

Notes on home birth: Safety, interventionism and satisfaction

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Research article

Keywords: Home birth, pregnancy, midwives, newborn

Posted Date: June 8th, 2020

DOI: <https://doi.org/10.21203/rs.3.rs-27916/v1>

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Abstract

Background: Home birth is still considered an unusual situation on most developed countries, where it accounts between 0.2 and 25 percent of all births depending of the country. However, the safety of the process and whether it should be offered as a choice makes it a controversial topic with strong opinions on both sides. This review aims to describe the situation of home birth in several developed countries and debate its safety and mothers' satisfaction, by reviewing studies that compare home vs. hospital births.

Methods: A systematic research has been done using different search engines to find publications that portray the current situation on this topic. Protocols and historical facts were selected using no filters, while publications reporting maternal and birth outcomes, as well as levels of satisfaction, were selected using filters that limited the search to articles that had been published in the last 10 years. A total of 45 articles were selected and reviewed.

Results: Home birth in each country depends on many factors, including historical and cultural. Some countries have either developed good practice guidelines or included home birth on the already existing ones, while some other countries still do not recognize it as a safe option. While most studies do not show significant differences on neonatal mortality APGAR score and intensive care admissions, they do describe slightly better maternal outcomes on home birth due to lower interventionism. Studies also show that between 13 and 29 percent of home births require transferring the woman or the fetus to the hospital. Satisfaction levels also appear to be higher in women who had a planned home birth.

Conclusions: Home birth appears to be a safe choice for women with low risk pregnancies, due to a lower rate of interventionism. However, safety depends on many factors, from professional accreditation, to the presence of protocols and good practice guidelines. Satisfaction also appears to be higher on women who had a planned home birth, although it depends on personal considerations and circumstances.

Introduction

Almost since the beginning of the medical practice the patient has always played a secondary role in the decision-making process. However, this tendency is slowly changing due to the democratization of knowledge, mainly influenced by the fast development of IT, freedom of speech and the achievement of basic rights on the second half of the XX century.

This tendency is even more evident in the field of obstetrics, where women are demanding more than ever their right to take a part on deciding any affairs that have to do with their bodies.

Looking at this context it should not come as a surprise that women are demanding more control over pregnancy care and delivery. Today more than ever, a large number of women ask for a non-medicalized delivery at the hospital, and there is a raising amount of them that go further and demand a home birth, usually under the care of midwives. This tendency differs from one country to another, and even between regions of the same country.

It cannot be forgotten that although woman rights should never be ignored, on the medical practice this is an extremely political matter, and that controversial terms such as *obstetric violence* (1) have been established within the last twenty years pushed, amongst others, by political agendas.

This review has several objectives. The first objective is to review the situation of home birth in developed countries, specially focusing on those countries that have developed protocols including midwifery care and home birth within their health policies. Additionally, the social and historical context in which home birth is perceived depending on the country will also be reviewed. Outcomes data of both the newborn and the mother will also be reviewed to determine the safety of home birth and the profile of women that might be eligible to choose it as an option. Last but not least, the satisfaction of women who gave birth both at home and the hospital will be reviewed.

Methods

The exploration taken in this work has been limited to several developed countries. We mainly chose studies published within the last 10 years, primarily with the purpose of exploring the current situation and therefore avoiding possible biases related to the changes that new technology and outdated guidelines might lead to. However, some older articles have been used, primarily to describe historical or governmental facts.

Additionally, there is literature that addresses the risks, outcomes and satisfaction on women that choose to give birth at childbirth centers and compares it with hospital childbirths. This will not be included, as the focus of this review is home birth compared to hospital for the place of birth. Nevertheless, references to birth centers might be found on some sections of this work, however, articles which main topic were birth centers have been excluded.

Search strategy

When exploring literature, we primarily focused on research studies, reviews, meta-analyses, and opinion papers, by searching electronic databases and reviewing reference lists. Search engines mainly included *PubMed*, *Google Scholar* and *Cochrane Library*. A literature and publications manager such as *Mendeley* were also utilized.

Due to the structure of this review, literature search has been split into different sections. Literature for each country has been separately searched, following common criteria but also, adapting the search to different country needs. To describe the situation as accurate as possible, protocol research has been limited to Western Europe countries and North America.

The final list of selected countries has been made after researching a series of historical, cultural and sociological facts of each one of them. We also took into consideration the differences in their health systems and the literature available, with the aim to portrait a vision as wide as possible. This list includes the following countries: The Netherlands, United Kingdom and Spain from Western Europe, and the United States of America and Canada from North America.

For estimating the situation of each country, common search techniques were used. Search terms included "home" + "birth" + "name of the country" and "midwives" + "name of the country" using filters that adapted the search. The key words contained in either the title and/or the abstract. When searching for the United States and United Kingdom the terms "US" and "UK" were added to the search.

The electronic searches in the search engines listed above yielded a number of publications in PubMed and in Google Scholar for the Countries listed (Table 1). After reviewing the titles and the abstracts, a total of 42 publications, which followed the criteria and topic of this review, were selected and reviewed.

Table 1
Results for each country in the selected search engines.

	<i>PubMed</i>	<i>Google Scholar</i>	<i>Selection</i>
Netherlands	459	66	8
Spain	511	21	11
UK	1021	119	10
US	1368	168	7
Canada	299	36	6
Total	3658	410	42

There have been some exceptions on this search. When searching for Spain there were also included results in Spanish that were published by Spanish governmental institutions such as the Spanish Ministry of Health, the Spanish Statistical Institute and a Spanish professional association of midwives. When searching for the UK, NICE guidelines were also included in this review.

When searching for the outcome's section, search terms included "home" + "birth" + "outcomes" and "homebirth" + "outcomes" with filters that limited the search for results that included the keywords in either the title and/or the abstract. In this case the search was extended to other developed countries outside of Europe and North America. This search yielded 53 results in *PubMed*, 49 results in *Google Scholar* and 56 results in *Cochrane library*. Search techniques for this section also included the terms "home" + "birth" or "homebirth" filtered to include these keywords in the title, throwing 450 results in *PubMed* and 598 results in *Google Scholar*. After reviewing the titles and the abstracts of these publications, 16 publications followed the criteria and were selected (Table 2).

Table 2
Outcomes and satisfaction search in selected search engines.

	<i>PubMed</i>	<i>Google Scholar</i>	<i>Selection</i>
Outcomes	53	49	16
Satisfaction	107	1	9
Total	160	50	25

When browsing for the satisfaction section, search terms included "home" + "birth" + "satisfaction" and "homebirth" + "satisfaction" with filters that also limited the search for results that include the keywords in either the title and/or the abstract. This search yielded 107 results in *PubMed* and 1 result in *Google Scholar*. After reviewing the titles and the abstracts, 9 publications followed the criteria and were selected (Table 2).

Together with the publications selected on Table 1, a total of 67 publications were selected and fully reviewed, and 45 of them have been referenced.

Results

North America

United States of America

Planned home birth in the United States (US), as it is in most of other developed countries, can be considered a first-class health care. It is an expensive service and is almost never covered by any public funds, and as stated by *The New York Times* in 2012, it is becoming some sort of a "status symbol" (2). This is especially evident in the US if it is compared to other countries such as Canada or the Netherlands, where there is a public health care system that covers home birth expenses. In the US there is a high number of uninsured individuals and hence models that are observed in other countries cannot be assumed.

Although in the US the rate of home births rose 41% between the years 2004 to 2010 (3), it is still relatively low compared to other countries. According to a 2015 publication where national data between 2010 and 2012 was reviewed, home births only accounted for 0,71% of all births in the US (4)(5). However, the percentage of home births was significantly different among counties. Rural counties had a 74% higher home birth rate compared to non-rural counties (6). This fact is easily explained by logistical and infrastructural reasons, since over 80% of rural counties have no hospital providing obstetric services and 50% of rural counties have no actively practicing obstetricians. Also, rural women face higher challenges if they decide to choose a hospital to give birth, since less than 50% of rural US women live within a 30 minute ride to the nearest hospital offering obstetric services (6).

There is also a perception not only in the medical community, but also within the general public, that home birth is significantly riskier than a hospital based birth (5). And although there are many studies that show otherwise (4–6) it is true that in the hypothetical case that complications appear, the transferal to a hospital is challenging (5).

The US system also shows some problematics due to the particularly tense relationship between medical practitioners and midwives who work in home births (7). Obstetricians are trained medical doctors (MDs) and have the skills to provide care to both low and high-risk pregnancies.

US midwives, on the other hand, can be either Certified Nurse Midwives (CNMs), Certified Midwives (CMs), Certified Professional Midwives (CPMs) and lay midwives (5). The technical differences between them are essentially educational (8). CNMs and CMs have a Graduate Degree and are certified by the *American College of Nurse Midwives* (AMCB), whereas CPMs are only required to have a High School diploma or equivalent and are not certified by the AMCB, however they have to meet the standards of the North American Registry of Midwives (8). The factual difference between them is that CNMs and CMs can attend both hospital and home births whereas CPMs and lay midwives usually attend exclusively at extra-hospitality settings. Nowadays only 10% of all births are attended by midwives (5) and that might be also explained by the absence of protocols or evidence-based guidelines that are meant to set standards in order to offer a safer, higher quality practice.

All of the above helps to explain why most births in the US nowadays take place in hospitals and rely on obstetricians rather than midwives.

Canada

Contrary to what happened in many other countries like the Netherlands, midwives were not allowed to practice in Canada until 1993 (9,10). Therefore, births took place in the hospital and the primary care provider during pregnancy and post-partum care was the doctor, either a primary care doctor or an obstetrician.

Since then, registered midwives have increased their presence in eight out of ten provinces and one out of three territories. However, the number of active midwives is still small, accounting a total of 943 midwives in 2010 for the whole country, and they attend around 5% to 10% of all births, depending on the region (11).

Currently, pregnant women in Canada can choose who will be their primary care provider during pregnancy. They can, hence, choose between a primary care doctor, an obstetrician or a midwife (9). Historically, obstetricians usually only provided consulting services and would deliver at the hospital, and although this last fact has not changed, they do now provide primary care and follow up services, all of them integrated, however, at the hospital. Midwives on the other hand, are usually more versatile since they provide their services either at home, birth centers or hospitals. In some areas, midwives are actually required to attend a minimum number of cases in each setting to maintain their status (12).

Although birth at home only represents 2% of the total births in Canada (9) it scores up to 30% of midwives attending births, depending on the region (11,12). Whereas it is still a small movement, general practitioners and obstetricians still have a negative perception of this practice (9).

Europe

Spain

Planned home birth in Spain is considered to be a choice that is taken by a minor group of women. There are very few sources that offer statistics and information about this topic in Spain, however in 2013 a home birth association published that around 800 women had chosen a home birth that year. This is the equivalent to 0.2% of all births in Spain (13).

This is probably due to the fact that the Spanish National Health Service (SNS) only offers the opportunity to give birth at the hospital (13,14). Generally, in Spain, pregnant women are classified in three groups according to the risk of complications during delivery: low, intermediate and high risk. Usually, and according to the SNS guidelines (15) low risk pregnancies and deliveries should be attended by midwives in the obstetric unit, leaving medium and high risk individuals to the obstetrician. Midwives in Spain are required to be graduated nurses and complete a two year training program that can only be accessed by passing an official exam, commonly known as Resident nurse in training (RNT)(16).

Consequently, the SNS does not offer any alternative to those women who do not want to give birth at the hospital. Even so, in the public recommendations that the SNS has published it is stated that birth at home does not have enough evidence to be introduced in such guidelines (17). Overall, the primary care and labor assistance offered by the SNS is considered to be based on a interventionist-institutionalized model (17).

Women that actually decide to plan a birth at home have to do it with a private midwife and cover all the costs related to the procedure. Nonetheless, Catalonia, a region of Spain, is currently a leader in the home birth tendency. In 2016, according to the National Statistics Institute (NSI) there were 67,909 births in the region (18), and a total number of 373 of them were at home (19), what makes a 0.54% of all births in this region, which doubles the national average. As a result, the official college of nurses of Catalonia has developed a guideline to help midwives assist births at home "*Guideline of home birth delivery*" (13,19) and also determine which women are eligible to have a birth at home, according to the established criteria.

United Kingdom

In 2014 the British *National Institute for Health and Care Excellence* (NICE) updated their guidelines for "*Intrapartum care for healthy women and babies*" in which they stated that women with low risk pregnancies should be able to choose freely the place they want to give birth on. More exactly it was specified that low risk multiparous women had no additional risk and therefore should be free to choose the birth setting. Meanwhile low risk nulliparous women should acknowledge that if a home birth is chosen, there is a small increase in the risk of an adverse outcome for the baby (20).

This happened following a series of health policies adopted in the late 2000's that focused on prioritizing the right of the mother to choose over the birth setting if, once ensured the safety, it is more comfortable and satisfying for the woman (21). Not only the government but the *Royal College of Obstetricians and Gynecologists (RCOG)* along with the *Royal College of Midwives (RCM)* stated in 2007 that they institutionally supported home birth for low risk pregnancies (21).

Currently in the United Kingdom, women with low risk pregnancies are offered to choose between four different settings to give birth: A obstetric unit; a midwifery unit that is commonly located also in the hospital or health center next to the obstetric unit; a freestanding midwifery unit, located afar from the obstetric unit; or at home, with the services of a midwife (22).

In terms of popularity, the number of women that chose to have a birth at home varies significantly from one region to another. The average home birth rate from England and Wales was the 2.5% of all births. Regional ranges varied widely: from only 1.2% in the North East of England, to 3.3% in East of England and up to 7.6% in one Welsh region (21). In Northern Ireland, the amount reported was of only the 0.3%, this is consistent with the rate that can be found in the Republic of Ireland, which is about the 0.2% of maternities (23).

In England the average transfer rate to the closest hospital in a home birth is 20.8%, being up to four times more common in nulliparous women than in multiparous women. The most common problem that requires a transfer is the failure of progress in either the first or the second stage of birth. However, almost half of the transfers take place after the birth for different reasons that can actually be considered a hazard for either the woman's or the baby's health (22).

The Netherlands

In the Netherlands, in the 1990s, nearly one-third of births used to happen at home (24) however, and although this is a tendency that is slowly declining, a review of the current literature shows that the number is closer to one-fourth of births (25). The Netherlands is a special case because it features a collection of circumstances that make home birth a service offered by the government and included it in the public health system.

On the first place, Dutch midwives are considered amongst the best educated in the world, and because of that they have an increased level of autonomy compared to their fellows of other western countries. This situation, on top of the historic importance of midwifery in the country has contributed to the development of a system where midwives take care of nearly 50% of births (24).

In the Netherlands there are protocols that regulate and strictly limit the choices of women when it comes to choose the place and method of delivery. Usually when women suspect they are pregnant they consult with their primary care doctor, and in this first visit, based on Dutch guidelines, they are categorized according to the risk. High risk pregnancies are referred to the gynecologist, who will be in charge of both the pregnancy follow up and the intrapartum care. Medium risk pregnancies must go to the hospital for the delivery, but they can be supervised by an experienced community midwife. Finally, women with low risk pregnancies can actually decide whether they want to deliver at home or at the closest hospital or health center, where the pregnancy would be managed by a community midwife (26).

There are several other factors that contributed to the development of this system. Aside from the midwives' care quality and autonomy, the Netherlands' topography and infrastructural features allow a fast and efficient transfer of the woman if any complications are encountered (24).

Although the Netherlands have one of the highest perinatal mortality rates in Europe, it has been shown that it is not directly linked to home birth (27).

Outcomes

Neonatal outcomes

When investigating the safety and results of planned home births there is a wide setting of options available to measure the morbidity of newborn infants in the process. Most publications used the variables neonatal and perinatal death (8,28–36), neonatal intensive care unit (NICU) admissions (29,31,34) and 5-minute APGAR scores (29,31,32,34,35,37) to report neonatal outcomes. Some studies also use intra-partum stillbirth rates (30)(29), birth trauma (29) and intrauterine hypoxia (29).

Most publications give results that stay in an equivalent range, although when studying neonatal and perinatal mortality, the balance is tilted to favor home birth or hospital birth depending on the country. As it is shown in Table 3, most publications described a slightly increased neonatal mortality rate in planned home births compared to planned hospital births, however the results are usually not considered to be statistically relevant, except for *Grünebaum et al* (8) who evidenced a significantly lower rate of neonatal mortality in births at the hospital compared to home births when both are managed by a CNM. This article also describes that having a home birth that is attended by an uncertified midwife notably increases the rate of neonatal mortality.

Table 3

Country	Author and year	Study design	Population and sample size	Outcome measures	Results																					
US	Grünebaum et al (4) 2015	Retrospective cohort study using US CDC's data from 2010-2012.	Women attended by midwives at home (n=56,146) vs. those attended by hospital midwives (CNM) in the US (n=736,070).	<u>Perinatal risk factors:</u> Vaginal breech Prior caesarean delivery Twins Postdates >41w >42w	Vaginal breech rate: 0.74% home vs. 0.23% hospital. Prior caesarean delivery rate: 4.4% home vs. 2.11% hospital. Twins rate: 0.64% home vs. 0.31% hospital. Postdates >41w rate: 28.19% home vs. 18.59% hospital. Postdates >42w rate: 9.5% home vs. 6.91% hospital.																					
	Grünebaum et al (8) 2014	Retrospective cohort study (2006-2009)	<u>3 groups:</u> Certified midwife hospital (CNM) birth (n=1,096,555) CNM home birth (n=43,604) Uncertified midwife home birth (n=18,389)	Neonatal mortality <41 weeks Neonatal mortality ≥41 weeks	<u>Neonatal mortality <41 weeks:</u> · Hospital CNM: 3.4/10000 · Home CNM: 9.8/10000 · Home uncertified midwife: 10.4/10000 <u>Neonatal mortality ≥41 weeks:</u> · Hospital CNM: 2.7/10000 · Home CNM: 10.3/10000 · Home uncertified midwife: 21.6/10000																					
CANADA	P. Janssen et al (28) 2009	5-year prospective cohort study	<u>Low risk pregnancies:</u> Planned home birth (n=2889) Midwife attended (n=4752) Physician attended (n=5331)	Perinatal death. Obstetric interventions. Adverse neonatal outcomes. Adverse maternal outcomes.	<u>Neonatal outcomes:</u> Perinatal mortality: 0.35/1000 (home) vs. 0.57/1000 (midwife) vs. 0.64/1000 (physician) Apgar <7 at 5': 0.76 home vs. 0.74 hospital midwife. <u>Maternal outcomes:</u> C/S rate: 7.2% home birth vs. 10.5% hospital. Operative vaginal birth: 3% home vs. 7.2 hospital midwives. Intact perineum rate: 54.4% home vs. 46.1% hospital midwife. PPH rate: 3.8% home vs. 6% hospital midwife.																					
AUSTRALIA	M. Davies-Tuck et al (29) 2018	Retrospective cohort study (2000-2015)	All births in Victoria: 3973 women (743 high risk) who planned a home birth with a midwife and 829,286 women (128,228 high risk) who planned a hospital birth.	<u>Perinatal outcomes:</u> Stillbirth, neonatal death, perinatal mortality, admission to SCN, NICU, Apgar <7 at 5', birth trauma, intrauterine hypoxia. <u>Mother outcomes:</u> Admission to HDU/ICU, 3 rd /4 th degree tear, postpartum haemorrhage, blood transfusion, manual removal of placenta, rupture of uterus.	<table border="1"> <thead> <tr> <th></th> <th>Low risk</th> <th>High risk</th> </tr> </thead> <tbody> <tr> <td>Stillbirth</td> <td>0.62/1000 home vs 1.29/1000 hospital</td> <td>4/1000 home vs 2.8/1000 hospital</td> </tr> <tr> <td>Neonatal death</td> <td>0.94/1000 home vs 0.37/1000 hospital</td> <td>5.3/1000 home vs 0.74/1000 hospital</td> </tr> <tr> <td>Perinatal mortality</td> <td>1.6/1000 home vs 1.7/1000 hospital</td> <td>9.3/1000 home vs 3.5/1000 hospital</td> </tr> <tr> <td>Admission to SCN</td> <td>1.8% home vs. 8.3% hospital</td> <td>4.4% home vs. 13.3 hospital.</td> </tr> <tr> <td>Admission to NICU</td> <td>0.4% home vs. 0.2% hospital.</td> <td>1.6% home vs. 0.4% hospital</td> </tr> <tr> <td>Apgar <7 at 5'</td> <td>0.9% home vs. 1.2% hospital.</td> <td>2.4% home vs. 1.8% hospital.</td> </tr> </tbody> </table>		Low risk	High risk	Stillbirth	0.62/1000 home vs 1.29/1000 hospital	4/1000 home vs 2.8/1000 hospital	Neonatal death	0.94/1000 home vs 0.37/1000 hospital	5.3/1000 home vs 0.74/1000 hospital	Perinatal mortality	1.6/1000 home vs 1.7/1000 hospital	9.3/1000 home vs 3.5/1000 hospital	Admission to SCN	1.8% home vs. 8.3% hospital	4.4% home vs. 13.3 hospital.	Admission to NICU	0.4% home vs. 0.2% hospital.	1.6% home vs. 0.4% hospital	Apgar <7 at 5'	0.9% home vs. 1.2% hospital.	2.4% home vs. 1.8% hospital.
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Birth trauma	1.4% home vs. 6.6% hospital.	3.1% home vs. 7.6% hospital.
Intrauterine hypoxia	1.5% home vs. 5.8% hospital.	3.2% home vs. 6.6% hospital.
<u>Maternal outcomes</u>		
Admission to HDU/ICU	0.2% home vs. 0.6% hospital.	0.5% home vs. 1.1% hospital.
3 rd /4 th degree tear	1% home vs. 2% hospital.	1.6% home vs. 1.9% hospital.
postpartum hemorrhage	9.1% home vs. 12.9% hospital.	14.5% home vs. 19.6% hospital.
blood transfusion	0.3% home vs. 0.7% hospital.	1.9% home vs. 1.3% hospital.
manual removal of placenta	0.9% home vs. 2.5% hospital.	2% home vs. 3.2% hospital.
rupture of uterus	0% home vs. 0.13% hospital	1.3/1000 home vs. 1.1/1000 hospital
intrapartum hemorrhage	0.1% home vs. 0.4% hospital.	0.4% home vs. 0.52% hospital

Homer et al (30) 2014	Retrospective analysis of public birth data	258.161 women 0.3% planning a home birth	Place and mode of birth. Composite measure of neonatal mortality/morbidity. Stillbirth.	<u>Transfer rate:</u> 29% <u>Neonatal outcomes:</u> Stillbirth 1.44/1000 home vs 1.05/1000 hospital. Composite outcome 7.1/1000 home vs. 5,8/1000 hospital <u>Maternal outcomes:</u> 3.3% C/S rate for planned home birth 10.6% C/S rate for planned hospital birth 4% instrumental birth for planned home birth
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					15.5% instrumental birth for planned hospital. 2% 3 rd or 4 th degree perineal trauma for planned home birth. 3.3% 3 rd or 4 th degree perineal trauma for planned hospital. 3.9% episiotomy rate for planned home birth. 18.7% episiotomy rate for planned hospital.
	Catling - Paull et al (31) 2013	Descriptive retrospective cohort study from 12 publicly funded homebirth programs (2005-2010)	1807 women who planned a home birth.	<u>Maternal outcomes:</u> Mortality Place and mode of birth. Perineal trauma. Management of the third stage of labour. Postpartum haemorrhage. Transfer to hospital. <u>Neonatal outcomes:</u> Early mortality. Apgar score at 5' Birthweight. Breastfeeding. Admit to SCU.	<u>Transfer rate:</u> 17% <u>Maternal outcomes:</u> C/S rate: 5.4% Instrumental birth rate: 3.8% Episiotomy rate: 2.6% PPH rate: 1.8% <u>Neonatal outcomes:</u> Mortality: 3.3/1000 (1.7/1000 after excluding foetal abnormalities) Admit to SCU: 2.7% Breastfeeding initiation 96.8% (69% at 6 weeks)
JAPAN	Yaeko Kataoka, PhD et al (32) 2012	Descriptive, retrospective	5.477 women attended by midwives: 83.9% in birth centres and 16.1% at home.	Neonatal mortality APGAR test <7 Labour duration Perineal laceration	<u>Neonatal outcomes:</u> No neonatal mortality in either group No difference in APGAR scores <u>Maternal outcomes:</u> PPH rate for primiparas women was 17.6% in home vs. 27.2% in birth centre No difference in perineal outcomes
	Hiraizumi et al (37) 2013	Retrospective cohort study.	168 women who chose midwife assisted home birth. 123 women who chose midwife assisted hospital birth.	Rate of transfers. Perinatal outcomes: Labour duration, Labour augmentation, Delivery mode, Laceration rate, PPH, Apgar <7	<u>Transfer rate:</u> 21% of home births. Apgar <7: 1.6 home vs. 1.8 hospital. <u>Maternal outcomes:</u> · Labour >24h: 2% both groups. · C/S: 2.4% home vs. 2.5% hospital. · PPH: 5.7% home vs. 6% hospital.
NETHERLANDS	Van der Kooy et al (36) 2011	Retrospective analysis of population data.	679,952 low risk women, 602,331 using perfect guideline approach.	IP and neonatal death before 7 days. Congenital abnormalities,	IP and neonatal death before 7 days: 0.15% planned home vs. 0.18% planned hospital.

		Two different analyses performed: natural prospective (intention to treat) and perfect guideline approach.		Preterm, Apgar scores.	These 4 risk factors were present in 85% of deaths: Congenital abnormalities, Preterm, Apgar scores.
	Van der Kooy et al (33) 2017	Retrospective analysis of population data.	622,017 low risk women attended by midwives. Two groups are split: planned home birth (n=402,912) and planned hospital birth (n=219,105)	Interventional rates defined as instrumental vaginal delivery and/or caesarean section. Perinatal mortality. Congenital abnormalities, small for gestational age, preterm birth, low Apgar score.	Interventional rates: 10.9% home vs. 13.7% hospital. IP and neonatal mortality: 0.15% for planned home births vs. 0.18% hospital.
	De Jonge et al (34) 2015	Nationwide cohort study analysing national registration data.	814,979 low-risk women in 3 groups: Planned home birth (n=466,112), Planned hospital birth (n= 276,958), Unknown place of birth (n=71,909)	Intrapartum (IP) and neonatal death, 0-28 days. Apgar score < 7 at 5 minutes. Admission to NICU within 7 days. Admission to NICU within 28 days. Severe adverse perinatal outcome.	<u>Intrapartum (IP) and neonatal death, 0-28 days:</u> · nulliparous women: 1.02% home vs. 1.09% hospital. · Multiparous: 0.59% home vs. 0.58% hospital <u>Apgar score < 7 at 5 minutes:</u> · nulliparous women: 7.92% home vs. 18.85% hospital. · Multiparous: 3.2% home vs. 4.57% hospital <u>Admission to NICU within 7 days:</u> · nulliparous women: 3.25% home vs. 3.47% hospital. · Multiparous: 1.22% home vs. 1.66% hospital. <u>Severe adverse perinatal outcome.</u> · nulliparous women: 4.17% home vs. 4.47% hospital. · Multiparous: 1.82% home vs. 2.41% hospital
NORWAY	Blix et al (35) 2012	Retrospective cohort study.	Midwife attended home births (n=1.631) and low risk comparison group (n=16.310)	Perinatal mortality Neonatal mortality Delivery method Epidural rate Episiotomy rate PHH	<u>Neonatal outcomes:</u> Perinatal mortality rate 0.6/1000 both home and hospital. Neonatal mortality rate 0.6/1000 home vs. 0.9/1000 hospital No differences in APGAR scores <u>Maternal outcomes:</u> Instrumental birth rate in primiparas: 5.7% home vs. 14.8% hospital Instrumental rate in multiparous: 0.6% home vs. 1.8% hospital. Episiotomy rate in primiparas: 13.3% home vs. 16.7% hospital. Episiotomy rate in multiparous 1.7% home vs. 3.7% hospital.

PPH in primiparas: 7.1% home vs. 10.7% hospital.

PPH in multiparas: 1.9% home vs. 6.6% hospital.

INTERNATIONAL:	Blix et al (40)	Prospective cohort study using data collected from planned home births in Norway, Denmark, Sweden and Iceland between 2008 and 2013	Data from 3068 women (572 primiparas and 2446 multiparas) who opted for a planned home birth.	<u>Transfer rate measures:</u> Total transfers rate. Transfers during labour. Transfers after birth. Potentially urgent transfers. Other factors were also studied such as transportation method, and duration of the trip.	<u>Total transfers rate:</u> 13.1% (32.7% of all nulliparous vs. 8% of multiparous). <u>Transfers during labour:</u> 8.8% (24% of nulliparous vs. 4.8% of multiparous) <u>Transfers after birth:</u> 4.3% (8.6% nulliparous vs. 3.2% multiparous) <u>Potentially urgent transfers:</u> 3.8% of all deliveries, 28.9% of all transfers (8.7% of nulliparous vs. 2.5% of multiparous)
- NORWAY	2016				
- SWEDEN					
- DENMARK					
- ICELAND					

This does not happen when reviewing publications from the Netherlands, where a similar situation happens all the way round. The results from the Netherlands show a very slight superiority on planned home births compared to hospital births when neonatal mortality is reviewed.

Only one publication compared not only planned home births against planned hospital births but it also included categories for women according to the risk of the delivery (29). For low risk women the results do not really vary much from what is exposed above, but for high risk women the results confirm that planned hospital births offer a superior safety since high risk women having a planned home birth had a 7.16% more risk to present neonatal death.

De Jonge et al (34) described in a Dutch nationwide cohort study that the differences in intra-partum and neonatal mortality between a planned home birth and a planned hospital birth were not relevant, even comparing the groups of nulliparous and multiparous women. When analyzing the APGAR score at 5 minutes, only *De Jonge et al* (34) described differences between planned home birth and planned hospital birth, especially notable in the nulliparous women group (the percent of low APGAR scores was 7.92% home vs. 18.85% hospital). In this study, multiparous women also showed an inferior rate of low APGAR scores at 5 minutes when having birth at home, but the difference is not as notable (3.2% home vs. 4.57 hospital).

The rest of studies that used this variable (28,29,35,37) did not show any clear superiority in either groups, only *M. Davies-Tuck et al.* described an slightly inferior rate of births that scored an Apgar <7 at five minutes in the high risk women that gave birth at an hospital facility (2.4% home vs. 1.8% hospital).

1. *Davies-Tuck et al* (29) and *de Jonge et al* (34) also studied the admission rate to NICU after birth. In low risk women the rates were very similar but slightly better for hospital births (0.4% home vs. 0.2% hospital) (29). In high risk pregnancies the rates are still relatively low, but they show that having a birth at the hospital is safer (1.6% home vs. 0.4% hospital). No significant differences were observed when comparing nulliparous and multiparous women.

Only *M. Davies-Tuck et al* (29) studied variables such as birth trauma and intrauterine hypoxia. The authors described that birth trauma is more frequent when giving birth at a hospital in both low risk (1.4% home vs. 6.6% hospital) and high-risk (3.1% home vs. 7.6% hospital) women. Intrauterine hypoxia was also more common at the hospital in both groups (1.5% home vs. 5.8% hospital in low risk women and 3.2% home vs. 6.6% hospital for high risk women).

Overall if we resort to a *Cochrane Library* meta-analysis published in 2013 (38) it confirms what is described above, that there is no strong evidence to favor either planned hospital or planned home births on low-risk pregnancies.

Maternal outcomes

Similar to what happened with neonatal outcomes, in the study of maternal outcomes a wide setting of variables is available to measure and describe the morbidity of the birth process. However, there are certain factors that are more common than others. Postpartum hemorrhage (PPH) is probably the most common variable used by publications (28,29,31,32,35,37), followed by the rate of instrumental birth in both women who gave birth at home and women who planned a hospital birth (28,30,31,33,35), the caesarean section (C/S) rate (28,30,31,37), the health of the perineum after birth (28–30,32), and the episiotomy rate (30,31,35).

When studying the interventional rate three main variables are used: C/S rate, the instrumental birth rate and the episiotomy rate. Overall, as most publications describe, and as *R. Zielinsky et al.* already stated in a similar but older study (39), women who have a planned home birth are less likely to experience interventions such as operative vaginal delivery and induction of labor. Most studies show a significant difference when comparing the two groups. *P. Janssen et al.* showed that this difference is not only significant between low risk women who plan a birth at home compared to those who plan a hospital birth with a midwife (3% vs. 7.2% of interventions), but also between women who had a planned hospital birth attended by a midwife or a physician (7.2% vs. 13.8%). *Homer et al.* (30) also described significant differences in this topic between women who had a planned home birth and those who had a planned hospital birth (4% vs. 15.5%). However, in this case, it is not explicitly stated that all women in the sample were classified as low risk pregnancies. In the Netherlands, *Van der Kooy et al.* (33) reported more subtle differences in interventional rates: 10.9% in planned home birth vs. 13.7% in planned hospital birth. This is somehow predictable, since home birth in the Netherlands is highly protocolled and midwives are very well trained. *Blix et al.* (35) stated in 2012 that these differences should mainly come from women who were having their first baby since the rate of interventional births is of a 5.7% for home births and a 14.8% for hospital ones. However, when comparing multiparous women, the rates were not only lower, but also closer: 0.6% for home births and 1.8% for hospital births.

This should not be a surprise, since women who have a planned home birth not only should be classified with a lower risk than those who plan a hospital birth, but also most of these interventions are not eligible to be performed at home. Only studies performed in the Netherlands, where midwives are highly trained the results obtained were similar.

Across all studies reviewed, women intending to have a birth at home are less likely to have other obstetric interventions such as C/S or episiotomy performed on them. This is somehow, something to be expected since women who choose to give birth at home not only should be considered low risk, but also most obstetric interventions require an operation room and qualified professionals to be performed. When studying the C/S rate between these two groups only *Hiraizumi et al.* (37) described similar rates in a study performed in Japan: 2.4% for home birth and 2.5% for hospital birth. All other studies show important differences between the two groups. *P. Janssen et al.* (28) described a difference (7.2% C/S rate at home vs. 10.5% at the hospital) lower than *Homer et al.* (30) (3.3% C/S rate at home vs. 10.6% at the hospital). Similar outcomes are observed when studying the episiotomy rate: *Homer et al.* (30) presented major differences between the two groups in Australia. Only 3.9% of women who had a planned home birth had episiotomy performed, against 18.7% of women who planned a hospital birth. Similar results were described by *Catling-Paull et al.* (31) whereby only a 2.6% of a single group of women who gave birth at home had an episiotomy performed. *Blix et al.* (35) also showed that multiparous women are less likely to have a episiotomy performed despite the place they choose to give birth on. The episiotomy rate in first time mothers was lower at home compared to the hospital (13.3% vs. 16.7%), but generally much higher than multiparous women (1.7% at home vs. 3.7% at the hospital).

The morbidity of the process can be described using many variables and typical complications. However, because of their severity, PPH, and perineal laceration are usually the most commonly used to evidence the morbidity of eutectic deliveries.

In a similar way as women who had a home birth are less likely to have an instrumental birth, this group is less likely to develop complications as PPH as well. Many studies confirm this difference, showing substantial difference between groups. *P. Janssen et al.* (28) published in 2009 that women who had their midwife-attended birth at home had almost 50% probability to lower the risk of developing PPH (3.8% home birth vs. 6% hospital midwife attended). *Yaeko Katakao et al.* (32) described an important difference between groups as well. Despite both groups presenting high PPH rates, women who gave birth at a birth center with a midwife has a higher risk (17.6% home birth vs. 27.2% birth center). Other studies such as the one published by *Hiraizumi et al.* (37) presented a more balanced rate, where the difference was not as substantial (5.7% home birth vs. 6% hospital birth). *M. Davies-Tuck et al.* (29) described in a recent study that even women classified as high risk presented a lower rate of PPH at home (14.5% home birth vs. 19.6% hospital) despite requiring higher necessities of blood transfusion. PPH rates were also lower in multiparous women despite the place where the procedure took part (35).

Studies also indicate that women who plan their birth at home are less likely to end up with any type of perineal issues. *P. Janssen et al.* (28) described that the group who planned their birth at home had a slight higher rate of intact perineum (54.4% home birth vs. 46.1% hospital birth). Following this idea *M. Davies-Tuck et al.* (29) showed that although infrequent, women who had their birth at home had a lower rate of 3rd/4th degree tear (1% for home birth vs. 2% for hospital birth). However, when pregnancies are considered high risk, the rates are more balanced (1.6% home birth vs. 1.9% hospital birth). *Homer et al.* (30) showed similar results: 2% of women who gave birth at home presented 3rd/4th degree perineal tear against 3.3% of women who gave birth at the hospital.

In addition, *M. Davies-Tuck et al* (29) described a series of maternal outcomes that are not mentioned in the rest of the articles that have been used to write this work. Similar to what happens with the morbidity variables described above, women who give birth at home are also less likely to be transferred to the Intensive Care Unit (0.2% of women who gave birth at home vs. 0.6% at the hospital) and to have their placentas removed manually (0.9% of women giving birth at home vs. 2.5% at the hospital).

Transferal rates

Another way to measure maternal outcomes in a more general way is studying the percentage of women that needed to be transferred to the hospital during a birth at home. *Homer et al* (30), *Catling-Paull et al* (31) and *Hiraizumi et al* (37) give simplified transferal rates: 29%, 17% and 21% respectively.

However an international prospective study was performed to 3068 women in Norway, Sweden, Denmark and Iceland by *Blix et al* (40) in 2016 with the aim of measuring accurate transferal rates of women who gave birth at home in those Nordic countries for both nulliparous and multiparous women. The study concluded that 13.1% of all women had to be transferred to the hospital either during labor or after labor. The transferal rate proved to be higher in nulliparous (32.7% of all nulliparous vs. 8% of multiparous). During labor a total of 8.8% women were transferred to the hospital, with a substantially higher rate of nulliparous women than multiparous (24% of nulliparous vs. 4.8% of multiparous). After birth a total of 4.3% of all women were transferred to the hospital, in this case the differences between nulliparous and multiparous women were not as significant (8.6% nulliparous vs. 3.2% multiparous). Finally, a 3.8% of all women had go under a potentially urgent transfer to the hospital, which accounts for 28.9% of all transfers. In this case nulliparous women also had a higher rate of transfers (8.7% of nulliparous vs. 2.5% of multiparous).

Women's motivations and satisfaction

In western countries like Spain, medical access is relatively easy. However, as it has been stated before, a small group of women make the choice to take a step outside the system and give birth at home. This study could not reach definitive conclusions without detailing the motivations of these women and their satisfaction with the whole process. Across the publications that were selected to formulate this work, three main topics were found consistently in almost all of them: Control and autonomy (41–43), relationship with the medical system, and perception of safety at home.

After researching for women's motivations, it becomes clear that the fear of losing autonomy if choosing a hospital setting is present in a large proportion of these women. Autonomy can be understood as a physical feature, but in this case also means the ability to make decisions about the process. *B. Murray et al* (42) proved that up to an 85.9% of their sample wanted to be able to move freely during labor. And over 90% of the women agreed that they wanted to be able to eat and drink during labor and be able to take part in the decision-making process.

Women's relations with the hospital environment are considered to be an important factor of the choice as well for both groups. Women who decide to have a home birth usually have the perception that home might be safer than the hospital. As *B. Murray et al* (42) described in their paper, this is related to the fact that 79.5% of women that decided to give birth at home wanted to avoid interventions. *H. Lindgren et al* (43) and *M. Hollander et al* (41) also expressed that some of these women believed that medical interventions are based on fear, and therefore unnecessary, since giving birth is a natural process.

On the other hand, 64% of women that decided to give birth at the hospital wanted to get an epidural, so interventionism can also be a decisive factor for women to lean towards the decision of giving birth at the hospital.

The perception of safety depending of the environment can also be considered as a determinant factor to women. *B. Murray et al* (42) also described that 96.1% of women who chose to give birth at home believed that home was a safer environment. This is significant, because it comes from a group that also scored high when they were asked about the importance of having the power to control surroundings. 45.5% of these women also stated that they had the feeling that recovery would be easier if they stayed at home. However, the cohort of women that decided to have a hospital birth stated very different opinions towards the home environment. 78.7% of these women felt safer at the hospital, but other reasons were considered. For example, 60% wanted to avoid the "mess" of a home birth, and 53% of them found the idea of giving birth at home stressful.

When it comes to the actual satisfaction of the process it becomes clear that it relies not only on the chosen setting, but also in the expectations that the women may have developed towards the process. However, *S. Fleming et al* (44) did find that satisfaction was higher for women who had both planned to deliver in a home or a birth center, and who had actually delivered in a home or a birth center. These findings were assessed using both the Birth satisfaction scale (BSS) and a shorter version on it, the Birth satisfaction scale revised (BSS-R). No differences in satisfaction were

found between giving birth at home or at a birth center, since both settings had a similar score (133 points in BSS and 33 in BSS-R) for home birth and (104 in BSS and 24 in BSS-R) for hospital birth with a wider standard deviation.

As we have stated before, expectations play an important role on the overall satisfaction, since women who planned to give birth at home or a birth center but ended up in the hospital tended to score lower on satisfaction tests(44). Studies developed in Belgium and Sweden also showed that women who needed to be transferred to a hospital tended to describe negatively the overall experience and emotional aspects of it (45).

Discussion

While some studies suggest that planned home birth is associated with a small increase in neonatal death rates (BB) and adverse neonatal outcomes, the results were not conclusive. Moreover, literature also describes that planned home birth is associated with a lower rate of adverse maternal outcomes and a lower rate of interventionism. Satisfaction is also higher in women who planned a home birth. However, some of these results have to be put into perspective. This is because although evidence leans towards the superiority of home birth when maternal outcomes and satisfaction are considered, there might be certain factors conditioning these results.

First, women who decide to give birth at home are fully executing the autonomy principle stepping outside the system, therefore only this very act, if it is consonant with the values and ethics of the patient, is considered a small victory by the patient. This is also related to the expectations that the mother might have about the act of giving birth, the relationship of the mother with the health care system, and the fact that the patient is in charge of the surroundings. Because of all of these statements, and because satisfaction is a highly subjective matter to review and analyze, results should be carefully interpreted. Despite good home birth's satisfaction results, it has been proven that the overall satisfaction of women who plan to give birth at the hospital is more than satisfactory.

Lower rates of interventionism and adverse maternal outcomes are also to be expected on women who plan a home birth, since most interventions require an operation room and the intervention of qualified physicians. In addition, it has been evidenced that the overall safety of planned home births depends on many factors, including the qualification and experience of the responsible midwife. However, carefully determining the eligibility for planning a home birth is considered the most important safety factor for both the woman and the fetus. Most publications agree with the fact that home births can only be a safe choice if the woman's pregnancy is classified as low risk and preferably if she is multiparous. This seems to limit the option of planning a home birth to a very specific type of women.

Moreover, this is a complex subject since this topic is surrounded by a high dose of debate and controversy, with strong opinions on both sides. It has even trespassed the purely scientific barriers, becoming an issue that has been discussed on mainstream media, with arguments linking it with a deeper discussion of patient's rights and women's rights. On the other side there are health care providers warning of the dangers of home birth if the patient is not eligible for the service or a careless choice is made. These differences frame the debate of home birth within the context of what should prevail as a primary focus: the principle of autonomy of the mother or the principle of fetus's benefit.

This social discussion has led to some countries like the UK to include the option of home birth in their national guidelines. In other countries like the Netherlands, guidelines were not modified to include home birth, since social and cultural heritage had made a standard out of it. While criteria to classify a pregnancy as low risk may differ from one country to another, most publications agree with the fact that including it on national guidelines acts as a security enhancer of the process. Countries like Spain have not recognized home birth as an option on its national guidelines, although one midwife's association has published its own(19).

Conclusions

Although studies confirm that home birth might be a safe choice to both women and the fetus, it is vital to individualize each case to evaluate their eligibility. It is fundamental to keep in mind that only women with low risk pregnancies should be offered this option and that a close follow up is mandatory in order to re-evaluate the case days prior to the due delivery date. Safety depends on many factors, the preparation and experience of the midwife is fundamental, that is why only certified midwives should attend these childbirths. Further studies should be done about cost-effectiveness of the procedure and further debates should be implemented about whether or not it should be publicly funded.

Abbreviations

- APGAR
Appearance, Pulse, Grimace, Activity, Respiration
- AMCB
American College of Nurse Midwives
- BSS
Birth Satisfaction Scale
- BSS-R

Birth Satisfaction Scale-Revised

- CMs

Certified Midwives

- CNMs

Certified Nurse Midwives

- CPMs

Certified Professional Midwives

- C/S

Caesarean Section

- RNT

Resident nurse in training

- SNS

Spanish National Health Service

- ICU

Intensive Care unit

- NSI

Spanish National Statistics Institute

- IT

Information Technology

- MDs

Medical Doctors

- NICU

Neonatal Intensive Care Unit

- NICE

National Institute for Health and Care Excellence

- PPH

Postpartum hemorrhage

- RCM

Royal College of Midwives

- RCOG

Royal College of Obstetricians and Gynaecologists

- UK

United Kingdom

- US

United States

Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

Availability of data and materials

Not applicable.

Competing interests

The authors declare that they have no competing interests

Funding

The publication of this paper has been supported by the Vice-Dean of Scientific Affairs of the University of Barcelona (Vicerrectorat de Política Científica, Universitat de Barcelona).

Author's contributions

MC wrote most part of the manuscript. FMS and AT helped in the collection of information and papers and also wrote some parts of the manuscript. PGB supervised all the work along the time of writing, made suitable changes as well as made the final corrections. All authors read and approved the manuscript.

Acknowledgements

We thank Manuel Perucho for language assistance. We also like to extend our thanks to Ms. Lucia Alcaraz Vidal, midwife, who offered advice on the early stages of the manuscript. The publication of this paper has been supported by the Vice-Dean of Scientific Affairs of the University of Barcelona (Vicerrectorat de Política Científica of the University of Barcelona).

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Figures

Home birth rates on studied countries

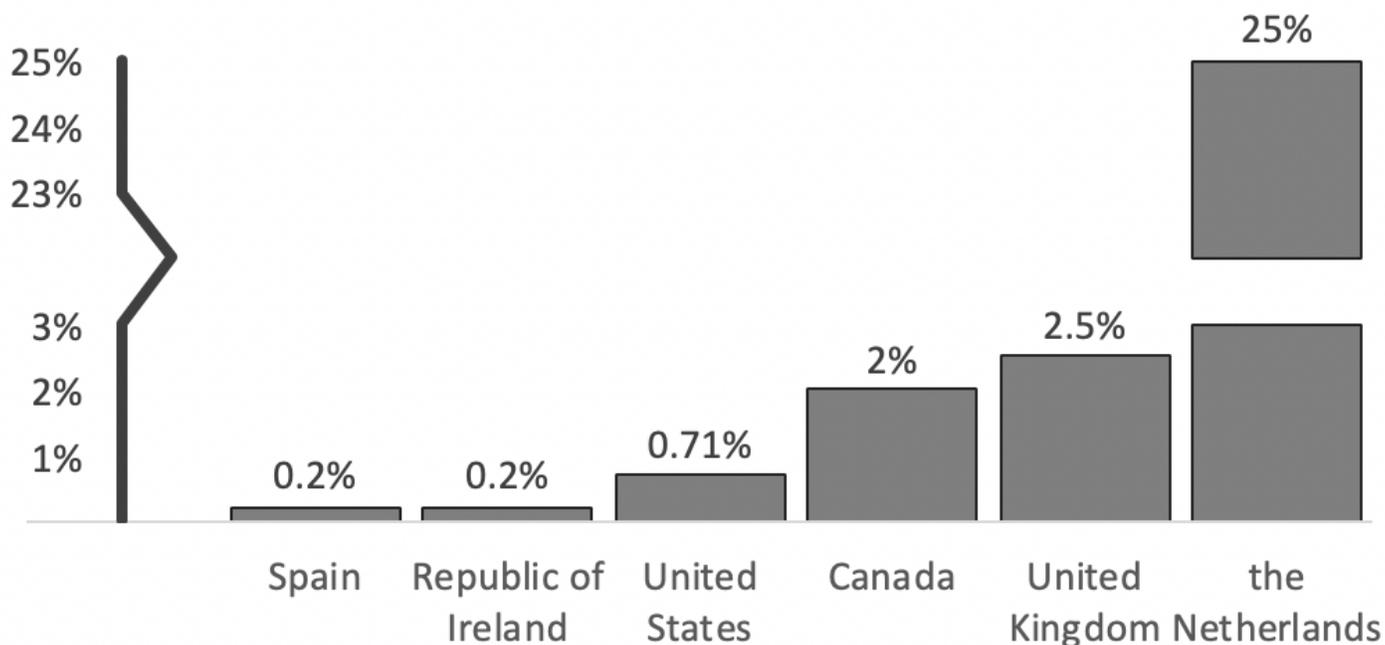


Figure 1

Home birth rates on the analyzed countries.

Home birth rates on selected regions of Spain and the UK

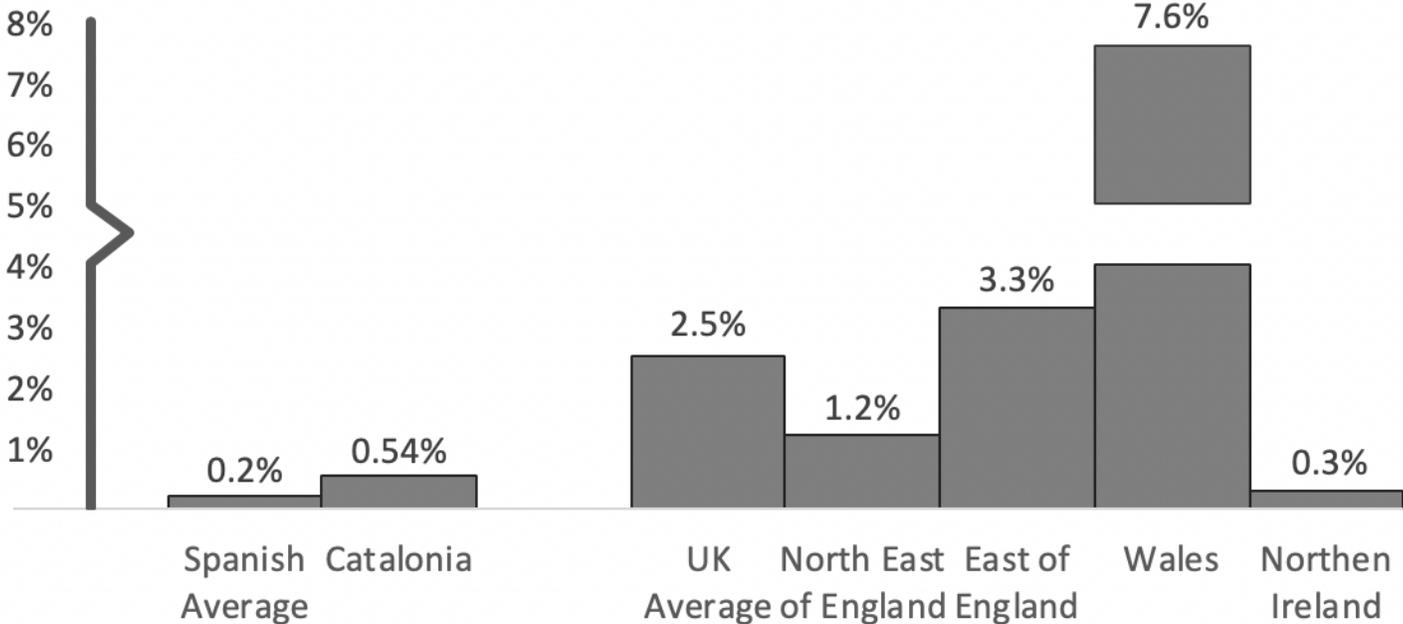


Figure 2

Home birth rates on selected regions of Spain and the UK.