

# Labor Management and Mode of Delivery Among Migrant and Spanish Women: Does the Variability Reflect Differences in Obstetric Decisions According to Ethnic Origin?

Cristina Bernis · Carlos Varea · Barry Bogin · Antonio González-González

© Springer Science+Business Media, LLC 2012

**Abstract** Based on previous findings showing both better birth outcomes in migrant than in Spanish women and different rates of medical intervention according to mother's origin, we hypothesize that mode of delivery decisions to solve similar problems differ according to ethnic origin. Ethnic differences for maternal characteristics, medical intervention, and mode of delivery were evaluated in 16,589 births from a Maternity Hospital in Madrid (Spain). Multinomial logistic regression analysis was used to evaluate the effect of mother's ethnic origin on the mode of delivery, adjusting for mother's age, parity, gestational age, birth weight, and epidural anesthesia. Compared with the Spanish mothers, the risk of having a Caesarean section is significantly higher in Latin Americans and significantly lower for the Chinese. Both low birth weight and macrosomic deliveries are at higher risk for Caesarean section. The interventionist system characterizing Spain is being extended to all ethnic groups and, at the same time, different medical interventions are applied to similar problems depending on women's ethnic origin. Obstetric interventions might be contributing to the increasing trend of low birth weight and late preterm/early full term deliveries (37–38 weeks) observed in Spain.

Behavioral and cultural values of the women and of the health care providers may contribute to systematic differences in labor management and mode of delivery.

**Keywords** Epidural analgesia · Obstetric intervention · Delivery · Ethnicity

## Introduction

Much debate has taken place in recent years as to the management of childbirth and the potentially adverse effects of unnecessary medical intervention. Since the World Health Organization issued alerts about the excessive interventionism and established some recommendations and action guidelines to reduce these [1–3], the governments and national Societies of Obstetrics and Gynecology from different countries have adjusted their protocols to the recommendations (i.e. in Spain: [4–6]). Despite this, the rise of interventions has continued, increasing the gap between national guidelines and their practical application in most countries [7, 8].

During the last 30 years the biosocial characteristics of childbearing women have changed in Western populations. More women have late maternal age, primiparity, multiple pregnancies, and foreign motherhood, either as single characteristics or in combination. These factors are associated with risky pregnancies and negative birth outcomes. For some authors [9–13] these changes explain the increased medical intervention in birth. In the late 1980s the promotion of the concept of evidence-based health care in the field of maternity in Europe was developed with the aim to find a balance between insufficient and excessive intervention that would result in better and more homogeneous patterns of perinatal care. Despite this the rise of

---

C. Bernis · C. Varea (✉)  
CD Antropología Física, Departamento de Biología, Facultad de Ciencias, Universidad Autónoma de Madrid, Edificio de Biología, C/Darwin, 3, 28049 Madrid, Spain  
e-mail: carlos.varea@uam.es

B. Bogin  
School of Sport, Exercise and Health Sciences,  
Loughborough University, Leicestershire, UK

A. González-González  
Hospital Universitario Materno-Infantil “La Paz”, Facultad de Medicina, Universidad Autónoma de Madrid, Madrid, Spain

interventions has continued, and wide variations among countries still exist. Higher levels of intervention are generally found in the southern European countries, including Spain, and the lowest levels of intervention in the northern nations, such as the Netherlands.

In Europe, migrant women and children usually have worse health indicators than native born populations, including insufficient antenatal care, maternal and perinatal mortality, low birth weight, preterm birth, and obstetrical interventions [9, 14–16]. However, findings differ according to country of origin, setting, and the amount of time elapsed since migration [17]. In Spain, where the proportion of deliveries by foreign mothers reached 20.9 % in 2009, information on types of medical intervention according to ethnic differences during labor is still scarce; more data are available on reproductive health outcomes [18–25], showing that in general migrant women have better birth outcomes than Spanish women matched for birth weight, and rather similar outcomes when matched for prematurity. The purpose of this article is to document ethnic differences in relation to medical interventions during labor and the mode of delivery.

## Methods

Records for 16,589 births were obtained from the registers of the public “La Paz” University Maternity Hospital (Madrid, Spain) for the years 2005 and 2007, which provide the following newborn and maternal variables: sex, birth weight, gestational age, presentation, maternal mother’s country of origin (referred to as ‘ethnicity’ in this paper), age, parity, and singleton, twin, etc. delivery, pain management with epidural anesthesia (yes/no), mode of delivery (vaginal non-instrumental, vaginal instrumental and Caesarean section), diagnosis for Caesarean section, and episiotomy (yes/no). Information on the diagnosis for Caesarean section was recorded and classified in the following hierarchal order: fetopelvic disproportion, prolonged labor, fetal distress, induction failure, other maternal characteristics, and other fetal characteristics. Previous Caesarean section was recorded for multiparous. When various causes for Caesarean section were recorded, the hierarchal order presented in the previous list was applied. Data collection was approved by ethical committees from both the Maternity Hospital and Madrid Autonomous University; information was collected in agreement with the WHO Declaration of Helsinki ethical guidelines [26].

These data belong to a research project which included two other data bases allowing us to contrast the reliability of the hospital birth records: (1) the national birth register (including all individual births in Spain from 1980 to 2009), and (2) a data set based on clinical histories and personal

questionnaires obtained from women who gave birth in “La Paz” Maternity Hospital between 2006 and 2008.

Spanish women represent 66 % of total sample, Latin Americans are the most numerous group of migrants (19.3 % South Americans, and 3.0 % Central American and Caribbean), Eastern Europeans and Maghrebians (mostly from Morocco) represent respectively 5.4 and 4.7 %, and Chinese contribute with 1.5 %. Ethnic differences for maternal characteristics, medical intervention, and characteristics of the newborn were evaluated with Chi-square test ( $\chi^2$ ). Multinomial logistic regression analysis has been used to evaluate the contribution of mother’s ethnicity on the mode of delivery, after adjusting for gestational age, birth weight, epidural anesthesia, mother’s age and parity. With the exception of the Table 1—which summarizes data on all deliveries—results are presented only for women with single deliveries in vertex presentation. Because of the differences in birth outcomes and in rate and type of medical intervention according to parity, ethnic differences are presented separately for primiparous and multiparous women.

SPSS.17 was used for statistical analysis.

## Results

Presented in Table 1 are maternal (a) and newborn (b) characteristics according to mother’s ethnicity (i.e. country of origin). All deliveries included, Spanish women differ significantly from the migrants in that they are older mothers ( $\chi^2 = 1,779.731$ ,  $df = 5$ ,  $p < .0001$ ), have higher rates of multiparity ( $\chi^2 = 1,888.36$ ,  $df = 5$ ,  $p < .0001$ ), low birth weight ( $\chi^2 = 39.144$ ,  $df = 5$ ,  $p < .0001$ ), and mal-presentation ( $\chi^2 = 14.77$ ,  $df = 5$ ,  $p = .001$ ), and—with the exception of the Eastern European mothers—are more frequently primiparous ( $\chi^2 = 188.36$ ,  $df = 5$ ,  $p < .0001$ ). The non-significant difference between Spanish and migrant women are for preterm births rates.

We analyzed ethnic variability for the birth outcomes separately for primiparous and multiparous women. Among primiparous mothers (Table 2), significant differences exist among the ethnic groups for gestational age ( $\chi^2 = 27.70$ ,  $df = 10$ ;  $p < .05$ ) and birth weight distributions ( $\chi^2 = 30.05$ ,  $df = 10$ ;  $p < .0001$ ). Prematurity is highest among the Eastern European and the Central American and Caribbean women, whereas the highest rates for low birth weight are found for Central American and Caribbean and Spanish mothers.

For multiparous mothers (Table 3), significant differences among ethnic groups are not found for gestational age, but are maintained for birth weight ( $\chi^2 = 60.63$ ,  $df = 10$ ;  $p < .0001$ ), with Spanish and Eastern Europeans showing the highest rates of low birth weight.

**Table 1** Maternal (a) and newborn characteristics (b) according to mother’s origin, all deliveries included (“La Paz” University Maternity Hospital, Madrid, Spain, 2005 and 2007)

Ethnicity (N <sup>a</sup> )	Maternal age (years) % (n/N) <sup>b</sup>				
	<20	20–29	30–39	≥40	
<i>(a)</i>					
Spain (10,956)	2.1 (224/10,918)	24.8 (2,708/10,918)	68.4 (7,467/10,918)	4.8 (519/10,918)	
Eastern Europe (903)	7.8 (707/901)	58.7 (538/901)	31.0 (279/901)	1.6 (14/901)	
Central America and Caribbean (493)	11.0 (54/493)	50.9 (251/493)	35.5 (175/493)	2.6 (13/493)	
South America (3,208)	6.7 (215/3,199)	50.7 (1,623/3,199)	38.8 (1,241/3,199)	3.8 (120/3,199)	
Maghreb (782)	2.8 (227/774)	52.5 (406/774)	40.8 (316/774)	3.9 (30/774)	
China (247)	0.4 (1/247)	53.0 (131/247)	44.5 (110/247)	2.0 (5/247)	
Total (16,589)	3.5 (586/16,532)	34.2 (5,657/16,532)	58.0 (9,588/16,532)	4.2 (701/16,532)	
Ethnicity (N <sup>a</sup> )	Newborn characteristics % (n/N)				
	Primiparous	Multiple births	Low birth weight	Preterm births	Breech and transverse presentation
<i>(b)</i>					
Spain (10,956)	53.9 (5,829/10,812)	2.7 (301/10,956)	10.0 (1,090/10,919)	8.2 (844/10,365)	4.6 (500/10,844)
Eastern Europe (903)	61.9 (557/900)	0.9 (8/903)	8.4 (5/898)	11.1 (94/846)	4.1 (37/894)
Central America and Caribbean (493)	39.8 (194/488)	1.6 (8/493)	8.5 (42/492)	9.7 (45/466)	2.4 (12/491)
South America (3,208)	47.1 (1,495/3,176)	1.1 (35/3,208)	7.0 (225/3,196)	8.1 (245/3,027)	3.5 (110/3,187)
Maghreb (782)	48.1 (371/772)	1.5 (12/782)	7.1 (55/779)	8.2 (61/747)	3.5 (27/773)
China (247)	44.5 (109/245)	1.2 (3/247)	4.0 (10/247)	7.5 (18/240)	2.8 (7/246)
Total (16,589)	52.5 (8,555/16,393)	2.2 (367/16,589)	9.1 (1,497/16,531)	8.3 (1,037/15,681)	4.2 (693/16,435)

<sup>a</sup> Distribution of births according to mother’s origin (N: total sample). The most represented countries of origin in each group are: (1) Eastern Europe: Rumania (73.0 %), Bulgaria (6.1 %), and Ukraine (4.0 %); (2) Central America and Caribbean: Dominican Republic (82.2 %), Cuba (8.4 %), and Honduras (0.8 %); (3) South America: Ecuador (42.8 %), Colombia (16.7 %), Bolivia (13.0 %), and Peru (12.0 %); and (4) Maghreb: Morocco (98.3 %)

<sup>b</sup> In this table and the following tables the symbol ‘n’ indicates the sample size for each sub-group within an ethnic group and the symbol ‘N’ indicates the total sample size for each ethnic group

Ethnic differences in the rates of epidural anesthesia, episiotomy, and in mode of delivery are also separately shown for primiparous and multiparous women (Tables 4, 5, respectively).

In all ethnic groups, primiparous women show higher rates of interventions (epidural anesthesia, episiotomy, and instrumental deliveries) and lower rate of vaginal births than the multiparous women. Instrumental deliveries are

**Table 2** Ethnic differences in birth outcome in primiparous women with single births and vertex presentation ("La Paz" University Maternity Hospital, Madrid, Spain, 2005 and 2007)

Ethnicity	Gestational age (weeks) % (n/N)			Birth weight (g) % (n/N)		
	<37	37–38	≥39	<2,500	2,500–3,999	≥4,000
Spain	6.8 (322/4,728)	17.5 (826/4,728)	75.7 (3,580/4,728)	8.9 (473/5,285)	87.8 (46,397/5,285)	3.3 (173/5,285)
Eastern Europe	9.6 (45/470)	18.5 (87/470)	71.9 (338/470)	7.7 (40/521)	86.4 (450/521)	6.0 (31/521)
Central America and Caribbean	8.7 (15/172)	17.4 (30/172)	73.8 (127/172)	9.3 (17/183)	88.5 (162/183)	2.2 (4/183)
South America	6.6 (84/1,274)	22.5 (287/1,274)	70.9 (903/1,274)	6.3 (89/1,421)	89.0 (1,264/1,421)	4.7 (68/1,421)
Maghreb	8.2 (26/319)	14.1 (45/319)	77.7 (248/319)	6.9 (24/347)	89.0 (305/347)	5.2 (18/347)
China	6.1 (6/99)	18.2 (18/99)	75.8 (75/99)	5.7 (6/105)	87.9 (93/105)	5.7 (6/105)
Total	7.0 (496/7,062)	18.3 (1,293/7,062)	74.6 (5,271/7,062)	8.3 (649/7,862)	88.6 (6,913/7,862)	3.8 (300/7,862)

**Table 3** Ethnic differences in the rates of medical intervention in multiparous women with single births and vertex presentation ("La Paz" University Maternity Hospital, Madrid, Spain, 2005 and 2007)

Ethnicity	Gestational age (weeks) % (n/N)			Birth weight (g) % (n/N)		
	<37	37–38	≥39	<2,500	2,500–3,999	≥4,000
Spain	7.1 (293/4,110)	22.5 (925/4,110)	70.4 (2,892/4,110)	7.0 (326/4,644)	88.6 (4,113/4,644)	4.4 (205/4,644)
Eastern Europe	12.1 (34/280)	18.9 (53/280)	68.9 (193/4,110)	6.9 (22/320)	84.7 (271/320)	8.4 (27/320)
Central America and Caribbean	7.7 (20/261)	25.3 (66/261)	67.0 (175/261)	5.6 (16/284)	87.3 (248/284)	7.0 (20/284)
South America	8.2 (115/1,411)	22.9 (323/1,411)	69.0 (973/1,411)	5.9 (94/1,584)	86.0 (1,362/1,584)	8.1 (128/1,584)
Maghreb	7.6 (26/342)	15.8 (54/342)	76.6 (262/342)	5.1 (19/375)	84.3 (316/375)	10.7 (40/375)
China	6.7 (8/120)	20.8 (25/120)	72.5 (87/120)	1.6 (2/129)	93 (120/375)	5.4 (7/375)
Total	7.6 (496/6,524)	22.2 (1,446/6,524)	70.2 (4,582/6,524)	6.5 (479/7,336)	87.6 (6,430/7,335)	5.8 (427/7,335)

uniformly reduced in multiparous women of all ethnic groups, whereas the rates of Caesarean section increase in multiparous women from South America and Maghreb, and decrease in the other groups. Significant ethnic differences exist among primiparous women (Table 4) in the rates of administration of epidural anesthesia ( $\chi^2 = 105.42$ ,  $df = 5$ ,  $p = .000$ ), episiotomy ( $\chi^2 = 48.00$ ,  $df = 5$ ,  $p = .000$ ), and mode of delivery ( $\chi^2 = 47.75$ ,  $df = 10$ ,  $p = .000$ ). The Spanish and Central American women

present the highest rates of interventions, contrasting with the Eastern Europeans, who display the highest frequency of vaginal non-instrumental deliveries (71.6 %). The type of intervention also differs among groups: Spanish and Eastern Europeans show the highest rates for epidural anesthesia, whereas Spanish and Central Americans show the highest rates for Caesarean section. The rate of instrumental deliveries is higher among Chinese, Maghrebians, and South Americans.

**Table 4** Ethnic differences in birth outcome in primiparous women with single births and vertex presentation (“La Paz” University Maternity Hospital, Madrid, Spain, 2005 and 2007)

Ethnicity	Epidural anesthesia % (n/N)	Episiotomy % (n/N)	Mode of delivery % (n/N)		
			Vaginal	Vaginal instrumental	Caesarean section
Spain	86.1 (4,556/5,294)	80.7 (3,273/4,054)	63.5 (3,383/5,328)	13.5 (692/5,328)	23.5 (1,253/5,328)
Eastern Europe	83.5 (436/522)	75.9 (330/435)	71.6 (375/524)	11.6 (61/524)	16.8 (88/524)
Central America and Caribbean	82.4 (150/182)	74.4 (96/129)	62.7 (116/185)	7.0 (13/185)	30.3 (56/185)
South America	80.9 (1,145/1,415)	72.8 (812/1,116)	66.6 (963/1,433)	16.0 (156/1,433)	17.4 (314/1,433)
Maghreb	74.4 (256/347)	78.5 (226/288)	66.6 (233/350)	16.0 (56/350)	17.4 (61/350)
China	57.7 (60/104)	64.1 (59/92)	66.0 (70/106)	20.8 (22/106)	13.2 (14/106)
Total	84.0 (6,607/7,976)	78.4 (4,796/61,149)	64.8 (5,140/7,926)	12.6 (1,000)	22.5 (1,786)

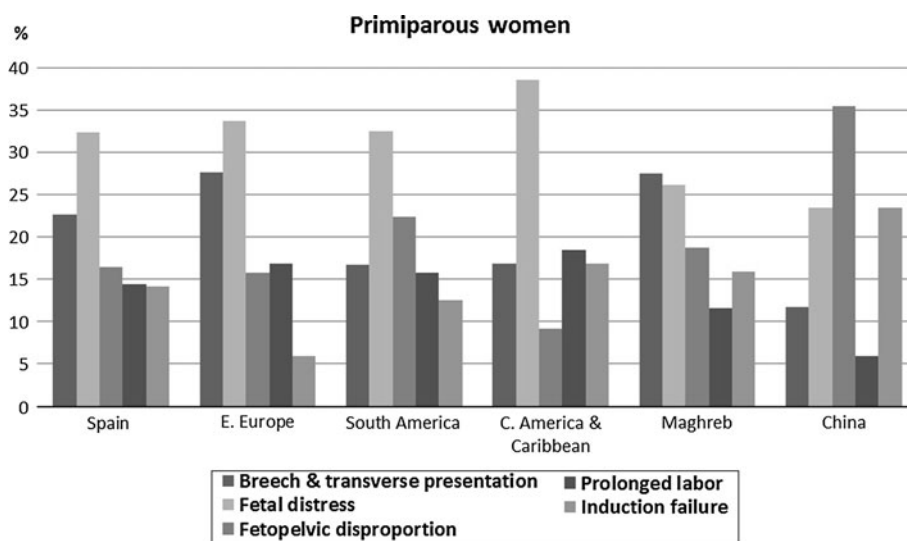
**Table 5** Ethnic differences in the rates of medical intervention in multiparous women with single births and vertex presentation (“La Paz” University Maternity Hospital, Madrid, Spain, 2005 and 2007)

Ethnicity	Epidural anesthesia % (n/N)	Episiotomy % (n/N)	Mode of delivery % (n/N)		
			Vaginal	Vaginal instrumental	Caesarean section
Spain	67.0 (3,108/4,612)	56.4 (2,161/3,832)	78.7 (3,665/4,654)	3.8 (175/4,654)	17.5 (814/4,654)
Eastern Europe	58.7 (186/317)	49.3 (132/268)	79.2 (255/322)	4.3 (14/322)	16.5 (53/322)
Central America and Caribbean	56.2 (159/283)	44.6 (91/204)	69.8 (199/285)	2.1 (6/285)	28.1 (80/285)
South America	55.4 (877/1,583)	40.2 (484/1,205)	72.5 (1,153/1,591)	3.6 (58/1,591)	23.9 (380/1,591)
Maghreb	40.8 (152/373)	43.8 (134/306)	77.9 (293/376)	3.5 (13/376)	18.6 (70/376)
China	36.7 (47/128)	47.4 (55/116)	86.0 (111/129)	3.9 (5/129)	10.1 (13/129)
Total	61.9 (4,529/7,322)	51.5 (3,057/5,931)	77.2 (5,678/7,357)	3.7 (271/7,357)	19.2 (1,410/7,357)

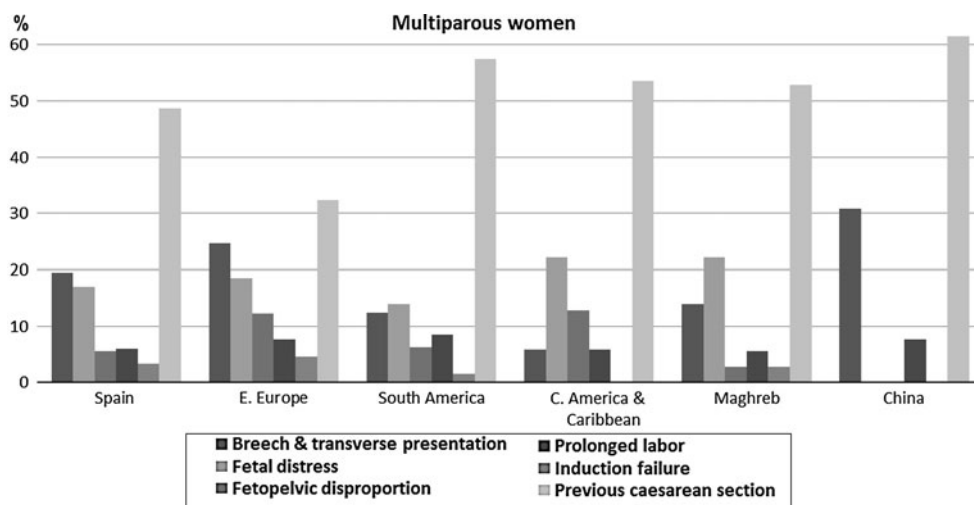
Multiparous mothers (Table 5) also present significant ethnic differences in all the three medical interventions considered: pain management with epidural anesthesia ( $\chi^2 = 190.12$ ,  $df = 5$ ,  $p = .000$ ), episiotomy ( $\chi^2 = 111.19$ ,  $df = 5$ ,  $p = .000$ ), and those related to the mode of delivery ( $\chi^2 = 55.96$ ,  $df = 10$ ,  $p = .000$ ), showing increased rate of vaginal deliveries, while that of instrumental deliveries decreases.

The main diagnoses for Caesarean section among primiparous and multiparous women are separately shown in Figs. 1 and 2, respectively, and present significant ethnic differences ( $\chi^2 = 31.885$ ,  $df = 20$ ,  $p = <.05$ ; and  $\chi^2 = 56.846$ ,  $df = 25$ ,  $p = .000$ , respectively). Fetal distress is the main diagnosis for Caesarean delivery among Spanish, Eastern European and Latin American women (ranging from 32.3 % in the former group to 38.5 in the

**Fig. 1** Ethnic variability in the main diagnoses for Caesarean section in primiparous women (“La Paz” University Maternity Hospital, Madrid, Spain, 2005 and 2007)



**Fig. 2** Ethnic variability in the main diagnoses for Caesarean section in multiparous women (“La Paz” University Maternity Hospital, Madrid, Spain, 2005 and 2007)



later); whereas among Maghrebian and Chinese mothers breech or transversal presentation, and fetopelvic disproportion rate first. For multiparous women the first diagnosis shared for all ethnic groups is a previous Caesarean section (51.1 %), followed by dystocic presentation (16.9 %) and fetal distress (16.4 %) as the second and third causes.

Results from the Multinomial logistic regression carried out on the mode of delivery (Table 6) show ethnic differences in risk of having instrumental deliveries and Caesarean section.

Chinese and Maghrebians have significantly higher risk for instrumental deliveries compared with the Spanish, whereas no significant differences were found for Latin Americans and Eastern Europeans. The risk of having a Caesarean section is significantly higher in Central and South American women and significantly lower for the Chinese; no significant differences were found for Eastern Europeans and Maghrebians. The risk of having an instrumental delivery is significantly increased with the use

of epidural anesthesia; Chinese and Maghrebian ethnicity especially increase this risk. Finally, the risk of having an operative delivery is significantly higher both in premature births and full term births with 37–38 weeks than in full term births with gestational age  $\geq 39$ . Newborns with low birth weight or with more than 4,000 g have increased risk of being delivered by Caesarean section compared with those of “normal weight”. Compared with the youngest age group, the risk of Caesarean section is significantly increased in all age groups (all OR in Table 6).

**Discussion**

The results show that at this one Spanish hospital the number of births involving epidural anesthesia, episiotomy, instrumental births, and, to a lesser extent, Caesarean section are within the highest range of the all European countries. Ethnic differences clearly exist, the Spanish

**Table 6** Results of the multinomial logistic regression analysis explaining the contribution of mother’s origin on the mode of delivery (reference: vaginal non-instrumental) after adjusting for the use of epidural analgesia and fetal and maternal characteristics (“La Paz” University Maternity Hospital, Madrid, Spain, 2005 and 2007)

Newborn, labor and maternal characteristics (reference category)	Mode of delivery					
	Instrumental			Caesarean section		
	Odds ratio	95 % CI		Exp (B)	95 % CI	
	Lower limit	Upper limit		Lower limit	Upper limit	
Gestation length (>39 weeks)						
<37 weeks	0.839ns	0.582	1.208	1.742***	1.454	2.087
37–38 weeks	0.812*	0.683	0.965	1.153*	1.034	1.286
Birth weight (2,500–3,999)						
<2,500	0.590**	0.406	0.858	1.375***	1.151	1.642
>4,000	1.182ns	0.875	2.131	1.783**	2.547	2.543
Epidural analgesia (no)						
Yes	3.766***	2.944	4.818	0.616***	0.559	0.678
Maternal age (<20 years)						
20–29 years	1.511*	1.052	2.171	3.976***	2.868	5.513
30–39 years	2.143***	1.490	3.081	2.395***	1.828	3.138
>40 years	2.045**	1.207	3.464	1.626***	1.242	2.130
Parity (multiparous)						
Primiparous	3.750***	3.212	4.378	1.800***	1.639	1.977
Origin (Spain)						
China	2.083**	1.335	3.249	0.473**	0.303	0.739
Eastern Europe	1.141ns	0.873	1.490	0.864ns	0.701	1.064
Central America and Caribbean	0.730ns	0.446	1.196	1.899***	1.517	2.377
South America	1.096ns	0.919	1.307	1.244***	1.110	1.393
Maghreb	1.467**	1.100	1.956	0.865ns	0.696	1.073

Gestation length in weeks, birth weight in grams, and maternal age in years  
 NS not significant  
 \*  $p < .05$ ; \*\*  $p < .000$ ;  
 \*\*\*  $p < .000$

being generally more medicalized, coinciding with findings for Catalonia and Valencian autonomous communities [19]. In Switzerland, where Caesarean section rates for all women are similar to those of Spain (26 %), Moroccan women have more Caesareans (34 %) than native Swiss women [27]. In contrast, Norway has one of the lowest Caesarean percentages in Europe (13–14 %), and the rates of Caesarean section do not differ between native Norwegians and Moroccan and Turkish migrants [17]. Nevertheless, in both Switzerland and Norway the rate of Caesarean section is very high among South American women. In the Maghreb, operative delivery is still uncommon [28, 29], even in private practice [30], whereas the rate of Caesarean section in Maghrebian women living in Spain surpasses 15 %, both in primiparous (17.4 %) and multiparous mothers (18.6 %); nonetheless, when compared with the Spanish, primiparous Maghrebian women are at a significantly lower risk of having a Caesarean section. In contrast, in the Latin American countries the rate of Caesarean section is quite high [29, 31–33], reaching 33 % in public and 51 % in private hospitals in 2005 [34], and remains so among those who have settled in Spain.

In Spain, in the mid-nineties, the extension of the epidural anaesthesia to all deliveries became an objective in

the National Health Care System [4]. In fact, epidural analgesia was received by 84 % of women in the analyzed sample. This fact must be taken into account to better understand the high prevalence of instrumental deliveries among all ethnic groups, and ethnic differences in delivery interventions. When epidural anesthesia is given before the active phase of labor, it more than doubles the probability of receiving a Cesarean section [35].

After a reduction in 2008 and 2009, the national rate of Caesarean sections in Spain has increased up to 26.3 % in 2010 [36], an incidence which is over the international and national recommendations [3, 4]. No information on other interventions is available at the national level; however, the coincidence of this decrease with the economic crisis beginning in 2008 may mean that restrictions in other interventions might also be occurring. The consequences of such changes for maternal and perinatal health deserve further research.

The results show that both low birth weight and macrosomic deliveries are at higher risk for Caesarean section, supporting the idea that increasing obstetric interventions might be contributing to the increasing trend of low birth weight and late preterm deliveries in Spain [22, 23]. Differences in early induction and in programmed and elective

Caesarean deliveries might partially explain the ethnic differences found for age at gestation and birth weight [9, 37]. The fact that the rate of operative deliveries is higher in multiparous (23.9 %) than in primiparous South American women (17.4 %) and remains very similar in primiparous and multiparous Central America and Caribbean women (30.3 and 28.1 %, respectively) is probably related to the high rates of Caesarean section in Latin America and to the frequency of previous children delivered at home by Caesarean section (it is still common practice in Spain to deliver by Caesarean section if the previous deliver was also by Caesarean section, despite data suggesting that this practice is not medically justified). In addition, the circumstances surrounding Latin American mothers suggest that they are under a considerable amount of stress as they are the economic backbone of large transnational families [38]. These families are formed by previous children born and left in their home countries—often under the care of grandmothers—and by the new children born in Spain [39]. The fear of losing their jobs and that many are the sole wage earners or single-parents (58 % remains unmarried in Spain: [40]) might explain why they show less and later prenatal care, why they present at the maternity hospital at a more advanced stage of labor, why they present high frequency of extremely preterm babies and a high rate (33.5 %) of unintended pregnancies [18]. Finally, the fact that Latin Americans are the shortest women [18, 24, 25] might also be a factor influencing clinical decisions and contributing to explaining their high rates of Caesarean section among primiparous, who also present the highest rates for the of diagnosis fetopelvic disproportion.

Our data demonstrate the multiplicative effects of epidural anesthesia, which significantly increases the risk of all type of intervention for vaginal deliveries. Previous research also finds that epidural anesthesia is associated with a prolonged expulsive period of labor [41, 42], and with the significant increase in instrumental deliveries [43, 44]. Our data also demonstrate higher risk for premature and low birth weight in operative deliveries, which have also been reported in other studies [9, 37]. For the last three decades, coinciding with an extraordinary decrease in fetal and infant mortality, a continuous rise in pre-term deliveries has been detected both in developed and developing countries [3, 9, 45]. Risk factors for preterm and low birth weight are multifactorial which make difficult the interpretation of observed recent trends. Different explanations have been suggested, including changing maternal biosocial characteristics [46], changes in vital records reporting practices and changes in the way of reporting gestational age. The application of sophisticated technology for pregnancy surveillance increases false positives for fetal hypoxemia, which is often resolved either with early induction or with Caesarean delivery [8, 9, 34, 47]. Finally, early

therapeutic deliveries and extensive unnecessary medical intervention [3, 9, 23, 47–49] might also be contributing to rise of prematurity and low birth. Preterm labor is multifactorial in etiology and presents heterogeneity in perinatal outcome [33], and it has been described as one of the “great obstetrical syndromes” [45, p. 17] which have to be faced in the twenty-first century. Both low birth weight and prematurity present considerable fitness costs, reducing the chances to experience healthy development, increasing the risk of morbidity and mortality across the lifespan [46, 50–53]. The possibility that medical intervention, through the increasing of low birth weight and or preterm births, could be affecting the biology of fetal and perinatal development—either interfering with the adaptive responses to early environmental stress, or forcing the biological limits of early plasticity—needs further research. Previous analyses of this data set demonstrate significant differences both in the hourly pattern of birth according to the mode of delivery and to mother’s origin [20]. Non-intervened births mainly occur in the night hours, whereas those subject to intervention experience two diurnal peaks: (1) in the morning peak, multiple births, breech presentations and preterm births prevail, together with Caesarean sections; (2) in the afternoon peak, those vaginal deliveries suffering different types of interventions prevail. Barring Central Americans, migrant woman were significantly less medicalized, and their hourly birth distribution keeps a more nocturnal pattern. Differences found in the number and the type of interventions applied to migrant and Spanish women raises questions about the appropriate level of intervention. Certainly, this analysis is partially limited by available information from the maternity hospital registers. For example, there is no information on birth induction, despite the fact that induction failure is the fourth most common diagnosis for practicing a Caesarean section. Another limitation is that programmed and elective Caesarean sections—which did not receive epidural analgesia—cannot be identified, nor can the time at which the epidural anesthesia was administered, although in “La Paz” University Maternity Hospital, where our data came from, the rate of birth induction was 12 %, and 28 % of Caesarean sections were either programmed or elective [54]. Ethnic differences in mode of delivery remain after controlling for newborn, labor and maternal characteristics. These differences may be related to family history, diet, health, cultural, or socioeconomic factors not included in the register of the maternity [55] that should be considered in future analysis.

## Conclusion

Ethnic differences exist in different aspects of birth, the Spanish being generally more medicalized. Chinese and



Maghrebians have significant higher risk for instrumental deliveries compared with the Spanish, whereas no significant differences were found for Latin Americans and Eastern Europeans. Compared with the Spanish, the risk of having a Caesarean section is significantly higher in both Latin American groups and significantly lower for the Chinese. Both low birth weight and macrosomic deliveries are at higher risk for Caesarean section, suggesting that increasing obstetric interventions might be contributing to the increasing trend of low birth weight and late preterm deliveries in Spain. The interventionist system characterizing Spain is being increasingly extended to all ethnic groups, and at the same time the behavior and cultural setting of women and that of the health care providers applying different solutions to similar problems depending on women's origin, contribute to systematic differences in delivery care and outcomes. Comparing the health care provided to migrant and Spanish women in diverse settings can facilitate an evaluation of the rates of obstetrical interventions in low-risk pregnant women and help to identify factors associated with unfavorable birth outcomes.

**Acknowledgments** This paper has been written as a part of the research project *The impact of migration on maternal-infant health from a gender perspective*, funded by I+D+I National Plan (2006–2008), Exp. 06/31, Ministerio de Sanidad y Política Social (Spain).

## References

- WHO. (1985). Appropriate technology for birth. *The Lancet*, *2*, 436–437.
- WHO. (1999). *Care in normal birth: A practical guide*. Report of a technical working group. WHO/FRH/MSM/96.24. Geneva: World Health Organization.
- WHO. (2006). *Pregnancy, childbirth, postpartum and newborn care: A guide for essential practice* (2nd ed.). Geneva: World Health Organization.
- Ministerio de Sanidad y Consumo. (2007). *Estrategia de atención al parto normal en el sistema nacional de Salud*. Madrid: Ministerio de Sanidad y Política Social.
- Ministerio de Sanidad y Política Social. (2010). *Guía de práctica clínica sobre la atención al parto normal*. Madrid: Ministerio de Sanidad y Política Social.
- SEGO. (2008). *Recomendaciones sobre la asistencia al parto*. Madrid: Sociedad Española de Obstetricia y Ginecología.
- Festin, M. R., Lumbiganon, P., Tolosa, J. E., Finney, K. A., Ba-Thike, K., Chipato, T., et al. (2003). International survey on variations in practice of the management of the third stage of labour. *Bulletin of the World Health Organization*, *81*, 286–291.
- Chaillet, N., Dubé, E., Dugas, M., Francoeur, D., Dubé, J., Gagnon, S., et al. (2007). Identifying barriers and facilitators towards implementing guidelines to reduce caesarean section rates in Quebec. *Bulletin of the World Health Organization*, *85*, 791–797.
- EURO-PERISTAT. (2008). *European perinatal health report*. EURO-PERISTAT project, with SCPE, EUROCAT, EURONEOSTAT. EURO-PERISTAT. Available from <http://www.europeristat.com/publications/european-perinatal-health-report.shtml>.
- Wilkinson, C., McIlwaine, G., Boulton-Jones, C., & Cole, S. (1998). Is a rising caesarean section rate inevitable? *British Journal of Obstetrics and Gynaecology*, *105*, 45–52.
- Astolfi, P., Ulizzi, L., & Zonta, L. A. (1999). Selective cost of delayed childbearing. *Human Reproduction*, *14*, 572–573.
- Joseph, K. S., Young, D. C., Dodds, L., O'Connell, C. M., Allen, V. M., et al. (2003). Changes in maternal characteristics and obstetric practice and recent increases in primary cesarean delivery. *Obstetrics & Gynecology*, *102*, 791–800.
- Machado, C. J. (2006). Impact of maternal age on birth outcomes: A population study of primiparous Brazilian women in the city of San Paulo. *Journal of Biosocial Science*, *38*, 523–535.
- Malin, M., & Gissler, M. (2009). Maternal care and birth outcomes among ethnic minority women in Finland. *BMC Public Health*, *9*, 84–93.
- Luque, M. A., Bueno, A., & Mateo, S. (2010). Excess of maternal mortality in foreign nationalities in Spain, 1999–2006. *European Journal of Obstetrics & Gynecology and Reproductive Biology*, *149*, 52–56.
- Alderliesten, M. E., Vrijkotte, T. G. M., van der Wal, M. F., & Bonsel, G. J. (2007). Late start of antenatal care among ethnic minorities in a large cohort of pregnant women. *British Journal of Obstetrics and Gynaecology*, *114*, 1232–1239.
- Vangen, S., Stoltenberg, C., Skrondal, A., Magnis, P., & Stray-Pedersen, P. M. (2000). Cesarean section among immigrants in Norway. *Acta Obstetrica et Gynecologica Scandinavica*, *79*, 553–558.
- Bernis, C. (2009). Determinantes biológicos y sociales del embarazo y el parto: estado nutricional, género y origen. In C. Bernis, R. López, P. Montero (Eds.), *Determinantes biológicos, psicológicos y sociales de la maternidad en el S XXI. Mitos y realidades* (pp. 79–124). Madrid: Ediciones: Universidad Autónoma de Madrid.
- Río, I., Castelló, A., Jané, M., Prats, R., Barona, C., Más, R., et al. (2010). Indicadores de salud reproductiva y perinatal en mujeres inmigrantes y autóctonas residentes en Cataluña y en la Comunitat Valenciana (2005–2006). *Gaceta Sanitaria*, *24*, 123–127.
- Bernis, C., & Varea, C. (2012). Hour of birth and birth assistance: From a primate to a medicalized pattern? *American Journal of Human Biology*, *24*, 14–21.
- Acevedo, P. (2005). Impacto socio-sanitario de la migración en las mujeres magrebíes y latinoamericanas en Madrid. *Revista Cubana de Salud Pública*, *31*, 192–201.
- Varea, C., Bernis, C., González-González, A. (2012). Maternal characteristics and temporal trends in birth outcomes: comparison between Spanish and migrant mothers. *International Journal of Population Research*. Article ID 412680. doi:10.1155/2012/412680.
- Bernis, C. (2010). Factores causales de la reducción del peso al nacer en España 1980–2007: cambios en la viabilidad fetal, en la distribución de la edad gestacional y en la dinámica del crecimiento intrauterino. *Revista Española de Antropología Física*, *31*, 233–247.
- Acevedo, P., Bernis, C., Varea, C., & Montero, P. (2009). Gestación y maternidad de las mujeres de Madrid: comparación entre madres inmigrantes y españolas. *Revista Española de Antropología Física*, *30*, 23–30.
- Alonso V. (2008). *Características de la reproducción y somatometría del recién nacido en población española y latinoamericana residente en Madrid*. Ph. D. dissertation, Universidad Complutense de Madrid, Spain.

26. World Medical Association. (2004). *Declaration of Helsinki. Ethical principles for medical research involving human subjects*. Available from: <http://ohsr.od.nih.gov/guidelines/helsinki.html>.
27. Merten, S., Wyss, C., & Ackerman-Liebrich, U. (2007). Cesarean sections and breastfeeding initiation among migrants in Switzerland. *International Journal of Public Health*, 52, 210–222.
28. Stanton, C. K., Dubourg, D., De Brouwere, V., Pujades, M., & Ronsmans, C. (2005). Reliability of data on cesarean sections in developing countries. *Bulletin of the World Health Organization*, 83, 1.
29. WHO. (2011). *World health statistics*. Genève: World Health Organization. Available from: [http://www.who.int/whosis/whostat/EN\\_WHS2011\\_Full.pdf](http://www.who.int/whosis/whostat/EN_WHS2011_Full.pdf).
30. Abbassi, H., Aboufalah, A., Morsad, F., Matar, N., Himmi, A., & El Mansouri, A. (2000). Maternal complications of cesarean section: Retrospective analysis of 3,231 interventions at the Casablanca University Hospital (Morocco). *Sante*, 10, 419–423.
31. Belizan, J. M., Althabe, F., & Cafferata, M. L. (2007). Health consequences of the increasing caesarean section rates. *Epidemiology*, 18, 485–486.
32. Belizán, J. M., Althabe, F., Barros, F. C., & Alexander, S. (1999). Rates and implications of caesarean sections in Latin America: Ecological study. *British Medical Journal*, 319, 1397–1400.
33. Althabe, F., & Belizán, J. F. (2006). Caesarean section: the paradox. *The Lancet*, 368, 1516–1523.
34. Villar, J., Valladares, F., Wodgdyła, D., Zavaleta, N., Carroli, G., Velasco, A., et al. (2006). Cesarean delivery rates and pregnancy outcomes. The 2005 WHO global survey on maternal and perinatal health in Latin America. *The Lancet*, 367, 1819–1829.
35. Klein, M. C. (2006). Does epidural analgesia increase rate of cesarean section? *Canadian Family Physician*, 10, 419–421.
36. INE. (2012). *Vital statistics*. Available from [www.ine.es](http://www.ine.es). Madrid: Instituto Nacional de Estadística.
37. Murta, E. F., Freire, G. C., Fabri, D. C., & Fabri, R. H. (2006). Could elective cesarean sections influence the birth weight of full-term infants? *Sao Paulo Medical Journal*, 124, 313–315.
38. UNFPA. (2006). *State of world population 2006: A passage to hope: Women and international migration*. New York: United Nations Population Fund.
39. INE. (2009). *Encuesta Nacional de Inmigrantes 2007: una monografía*. Madrid: Instituto Nacional de Estadística.
40. Varea, C. (2009). El debate sobre un nuevo patrón reproductor en España y la contribución del colectivo de mujeres emigrantes In: C. Bernis, R. López, P. Montero (Eds.), *Determinantes biológicos, psicológicos y sociales de la maternidad en el S XXI. Mitos y realidades* (pp. 171–198). Madrid: Ediciones Universidad Autónoma de Madrid.
41. García, A. (2009). Analgesia epidural: variación con paridad, origen materno y transcurso del parto. In: C. Bernis, R. López, P. Montero (Eds.), *Determinantes biológicos, psicológicos y sociales de la maternidad en el S XXI. Mitos y realidades* (pp. 27–341). Madrid: Ediciones Universidad Autónoma de Madrid.
42. Bajo, J. (2009). Parto no medicalizado acorde a las directrices de la SEGO. In: C. Bernis, R. López, P. Montero (Eds.), *Determinantes biológicos, psicológicos y sociales de la maternidad en el S XXI. Mitos y realidades* (pp. 341–352). Madrid: Ediciones: Universidad Autónoma de Madrid.
43. Bofill, J. A., Vincent, R. D., Ross, E. L., Martin, R. W., Norman, P. F., Werhan, C. F., et al. (1997). Nulliparous active labour, epidural analgesia, and cesarean delivery for dystocia. *American Journal of Obstetrics and Gynecology*, 177, 1465–1470.
44. Thompson, T. T., Thorp, J. M., Mayer, D., Kuller, J. A., & Bowes, W. A. (1998). Does epidural analgesia cause dystocia? *Journal of Clinical Anesthesia*, 10, 58–65.
45. Romero, R., Espinoza, J., Kusanovic, J. P., Gotsch, F., Hassan, S., Erez, O., et al. (2006). The preterm parturition syndrome. *American Journal of Obstetrics and Gynecology*, 113(Supplement 3), 17–42. doi:10.1111/j.1471-0528.2006.01120.x.
46. Kramer, M. S. (2003). The epidemiology of adverse pregnancy outcomes: An overview. *The Journal of Nutrition*, 133, 1592S–1596S.
47. Alexander, G. R., & Slay, M. (2002). Prematurity at birth: Trends, racial disparities, and epidemiology. *Mental Retardation and Developmental Disabilities Research Reviews*, 8, 215–220.
48. Alexander, G. R., Himes, J. H., Kaufman, R. B., Mor, J., & Kogan, M. (1996). United States national reference for fetal growth. *Obstetrics & Gynecology*, 87, 163–168.
49. Ferré, C., Handler, A., Hsia, J., Barfield, W., & Collins, J. W. (2011). Changing trends of low birth weight rates among non-Hispanic black infants in the United States, 1991–2004. *Maternal and Child Health Journal*, 15, 29–41.
50. Crump, C., Sundquist, K., Sundquist, J., & Winkleby, M. (2011). Gestational age at birth and mortality in young adulthood. *The Journal of the American Medical Association*, 306, 1233–1240.
51. Kościński, K., Krenz-Niedbała, M., & Kozłowska-Rajewicz, A. (2004). Month-of-birth effect on height and weight in Polish rural children. *American Journal of Human Biology*, 16, 31–42.
52. Barker, D. J. P., Gluckman, P. D., Godfrey, K. M., Harding, J. E., Owen, J. A., & Robinson, J. S. (1993). Fetal nutrition and cardiovascular disease in adult life. *The Lancet*, 341, 938–941.
53. Hales, C. N., & Barker, D. J. (2001). The thrifty phenotype hypothesis. *British Medical Bulletin*, 60, 5–20.
54. González-González, A. (2009). Riesgos del embarazo y del parto. In: C. Bernis, R. López, P. Montero (Eds.), *Determinantes biológicos, psicológicos y sociales de la maternidad en el S XXI. Mitos y realidades* (pp. 297–317). Madrid: Ediciones Universidad Autónoma de Madrid.
55. Rao, A. K., Cheng, Y. W., & Caughey, A. B. (2006). Perinatal complications among different Asian-American subgroups. *American Journal of Obstetrics and Gynecology*, 194, e39–e41.