptoms occur at home. Furthermore, they appraised their symptoms as not serious, waited for symptoms to go away and worried about troubling others. North Americans (p&lt;0.05) fear consequences of seeking help and do not recognize the symptoms. Australians (p&lt;0.05) were embarrassed about seeking help.</p> | Programs to reduce delay in response to acute myocardial infarction symptoms must take account of cognitive and emotional processes and differences in response in the particular cultures of patients. | Questionnaire did not elicit information about the nature of fears. Study was limited to patients who sought treatment relatively quickly.  | None mentioned.  |
| Chaturvedi N et al. [58]<br><i>Lancet</i><br>          | 1997 | C    | C    | 2000 people were selected and received questionnaires to investigate whether South Asians and Europeans interpret & act upon angina symptoms differently.  | <p>553 responders were European, 124 were Hindu and 235 were Sikh. 77 (24%) European, 25 (35%) Hindu and 58 (46%) Sikh women would seek immediate care (p&lt;0.0001). Women would be more likely to discuss symptoms with relatives or friends. European groups said they could discuss symptoms with relatives and friends, use alternative therapy, visit the pharmacist and etc.</p>   | Hindus and Sikhs reported a greater likelihood of seeking immediate care for angina symptoms than Europeans.  | Barriers to care may differ in acute (extensive consultation with family and friends may increase delays in seeking care) and chronic settings. Results are not easily generalizable. | Service-related explanations must be explored to find out way South Asian people experience greater delays in obtaining appropriate care than Europeans. |
| Narayan MC [59]<br><i>Home Healthcare Nurse</i><br>  | 2003 | D    | N    | This study describes a cultural assessment tool, strategies for obtaining cultural assessment data and a process for creating a culturally appropriate care plan.  | <p>Steps to providing culturally competent care; (1) cultural assessment and (2) developing the plan of care. There are 3 strategies for obtaining a cultural assessment; (A) ask patient or family to explain their understanding of the health problem, (B) consult cultural resources to gain insight about cultural patterns and</p>  | Incorporating cultural practices will support a mutually agreeable plan that is culturally acceptable to the patient and able to achieve good outcomes sought by both the clinician and the patient.    | None mentioned.   | None mentioned.  |

| Authors   | Year | Type | Area | MI | Results<br>(C) embed questions in other assessments.   | Conclusion  | Limitations  | Recommendations  |
|---|------|------|------|----|--|---|--|--|
| Heineken J et al. [60]<br><i>Home Healthcare Nurse</i><br>     | 2000 | D    | N    |    | The article presents a cultural assessment tool that can be done quickly and enables the nurse to gather information necessary for care planning.  | Gaining a more thorough understanding of the patient and his/her family's health care beliefs is critical to achieving cost-effective and clinically positive outcomes.   | None mentioned.  | None mentioned.  |
| Harvey DJ [61]<br><i>Rural and Remote Health</i><br>           | 2007 | R    | PH   |    | Searches conducted of CINAHL, MEDLINE, Proquest, Blackwell Synergy, Informit, Infotrac, National Rural Health Alliance and Indigenous Health Infonet databases to analyze understandings about how rural Australian women maintain health and wellbeing.                   | A deeper understanding of the health and wellbeing of rural women in Australia is enabled. The social experiences of rural women influence the way they construe their health and wellbeing. The 4 themes can either positively influence their health and wellbeing or negatively. | Very few articles have been studied (6 studies selected); when more articles were included, the results might have been different.   | Research has to be conducted which draws on the voices of women themselves; experiences, behavior and opinions out of first hand.                                    |
| Arcury TA et al. [62]*<br><i>Health Services Research</i><br>  | 2005 | C    | PH   |    | A survey of 1,059 adults in rural North Carolina is conducted to determine the importance of geography and spatial behavior as predisposing and enabling factors in rural healthcare utilization, controlling for demographic, social, cultural and health status factors. | Results show the importance of geographic and spatial behavior factors in rural healthcare utilization. Geographic measures, as predisposing and enabling factors, were related to regular check-up and chronic care, but not to acute care visits.                                 | Participants could be subject to recall bias in recounting the number of healthcare visits. Study has been performed in only one rural region (however, the strength of the study's sample design and data collection procedures compensate for this). | Inequity in rural healthcare utilization must be addressed in public policy.   |
| DM Tromp et al. [63]<br><i>Health Education Research</i><br> | 2005 | C    | ON   |    | Health behavior plays an important role in the development, detection and course of cancer. 264 patients participated; filled in a questionnaire and were interviewed about the care-seeking process.  | Delay in seeking care was related to perceived health competence and external health locus of control. Higher perceived health competence leads to a lower chance of delay.   | Non Dutch speaking patients were excluded. It can be questioned whether self-report measures are reliable.   | Interventions should take psychological factors into account. Future research should explore the relationship with health behaviors (smoking etc.) and care seeking. |
| Woods CR et al. [64]*<br><i>Pediatrics</i><br>               | 2003 | C    | P    |    | Assess determinants of healthcare visits among children in Western North Carolina.   | The rural population of Western North Carolina seems to have reasonably good access to care   | < 5 year age group was very small and nearly statistical relevant findings   | Differential use of healthcare among white and black children merits   |









































| Authors  | Year | Type | Area | MI   | Results  | Conclusion   | Limitations  | Recommendations   |
|--|------|------|------|--|--|--|--|---|
| Sheikh S et al. [65]<br><i>Social Psychiatry and Psychiatric Epidemiology</i><br> | 2000 | C    | PS   | Two questionnaires were completed by 287 adults to examine the relationship between culture beliefs about the causes of mental distress and attitudes associated with seeking professional help. | Positive attitudes were similar in the 3 groups (Pakistani, British Asian and Western European). Muslims have a less positive attitude to seeking care. Supernatural causes were significant predictors for a negative attitude towards seeking professional help. | Culturally determined beliefs of mental distress contribute to attitudes towards seeking professional help for psychological problems. | The 3 groups were highly educated; results might be difficult to generalize. In an effort to standardize samples, real socio-cultural differences have been minimized. | Further research is needed to investigate conceptions of mental stress. A more representative sample could result in a better insight in the associations between culture, causal beliefs and attitudes towards help seeking. |






Table 10 – Attitude to Healthcare related studies

| Type – Type of study used in the research   |                             | CA  |    | case control study |                   | D   |  | descriptive study |  |
|---|-----------------------------|---|----|--------------------|-------------------|---|--|-------------------|--|
| C   | F                           | I   | SR | interview study**  | systematic review | R   |  | review            |  |
| RCT   | randomized controlled trial |   |    |                    |                   |   |  |                   |  |
| Area – The clinical area in which the study has been performed                        |                             |   |    |                    |                   |   |  |                   |  |
| C   | cardiology                  | G   |    | gynecology         |                   | N   |  | nursing           |  |
| O   | obstetrics                  | ON  |    | oncology           |                   | P   |  | pediatrics        |  |
| PH  | public health               | PS  |    | psychiatry         |                   |   |  |                   |  |
| Nation – The nation in which the study has been performed                             |                             |   |    |                    |                   |   |  |                   |  |
|  | Australia                   |  |    | Austria            |                   |  |  | Bangladesh        |  |
|  | Belize                      |  |    | Brazil             |                   |  |  | Burkina Faso      |  |
|  | Cameroon                    |  |    | Canada             |                   |  |  | Cameroon          |  |
|  | Denmark                     |  |    | Ecuador            |                   |  |  | Ethiopia          |  |
|  | Finland                     |  |    | Gambia             |                   |  |  | Germany           |  |
|  | Greece                      |  |    | Ghana              |                   |  |  | Guatemala         |  |
|  | Guinea-Bissau               |  |    | Haiti              |                   |  |  | Hungary           |  |
|  | India                       |  |    | Indonesia          |                   |  |  | Ireland           |  |
|  | Italy                       |  |    | Jamaica            |                   |  |  | Jordan            |  |
|  | Kenya                       |  |    | Liberia            |                   |  |  | Malawi            |  |
|  | Malaysia                    |  |    | Mexico             |                   |  |  | Moldova           |  |
|  | Mozambique                  |  |    | Myanmar            |                   |  |  | Nepal             |  |
|  | Netherlands                 |  |    | Nigeria            |                   |  |  | Pakistan          |  |





| Authors   | Year  | Type | Area  | MI | Results   | Conclusion              | Limitations   | Recommendations         |
|---|---|------|---|----|---|-------------------------|---|-------------------------|
|   |  |      | Papua New Guinea                                  |    |  | Philippines             |  | Portugal                |
|   |  |      | Romania   |    |  | Russian Federation      |  | Scotland                |
|   |  |      | Senegal   |    |  | Sierra Leone            |  | Spain                   |
|   |  |      | Sri Lanka   |    |  | Sweden                  |  | Switzerland             |
|   |  |      | Tanzania  |    |  | Thailand                |  | Turkey                  |
|   |  |      | Uganda  |    |  | United Kingdom          |   | United States           |
|   |  |      | Zimbabwe  |    |   |                         |   |                         |
| <b>Abbreviations</b> – Abbreviations used to describe these studies |   |      |   |    |   |                         |   |                         |
|   | <b>ANC</b>  |      | antenatal care                                    |    | <b>EBP</b>  | evidence-based practice | <b>GP</b>   | general practitioner    |
|   | <b>LBW</b>  |      | low birth weight                                  |    | <b>MCH</b>  | maternal-child health   | <b>PNC</b>  | prenatal care           |
|   | <b>PPH</b>  |      | postpartum hemorrhage                             |    | <b>SBA</b>  | skilled birth attendant | <b>TBA</b>  | trained birth attendant |
|   | <b>UBTH</b>   |      | University of Benin Teaching Hospital             |    |   |                         |   |                         |
| <b>Remarks</b>  | *   |      | This study is also travel time & distance related |    |   |                         |   |                         |
|   | **  |      | Studies that conducted interviews only            |    |   |                         |   |                         |

## APPENDIX D – TRAVEL TIME RELATED STUDIES

| Authors   | Year | Type | Area | MI   | Results  | Conclusion   | Limitations  | Recommendations   |
|---|------|------|------|--|--|--|--|---|
| Orji EO et al. [66]<br><i>Journal of Obstetrics and Gynaecology</i><br>                                  | 2002 | C    | G, O | In case of brought-in maternal death relatives were interviewed to discover the immediate and remote causes.   | There are several causes, 47.1% of the cases were not able to obtain transportation on time, 33.3% of the cases could not have caesarean section and in 33.3% of the cases the problems were too late detected.  | The most common reason for too-late presentation in this study was inability to obtain transportation on time. Distance is an important barrier to seeking healthcare.   | The study has a very small sample size (24 maternal deaths), furthermore interviews may be biased or confounded by steering the interviewee or suggestive questioning.                       | Provide access roads, reduce hospital fees and train health care workers on how to detect obstetric emergencies early and refer.  |
| Van den Broek NR et al. [49]*<br><i>BJOG: an International Journal of Obstetrics and Gynaecology</i><br> | 2003 | C, D | G, O | Interviews with women in 20,649 households using structured questionnaires. To assess pregnancy outcome, maternal mortality and health-seeking behavior.   | Assistance with delivery was related to education levels of the woman and to distance to the hospital. Living within 1 km of the healthcare centre resulted in 79.1% live births, while living 7 km away resulted in 73.3% live births.                              | Many women in this rural community suffer the consequences of high pregnancy loss. Proximity of any household to a health centre has an effect on outcomes.  | Perinatal mortality could be different, because of cultural practice and language difficulties especially with regard to definitions it is likely that some deaths are differently recorded. | The education of the women population should be improved. Furthermore healthcare programs should involve more skilled assistance to pregnant woman. Better infrastructure is also required. |
| Urassa E et al. [53]*<br><i>Health Policy and Planning</i><br>   | 1997 | F    | G, O | A follow-up was done of all 117 cases of maternal deaths to identify main operational factors within and outside the healthcare system. Interviews were held and records reviewed. Of each hospital available resources were assessed. | 79% received some medical care and 11% arrived too late for treatment. In most cases the husband (29%) or the mother (31%) decided on the care of the woman. 25% of deceased women lived more than 4km away. Lack of equipment, drugs and staff increased mortality. | Wrong decision at the district level and lack of equipment at the referral centre were the main reasons for inadequate care. The women must culturally and economically be empowered to seek medical care. Relatives do not always realize the seriousness of the illness. Delay in arrival and poor transport facilities were also two important factors. | Second-hand information (obtained by interviewing relatives and healthcare workers) may bias the results. The sample size was small; only 117 cases were included.                           | Transportation problems should be solved; also roads should be improved.  |
| Bartlett LA et al. [67]<br><i>Lancet</i><br>   | 2005 | C    | G, O | Deaths among women of reproductive age were identified through a survey of all households in randomly selected villages & investigated through verbal-autopsy interviews of family members.  | Population of 90,816; 357 women died, 154 deaths related to complications during pregnancy and delivery. Maternal risks were high, especially in the more remote areas. In the 2 rural sites, no woman who died was assisted by a skilled birth attendant.           | Maternal mortality in Afghanistan is high and becomes significantly greater with increasing remoteness.  | Survey usage can result in errors. The estimates of possible maternal mortality ratios for Afghanistan were based on only four districts.  | Deaths can be prevented if complications were prevented through optimization of health status. Availability and accessibility of healthcare should be improved.                             |
| Turrell G et al. [68]   | 2006 | C    | PH   | 459,658 (population of   | SMR ranged from 0.21   | There is little support for the  | Tasmania has relatively small  | This study should be  |













| Authors  | Year | Type | Area     | MI | Results   | Conclusion   | Limitations  | Recommendations   |
|--|------|------|----------|----|---|--|--|---|
| <i>Health &amp; Place</i><br>   |      |      |          |    | Tasmania). SES was calculated with IRSD for each SLA. Social capital was studied with the HCS. Remoteness of each SLA was calculated with ARIA. Mortality data was acquired from ABS.                                   | relation between social capital and mortality and also for remoteness and mortality.   | geographical areas; in larger areas a more distinct relationship may be found. Study was population-based it does not have to reflect each individual.     | replicated in other areas of Australia or in the world to determine if there is any relationship between remoteness and mortality.                        |
| Wilkinson D et al. [69]<br><i>Journal of Public Health Medicine</i><br> | 2001 | C    | PH       |    | All-cause mortality rates [...] were calculated and standardized to the 1997 Australian population. Remoteness was measured using ARIA values. Socio-economic deprivation was measured using SEIFA values from the ABS. | Ecological correlation exists between all-cause mortality, Indigenous status, and remoteness and disadvantage across Australia.          | SEIFA scores of individual people cannot be linked to their mortality experience.  | Intervention targeted at remoteness, low SEIFA score and Indigenous statistical divisions could reduce much of the variability in mortality in Australia. |
| Alston M et al. [70]<br><i>Rural and Remote Health</i><br>              | 2006 | C    | PH       |    | Drawing on a survey of 820 women the study takes a look at rural health servicing through the eyes of women in rural Australia.   | Lack of safe, affordable, accessible and adequate services in a variety of areas continues to put women's health at risk in rural areas. | It is not known whether or not this group is representative of all rural women. Neither comparative urban data nor comparison with the views of rural men. | Same study could be repeated in the urban area and another study could be done with men.  |
| Brameld KJ et al. [71]<br><i>Health &amp; Place</i><br>               | 2006 | C    | PH       |    | The study analyzed the effect of location of residence on hospital utilization and outcomes using geocoded hospital morbidity and mortality data.   | Remoteness affects the health service utilization and outcomes; although the affection is not very clear.                                | Sample sizes of remote areas are quite small results might have turned out different in a bigger sample size.  | Further research is required at the individual disease level to identify the main factors that restrict the accessibility of services.                    |
| De Souza VC et al. [72]<br><i>Journal of Public Health</i><br>        | 2005 | C    | C, E, PH |    | Information from residents in West Sussex from 1996-1999. Travel time calculation to nearest hospital.  | There is no relationship between RAAA survival and travelling time to the hospital.  | The sample size of the study was limited. Travel times in West Sussex were quite narrow. Zip code areas used   | A larger sample size might find a relation. Also a larger area might influence the outcome of the study.  |

| Authors   | Year | Type | Area | MI | Results   | Conclusion  | Limitations  | Recommendations   |
|---|------|------|------|----|---|---|--|---|
| Jordan H et al. [73]<br><i>International Journal of Health Geographics</i><br> | 2004 | C    | PH   |    | Straight-line and drive-time measures were highly correlated. Greatest differences were found in coastal and rural wards of the far South West. 98% of the population were under 4.4 km or 6.3 min from their closest GP. Mean distance to an acute hospital was 12 km (13 min drive time). | Drive time is a more accurate measure of access for peripheral and rural areas. Drive time up to 50 minutes was predicted by the model, there are groups who would be disadvantaged by the travel distances that were reported in this study. | Only one region in England has been explored. Other aspects of accessibility include quantity and quality of services, financial and cultural barriers; these are not explored here. The inter relationship between use of healthcare, need and access has been insufficiently explored.     | Better measures of geographical access, which integrate public and private transport availability with distance and travel time, are required if an accurate reflection is to be obtained. Study must be reproduced in other areas. |
| Martin D et al. [74]<br><i>Health &amp; Place</i><br>                          | 2002 | D, R | PH   |    | Most of the studies use direct measures (like physical distances, travel times and public transport travel times/schedules) and/or indirect measures (like population density/sparsity and nearest neighbor distances).   | Car and bus travel times modeled are much more strongly related to the actual transportation barriers. Population density or straight line distance have often been used as proxies.  | Modeling public transport is lacking comprehensive and detailed information. Furthermore start-up time (to get to the bus or car), walking to the facility (when people step out of the car and bus) and parking the car are not incorporated in the total travel time.                      | More comprehensive and detailed public transportation information is needed to model travel time and distance barriers more accurately.   |
| Oleson JJ et al. [75]<br><i>Preventive Medicine</i><br>                        | 2008 | C    | PH   |    | Distance plays an important role in attendance, although its impact depends on the age of the women and the setting (urban or rural) of the intervention.   | The probability of attendance is affected by many factors, but travel distance appears to play an important role.   | None mentioned.  | In the future research will be conducted to investigate which factors influence participants' likelihood to return for additional sessions. Distance can play a more important role or less important role in this area.            |
| Probst JC et al. [76]<br><i>BioMed Central Health Services Research</i><br>  | 2007 | C    | PH   |    | Rural residents traveled further than urban counterparts (28.2 vs. 13.4 km). Rural trips took 31.4% longer than urban trips (27.2 vs. 20.7 min). African Americans spent more time in travel than whites (29.1 vs. 20.6 min).   | Rural residents and African Americans experience higher travel burdens than urban residence or whites when seeking medical/dental care.   | Grouping all travel for care as "medical/dental" is overly simplistic for health services research. NHTS only captures information for persons who completed the trip (it excludes people who avoid seeking care). Rising gas prices will constitute a barrier to travel for care, rural and | Policies should explore additional transportation strategies in rural areas.  |

| Authors  | Year | Type | Area  | MI | Results  | Conclusion  | Limitations  | Recommendations  |
|--|------|------|-------|----|--|---|--|--|
| Arcury TA et al. [62]*<br><i>Health Services Research</i><br>                   | 2005 | C    | PH    |    | A survey of 1,059 adults in rural North Carolina is conducted to determine the importance of geography and spatial behavior as predisposing and enabling factors in rural healthcare utilization, controlling for demographic, social, cultural and health status factors. | Results show the importance of geographic and spatial behavior factors in rural healthcare utilization. Geographic measures, as predisposing and enabling factors, were related to regular check-up and chronic care, but not to acute care visits. | Participants could be subject to recall bias in recounting the number of healthcare visits. Study has been performed in only one rural region (however, the strength of the study's sample design and data collection procedures compensate for this). | Inequity in rural healthcare utilization must be addressed in public policy.   |
| Hong T et al. [77]<br><i>Psychology, Health &amp; Medicine</i><br>              | 2004 | C    | PH    |    | Relationship between self-rated health and healthcare barriers measured by using a questionnaire; six healthcare barriers were questioned and one question was used to determine the participants' overall self-rated health.  | Healthcare barriers were just as important as age, race, gender and education when accounting for explained variance in self-rated health.  | Questionnaire and sample size were small. Only one question was used to assess health of participants, this could be easily biased.  | Future studies should consider intervening on healthcare barriers to improve self appraisals of health and improve health outcomes   |
| Bazzano AN et al. [78]<br><i>Tropical Medicine and International Health</i><br> | 2008 | C    | PH    |    | 14 in depth interviews with older mothers, 45 semi-structured interviews with mothers, 28 case histories, 32 expert interviews.  | Improvements in care-seeking are urgently needed. Financial and socio-cultural barriers should be addressed to improve neonatal care.   | Very small sample size. Interviews may be biased or confounded by steering the interviewee or suggestive questioning.  | Behavioral change interventions and communications training of health services personnel could potentially improve chances for survival even as improvement of infrastructure. |
| O'Neill L [79]<br><i>Health Care Management Science</i><br>                   | 2003 | C    | C     |    | A model was developed to estimate out-of-hospital deaths due to myocardial infarction. A GIS was used to determine travel times between hospitals and patients, based on patients' zip code of residence.  | Distance to the hospital has a significant impact on both access and eventual outcome. The probability of hospital admission decreased by about 1.25% for each five minute increase in hospital distance.   | Geographical selection bias in inpatient databases occurs when barriers to access result in a non-random sample of patients.   | In deciding whether to allow these closures, regulators must balance cost considerations with the need to ensure minimum levels of hospital access for rural residents.        |
| Lyon RM et al. [80]<br><i>Emergency Medical Journal</i>  | 2004 | C    | C, EC |    | Outcome & demographic data were obtained from 1956 OHCA's at home. Survival rates  | Survival to admission from OHCA is strongly influenced by response time and   | Distances and times calculated from ambulance stations, while ambulances   | Larger sample size may result in even more insight in the relation between   |

| Authors   | Year | Type | Area   | MI  | Results  | Conclusion  | Limitations   | Recommendations  |
|---|------|------|--------|---|--|---|---|--|
|  Nicholl J et al. [81]<br><i>Emergency Medical Journal</i>           | 2007 | C    | EC     | 10,315 cases were studied to determine whether distance is associated with mortality. For distance the straight line distance method was used. Logistic regression is used for distance-mortality relationship.           | Increased distance is associated with mortality (OR 1.02 per kilometer, $p < 0.001$ ). Patients with respiratory problems have the highest risk.   | Increased journey distance to hospital appears to be associated with increased risk of mortality.   | Only high risk population was selected. The relationship between distance travelled and mortality may be less evident. Cases were from 1997-2001, performance changes may improve distance travelled and quality of care etc. | Further research could also focus on a sample group which reflects the entire society better.  |
|  Vindén V et al. [82]<br><i>Journal of Intensive Care Medicine</i>   | 2001 | D,O  | IC, EC | Patients with ECMO that were transported to and from a tertiary referral center (29 patients in total). Calculation of transport time and survival rate during transport.   | All patients survived the transportation to the hospital. 21 of 29 (72%) patients survived the stay in the hospital.   | ECMO transports can be performed safely to transport patients also for long distances. Cause of death was not related to the transport in any case.   | Small study sample. Furthermore no statistical analysis is performed (nothing mentioned in article).  | Transport patients as early as possible. Furthermore research is needed to investigate relationship between transport time and survival.                                       |
|  Jong KE et al. [83]<br><i>Medical Journal of Australia</i>          | 2004 | C    | ON     | Patients diagnosed with cancer between 1992 and 1996. Survival determined to 31-12-1999. Used ARIA to determine remote areas.   | There are significant differences between remote areas and accessible areas for head & neck ( $p=0.05$ ), colon ( $p=0.006$ ), rectum ( $p=0.007$ ), lung ( $p=0.007$ ), melanoma of skin ( $p=0.002$ ), cervix ( $p=0.0004$ ), prostate cancer ( $p=0.003$ ) and all cancers ( $p=0.003$ ). | Cancer survival varies by remoteness of residence in New South Wales for all cancers together.  | Misclassification of area of residence is possible if patients moved to more accessible areas. Stage-specific survival analysis of individual cancer sites was prevented due to insufficient numbers of cases.                | It is important to continue exploring ways in which effective consultation, diagnostic support and education can support the services available in all non-metropolitan areas. |
|  Jones AP et al. [84]<br><i>European Journal of Cancer</i>         | 2008 | C    | ON     | Records of 117,097 cases of cancer diagnosed in Northern England between 1994-2002 were supplemented with estimates of travel times to GP's and hospitals attended; together with measures of access to public transport. | Area deprivation is related with a higher risk of death ( $p < 0.05$ ). Prostate cancer patients living further from their GP had worse change of survival ( $p < 0.05$ , 0.4% increase in risk per min).  | Geographical Accessibility to primary care appears to be more important for early diagnosis and survival than access to hospital. Overall, the possible risks associated with travel time to primary care were small. | Ovary cancer records were restricted by low numbers. Access to health services depends on a wider range of factors than those associated with transport.  | The mechanisms which might explain why difficulties in travel to primary care are linked to outcome require further investigation.   |
|  Dummer TJB et al. [85]<br><i>Archives of Disease in Childhood</i> | 2004 | C    | P      | CBD was used comprising 278,993 records of all births. Road network and hospitals were captured in GIS. Logistic regression was used to   | In all 3 groups; early neonatal death, neonatal death and post neonatal death the OR's were 1.00 and p-values ranged from  | There was no evidence to suggest that living further from hospitals, in terms of road travel time, increased the risk of infant death or  | Lacking data after 1993. Relying on straight line distance is crude, because accessibility depends on physical distance and   | None mentioned.  |

| Authors  | Year | Type | Area  | MI  | Results   | Conclusion   | Limitations  | Recommendations  |
|--|------|------|-------|---|---|--|--|--|
| <b>Woods CR et al. [64]*</b><br><i>Pediatrics</i><br>                     | 2003 | C    | P     | Assess determinants of healthcare visits among children in Western North Carolina, by using surveys.  | There were no apparent geographic access barriers to care in this population (p>0.05). Parents' perception of pain of the child does not statistically influence the healthcare use. Uninsured children had less visits, as is the case with SES, race and older age. | The rural population of Western North Carolina seems to have reasonably good access to care overall.                 | < 5 year age group was very small and nearly statistical relevant findings may be statistical relevant in larger populations. Study relies – solely – on parent recall of healthcare visits.                               | Differential use of healthcare among white and black children merits additional exploration.                                       |
| <b>McGuffie AC et al. [86]</b><br><i>The Journal of Trauma</i><br>        | 2005 | O    | TC    | 3,962 urban patients, 674 rural patients were included. Mann Whitney U test was used to compare medians. $\chi^2$ was used for categorical data.      | All pre-hospital times were longer for rural patients (p < 0.001). More air transfers were used for rural patients.   | Despite longer pre-hospital times, there was no significant difference in outcomes between urban and rural patients. | The effect of air ambulance transport on the outcome of rural trauma patients is unknown. It is possible that air transport introduced bias into the results. Study was not primarily focused on travel time and distance. | None mentioned.  |
| <b>Karanicolas PJ et al. [87]</b><br><i>The Journal of Trauma</i><br>     | 2006 | C    | TC    | 243 trauma patients transported by land and 139 trauma patients by air. Time intervals between these two were compared.                               | Actual travel time by ground was longer (78.9 vs. 58.4 min, p < 0.001). Mean time from decision to transfer to arrival was better for ground transport.   | Travel time was too long, because trauma patients should get care within the golden hour.                            | The focus of the study was on the time interval between critical events, rather than on mortality. Several data points were missing. Geographical differences reduce the generalizability of the study.                    | Repeat a similar study but take into account mortality. Use algorithms to calculate which transport type is the fastest transport. |
| <b>Nemet GF et al. [88]</b><br><i>Social Science &amp; Medicine</i><br> | 2000 | R    | GE    | Mail survey was used to explore the relationship between distance and the utilization of healthcare by a group of elderly residence in rural Vermont. | People who had to travel > 10 miles to their physician tended to go to their physicians less frequently (p=0.039). Propensity to seek care also has a strong association (p=0.015). People who had a regular doctor were more likely to seek care (p=0.000).          | The results confirm the idea that increased distance from provider does reduce utilization.                          | Study sample of 390 participants is relatively small.  | Further research is necessary that establishes links between place and the use of health facilities.                               |
| <b>Firozvi AA et al. [89]</b><br><i>Liver Transplantation</i><br>       | 2008 | C    | H, IM | Patients eligible for liver transplantation were divided in two groups, travelling > 3 hours and travelling < 3 hours.                                | No significant differences between group setup with respect to age, gender, psychosocial score and  | Patients with moderately increased travel time (>3 hours) are similar to those living closer and are not at a        | Single center study and regional bias. Zip codes may be inaccurate because in rural areas they can present a large   | Larger studies might find a significant relationship between mortality and travel time.  |

| Authors   | Year                                      | Type | Area | MI  | Results  | Conclusion  | Limitations   | Recommendations  |
|---|---|------|------|---|--|---|---|--|
| Jones AP et al. [90]<br><i>International Journal of Epidemiology</i><br> | 1999                                      | D    | PL   | Regression analysis is used to examine the relationship between health service accessibility and mortality from asthma. | Asthma mortality increased when travel time to hospital increased; relative risk of 1.07 for each 10 min increase in travel time (p=0.04). No consistent trend was found in travel time to GP's. | Inaccessibility of hospital services may increase the risk of asthma mortality. | In a population-based study it is not possible to determine the mechanisms by which hospital accessibility might influence mortality. | Provision of good access to these facilities may be one factor in reducing the burden of avoidable deaths from asthma. |
| Table 11 – Travel time related studies  |   |      |      |   |  |   |   |  |
| Type – Type of study used in the research   |   |      |      |   |  |   |   |  |
| C   | cohort study                              |      |      |   |  |   |   |  |
| O   | observational study                       |      |      |   |  |   |   |  |
| Area - The clinical area in which the study has been performed  |   |      |      |   |  |   |   |  |
| C   | cardiology                                |      |      |   |  |   |   |  |
| GE  | geriatrics                                |      |      |   |  |   |   |  |
| IC  | intensive care                            |      |      |   |  |   |   |  |
| ON  | oncology                                  |      |      |   |  |   |   |  |
| PL  | pulmonary                                 |      |      |   |  |   |   |  |
| Nation – The nation in which the study has been performed   |   |      |      |   |  |   |   |  |
|    | Afghanistan                               |      |      |   |  |   |   |  |
|    | Ghana                                     |      |      |   |  |   |   |  |
|    | Scotland                                  |      |      |   |  |   |   |  |
|    | United Kingdom                            |      |      |   |  |   |   |  |
| Abbreviations – Abbreviations used to describe these studies  |   |      |      |   |  |   |   |  |
| ARIA  | accessibility & remote index of Australia |      |      |   |  |   |   |  |
| ECMO  | extracorporeal membrane oxygenation       |      |      |   |  |   |   |  |
| NHTS  | national household travel survey          |      |      |   |  |   |   |  |
| SEIFA   | socio-economic index for Australia        |      |      |   |  |   |   |  |
|   |   |      |      |   | F  | follow-up study   | D   | descriptive study  |
|   |   |      |      |   | R  | review  |   |  |
|   |   |      |      |   | E  | epidemiology  | EC  | emergency care   |
|   |   |      |      |   | G  | gynecology  | H   | hepatology   |
|   |   |      |      |   | IM   | internal medicine   | O   | obstetrics   |
|   |   |      |      |   | P  | pediatrics  | PH  | public health  |
|   |   |      |      |   | TC   | trauma care   |   |  |
|   |   |      |      |   |   | Australia   |    | Canada   |
|   |   |      |      |   |   | Malawi  |    | Nigeria  |
|   |   |      |      |   |   | Sweden  |    | Tanzania   |
|   |   |      |      |   |   | United States   |   |  |
|   |   |      |      |   | ABS  | Australian Bureau of Statistics   | CBD   | Cumbrian births database   |
|   |   |      |      |   | HCS  | health communities survey   | IRSD  | index of relative socioeconomic disadvantage   |
|   |   |      |      |   | OCHA   | out of hospital cardiac arrest  | RAAA  | ruptured abdominal aortic aneurysm   |
|   |   |      |      |   | SLA  | administrative units (comparable with USA states)                               | SMR   | standardized mortality ratio   |
| Remarks   |   |      |      |   |  |   |   |  |
| *   |   |      |      |   | This study is also travel time & distance related  |   |   |  |

## APPENDIX E – ILLUSTRATING THE “THREE DELAY FRAMEWORK”

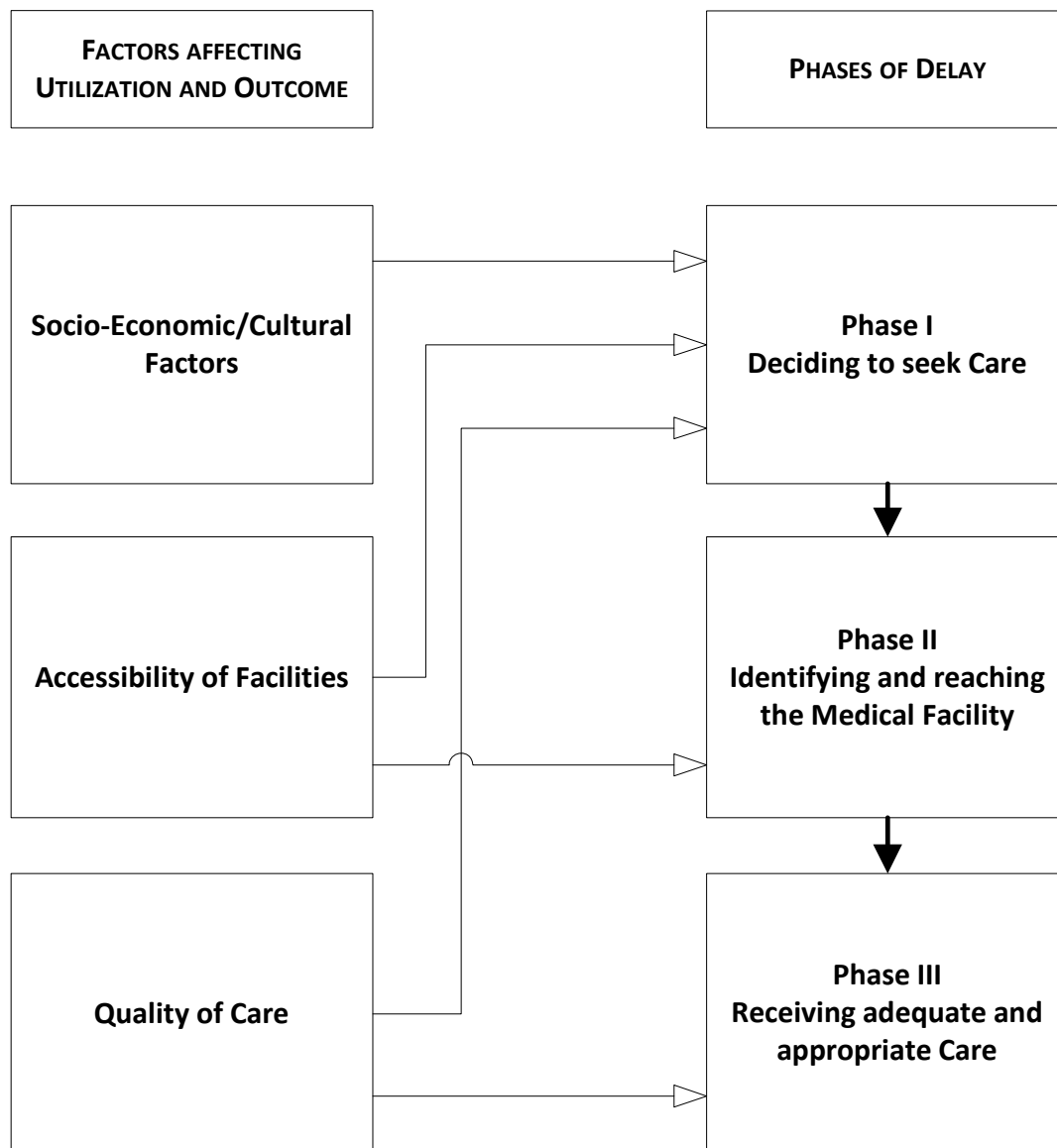


Figure 2 – Complete overview of the three delay framework [7]

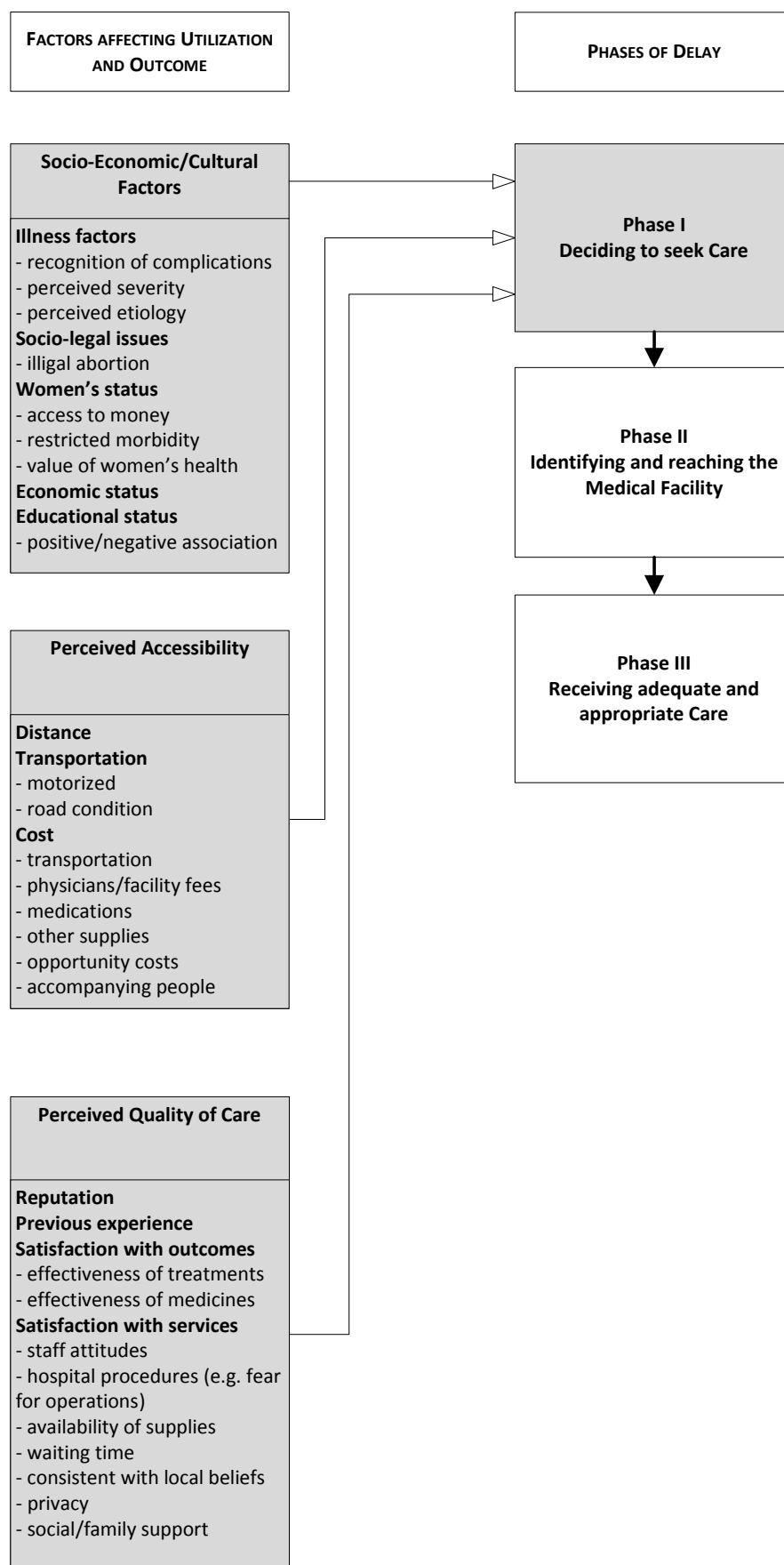


Figure 3 – Phase I of the three delay framework [7]

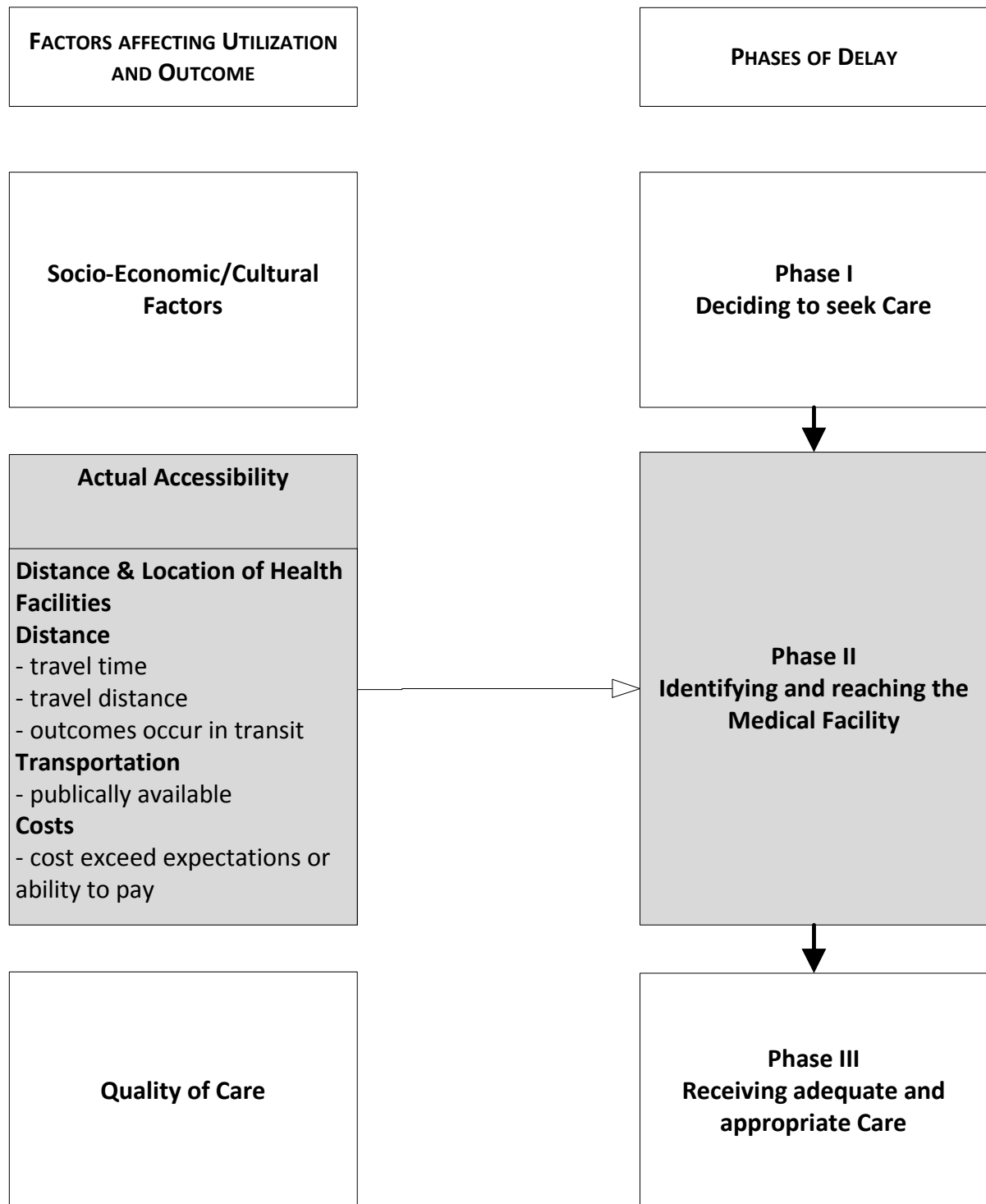


Figure 4 – Phase II of the three delay framework [7]

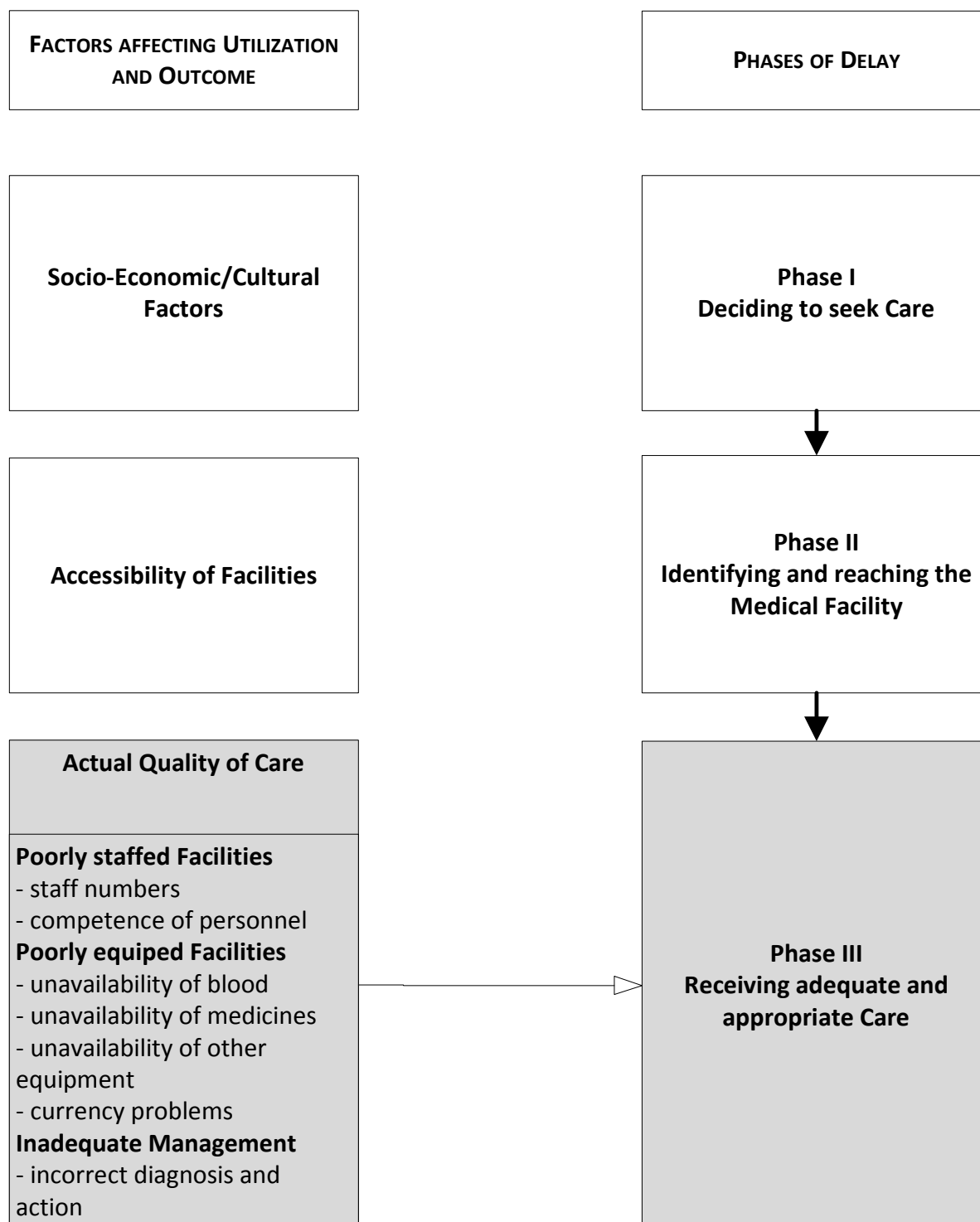


Figure 5 – Phase III of the three delay framework [7]

## APPENDIX F – ABBREVIATIONS

| Abbreviation | Meaning  |
|--------------|--|
| ABS          | Australian Bureau of Statistics                                      |
| ARIA         | Accessibility Remote Index Australia                                 |
| APGAR        | Activity, Pulse, Grimace, Appearance and Respiration                 |
| BMI          | Body Mass Index  |
| CBD          | Cumbrian Births Database   |
| EBM          | Evidence Based Medicine  |
| GIS          | Geographic Information System  |
| GPS          | Global Positioning System  |
| HELLP        | Hemolysis Elevated Liver enzymes and Low Platelets                   |
| HIV          | Human Immunodeficiency Virus   |
| HPV          | Human Papilloma Virus  |
| IUGR         | Intrauterine Growth Restriction                                      |
| MeSH         | Medical Subject Heading  |
| RCT          | Randomized Clinical Trial  |
| SEIFA        | Socio Economic Index For Australia                                   |
| SES          | Socio-Economic Status  |
| WISEWOMEN    | Well Integrated Screening and Evaluation for Women Across the Nation |

**Table 12 – Abbreviations and their meaning that have been used in the study**

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