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Comparing provision and appropriateness of health care between immigrants and non-immigrants in Germany using the example of neuraxial anaesthesia during labour: cross-sectional study

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ABSTRACT

Objective Research on health services for immigrants has mostly been concerned with access barriers but rarely with appropriateness and responsiveness of care. We assessed whether appropriateness and responsiveness of care depend on migration status, using provision of neuraxial anaesthesia (NA) during labour as indicator. In relation to their migration status, we analysed whether (1) women undergoing elective or secondary/urgent secondary caesarean sections (ESCS) appropriately receive NA (instead of general anaesthesia), (2) women delivering vaginally appropriately receive NA and (3) women objecting to NA, for example, for religious reasons, may deliver vaginally without receiving NA (provider responsiveness).

Design Cross-sectional study.

Setting Three obstetric hospitals in Berlin, Germany.

Methods Questionnaire survey covering 6391 women with migration history (first and second generations) and non-immigrant women giving birth; data linkage with routine obstetric data. We assessed the effects of migrant status, German language proficiency, religion and education on the provision of NA (primary outcome) after adjusting for other maternal and obstetric parameters.

Results The chance of receiving NA for elective/ESCS was independent of migrant status after controlling for confounding variables (adjusted OR (aOR) 0.93, 95% CI 0.65 to 1.33). In vaginal deliveries, first (but not second) generation women (aOR 0.79, 95% CI 0.65 to 0.95), women with low German language skills (aOR 0.77, 95% CI 0.58 to 0.99) and women with low educational attainment (aOR 0.62, 95% CI 0.47 to 0.82) had lower chances of receiving NA; there was no evidence of overprovision among women with strong affinity to Islam (aOR 0.77, 95% CI 0.63 to 0.94).

Conclusions We found evidence for underprovision of care among first-generation immigrants, among women with low German language proficiency and particularly among all women with low educational attainment, irrespective of migration status. There was no evidence for overprovision of care to immigrant women, either inappropriately (general anaesthesia for ESCS) or because of low provider responsiveness (no opt-out for NA in vaginal delivery).

Strengths and limitations of this study

- ► Unlike most studies examining healthcare for immigrants, this study focuses on access barriers and underprovision of care as well as on overprovision and low responsiveness.
- ► A reasonably large dataset with detailed information on migration status, obstetric history, obstetric procedures and outcomes, and selected socioeconomic variables was available for analysis.
- ► Explicit information on women's preferences was not available.
- ► A stratification by country of origin was not possible due to small numbers in most strata.

INTRODUCTION

Healthcare provided to patients should be both appropriate and patient centred. Care is appropriate when it is in line with guidelines based on evidence or consensus. Appropriateness thus implies that there is neither an underprovision of care (needed care that would improve outcomes is not provided) nor an overprovision (sometimes called overuse; unneeded care is provided that does not improve outcomes and may carry risks exceeding the benefits).[1 2] Within the frame of appropriateness, the healthcare system and the care providers should also be responsive to the preferences of the patients/clients, that is, care should be patient centred.[3]

In the context of healthcare for immigrants and their offspring, research has so far focused

mostly (and for good reasons) on access barriers and the associated underprovision of care.[4 5] Overprovision, as well as low responsiveness, has received little attention in comparison.[1] Both, however, could pose relevant problems in a healthcare setting that is not well adapted to the needs of immigrants. For example, in case of language barriers, providers may decide to opt for an overly invasive intervention 'just to be on the safe side'. They would thus resort to overprovision, rather than create structures such as translation services to overcome the underlying language barrier. In a care setting that is insufficiently responsive, patients may undergo (non-vital, optional) interventions that they might not have chosen had they been actively involved in treatment decision making or they may not be offered these options in the first place.[3]

Low appropriateness of care for immigrant patients and low responsiveness toward their wishes should not be perceived as inherent (and thus non-modifiable) attributes of a healthcare system or its care providers. If such problems are identified, appropriate action can be taken to improve performance. If, on the other hand, care provision for immigrants in a particular setting is shown to be appropriate and responsive, the respective approach could serve as a 'best practice' example. In more general terms, such a finding could be interpreted as evidence that health services can indeed successfully adapt to today's increasingly diverse clienteles.

Much research on appropriateness of care and responsiveness has been based on self-reported measures[2 3] or, if it is based on clinical indicators, has not focused on immigrant patients.[6] We try to bridge this gap using the provision of neuraxial anaesthesia (NA) during labour as indicator. It displays considerable variance in care settings serving a clientele with a high proportion of immigrants[7–11] and thus is particularly informative. NA, comprising epidural/peridural, spinal and combined epidural-spinal anaesthesia, is the appropriate anaesthesia for elective (primary) as well as secondary/urgent secondary caesarean sections (ESCS) because of equal[12] or better maternal and neonatal outcomes.[13 14] General (intubation) anaesthesia is indicated only in the subgroup of very urgent, so-called 'crash' emergency secondary caesarean sections.[15]

NA is also the most effective, low-risk method to provide labour pain relief.[16 17] In Germany, it is considered state of the art that it should be available on request to all women delivering vaginally.[18] NA is not usually a pre-requisite for safe vaginal delivery, however (only occasionally, it may be applied to avoid protracted labour, in the hope of preventing foetal distress[19]). Hence, providers should be responsive if a woman declines NA[20] because she assigns meaning to labour pain, for example, for spiritual or religious reasons,[20 21] as long as the neonate will not be compromised.

A small number of international studies provide evidence for ethnic inequalities in appropriateness and responsiveness of labour pain management, with the majority reporting a lower likelihood of immigrant women to receive pain relief during labour compared with non-immigrant women.[7–11] Differences in the perception of pain and patient preferences, on the one hand, and language barriers, cultural differences and family and/or partner influence or a mistrust of the healthcare system, on the other hand, were reported as possible reasons.[8 10] So far, no such data are available for Germany. We aimed to fill this gap by analysing provision of NA to women under labour in relation to their migration status. Several covariates possibly influence whether or not anaesthesia is given and, if so, which type is selected.[7–11 19 20] They include the following:

- maternal age, maternal body mass index (BMI; influencing need for as well as technical feasibility of NA), parity, foetal presentation, birth weight, instrumental delivery;
- German language skills and education (influencing knowledge and understanding of options available);
- religiousness (proxy variable for ascribing meaning to labour pain, as several religions explicitly do, thus influencing preferences); and
- smoking (influencing the secondary outcome, neonatal status).

Taking these covariates into account, we analysed whether (1) women undergoing elective or secondary/urgent secondary caesarean sections (ESCS) appropriately receive NA (instead of general anaesthesia), (2) women delivering vaginally appropriately receive NA and (3) women objecting to NA may deliver vaginally without receiving NA (provider responsiveness).

METHODS

Setting

Our study setting was Berlin, the largest German city. One in five residents of Germany (16.4 out of 80.9 million persons) had a migration background in 2014. The majority (10.9 million) were born outside Germany, the so-called first-generation immigrants; 5.5 million persons, here summarily called second generation, were born in Germany with parents/grandparents born abroad. The two numerically largest immigrant groups originate from Turkey and from Eastern European countries.[22]

Data source

Data were collected in a 12-month period 2011/2012 in three maternity hospitals in Berlin.[23] Pregnant women were interviewed by trained, multilingual female study staff in a standardised face-to-face interview before the onset of labour pain with questionnaires available in eight languages (see online supplementary files 1 and 2). Questions regarding migrant background, socioeconomic status and so on were taken from questionnaire instruments developed for and validated in the German national 'Children and Youth Health Survey'[24 25] and the German national 'Mikrozensus' (an annual, representative and compulsory questionnaire survey among

a 1% subsample of all households).[22] The questionnaire was translated and back-translated and piloted. Eligible for study participation were adult (18+ years) pregnant women (24+ completed weeks of gestation) with a permanent residence in Germany. Written informed consent was obtained from all participants. Uniformly collected and highly standardised obstetric process and outcome data were linked from the hospital data bases. Of the 8157 women delivering in the three hospitals, 7100 participated in the study (response 89.6%).[23]

Determinant and outcome variables

Immigrant status of the pregnant women was determined on the basis of their own and their parents' country of birth.[25] Women with a history of migration were classified as first-generation immigrants if they were born outside Germany and as second generation if they were born in Germany but with both (grand)parents born abroad. Women whose grandparents were already born in Germany served as reference group (hereafter referred to as non-immigrant women). Women with only one parent born abroad were assigned to the non-immigrant group due to similarities in findings and small numbers (n=303).

Maternal age was grouped as 18–24, 25–29, 30–34 and ≥35 years; and parity, as nullipara/primipara/bipara/multipara (at the time of the interview, ie, before delivery). Birth weight was grouped as not high versus high (≥3740 g, which is the 80th percentile). Instrumental delivery comprised vacuum extraction and forceps. Maternal BMI at the time of birth was categorised according to WHO recommendations in underweight/normal weight (<25 kg/m^2), overweight (25 to <30 kg/m^2), obesity (30 to <40 kg/m^2) and severe obesity (≥40 kg/m^2). Information on weight was missing in 8.5% and on height in 12.9% of the women. Imputation procedures using the average of five iterations based on linear regression analyses were applied (for maternal height based on migrant status and age; for weight based on migrant status, age, height, and parity).

German language proficiency was self-assessed as very good, good, moderate, little or none and classified as sufficient (very good/good/moderate) or low (little/none) language skills.

Educational attainment was measured by the highest graduation level and was classified into three categories: low (no graduation/primary education), medium (lower secondary education) and high (upper secondary and higher).

Religiousness was based on questions on religious affiliation and attachment to religion (five response categories) and classified into three categories comprising the most common religious orientations (no/little affinity, strong affinity to Christian/other religion, strong affinity to Islam).

Smoking status was categorised as non-smoker, occasional smoker and regular smoker. This information was missing in 295 women whose datasets were excluded (no imputation was done). Inclusion of these data sets did not materially change the findings for the primary outcome.

The three NA techniques epidural/peridural anaesthesia, spinal anaesthesia and combined epidural/spinal anaesthesia were merged into one dichotomous main outcome variable. In vaginal deliveries, the outcome was NA versus no NA to assess for underprovision and overprovision. In caesarean sections, it was NA versus general anaesthesia to assess for overprovision. The secondary outcome, neonatal status, comprised two dichotomous variables: umbilical cord pH ≤7.1 and transfer to a paediatric hospital to assess for foetal compromise.

A priori assumptions underlying the analyses

The analyses presented here were not part of the original study protocol of the Berlin Perinatal Study. To avoid data-driven analyses, we developed the following explicit assumptions based on the literature before analysing the data:

- Women undergoing elective/ESCS should receive neuraxial (as opposed to general) anaesthesia as the appropriate method. A higher proportion of general anaesthesia in the immigrant group (after controlling for confounding variables such as parity) can be interpreted as overprovision of care (presumably after failing to overcome language barriers).
- Women delivering vaginally should be offered NA. Lower uptake in one group (after controlling for confounding variables) would indicate an unfulfilled need and hence underprovision of care, unless women have a reason to decline NA.
- If women have reasons for declining NA and the foetal outcome is not compromised, they should not be pushed to use NA. Under these conditions, a lower uptake of NA would indicate that the healthcare setting is responsive to the clients and their preferences. If, under these conditions, the uptake among immigrants were higher, this might indicate that providers promote NA in order to manage deliveries where they perceive communication barriers, resulting in an overprovision of care.

Statistical analyses

Separate logistic regression models were fitted to estimate ORs for the influence of migrant status on the provision of NA for elective/ESCS and during vaginal delivery. Selection of determinant variables was based on our a priori assumptions. Linear regression models were used to check for multicollinearity of determinant variables (data not shown as no statistical evidence for multicollinearity was found). As instrumental deliveries could arguably be not a reason for NA provision but a consequence thereof, a sensitivity analysis was conducted. In a model for NA in vaginal deliveries excluding instrumental deliveries, estimates did not change materially, but CIs became wider due to the lower number of deliveries included (4737 instead of 5732; data not shown). We used a forward selection technique to identify significant

interaction terms and included these in the logistic regression models. Analyses were conducted using SAS 9.3.

As socioeconomic position, language skills and religion can be considered as mediators of the association between migration status and the outcome NA, we conducted a formal mediation analysis.[26] We found no material evidence of a mediating effect (see online Supplementary file 3).

RESULTS

Complete data for all variables relevant for the analyses were available for 6391 out of the 7100 pregnant women, of whom 2488 (38.9%) were first-generation immigrants and 839 (13.1%) were second-generation women, respectively (see table 1). The largest single group of origin were women from Turkey (data for other countries of origin not shown due to small numbers). Almost three quarters of the first-generation immigrants assessed their German language proficiency as sufficient, and almost all second-generation women did so. Immigrant women were on average younger, and the proportion of women with a high educational level was lower compared with non-immigrant women. The majority of non-immigrant women reported to have no or little religious affinity; many immigrant women showed a strong affinity toward the Islamic religion. Finally, non-immigrant women were more often nulliparous at the time of survey than immigrant women; second-generation immigrant women had the highest obesity prevalence compared with first-generation and non-immigrant women (see table 1).

Appropriateness of care: NA in caesarean sections

The proportion of elective/ESCS was lower among first- and second-generation women (29.1%; 29.6%) than among non-immigrant women (38.6%) (see table 1). Table 2 shows the baseline and the final model for the influence of migrant status on the provision of NA during elective/ESCS. In the baseline model, a statistical association of borderline significance between migration status and non-provision of NA was found. In the final adjusted model, however, migrant status was no longer significantly associated with the provision of NA during elective/ESCS. Instead, a pronounced social gradient other than migrant status became visible: women with low (OR 0.42, 95% CI 0.25 to 0.70) and medium (OR 0.53, 95% CI 0.38 to 0.75) educational attainment were less likely to receive NA than women with high educational attainment.

As expected, the vast majority of women undergoing a 'crash' caesarean section (90 out of 104) received general anaesthesia; the remaining 14 women were coded as both 'urgent secondary' and 'crash' caesarean section and received NA (data not shown in the tables).

Appropriateness and responsiveness of care: NA in vaginal deliveries

Of the non-immigrant women, 59.8% had a vaginal delivery, compared with 69.0% of the first- and 69.6% of second-generation women. While 45.8% of non-immigrant women received NA during vaginal (spontaneous/instrumental) delivery, this applied to only 26.4% of the first-generation women and to 36.3% of the second-generation women (see table 1).

Table 3 shows the baseline and the final model for the influence of migrant status on the provision of NA during vaginal delivery. In the baseline model, first- and second-generation women were significantly less likely to receive NA during vaginal delivery than non-immigrant women (first generation: OR 0.42, 95% CI 0.37 to 0.49; second generation: OR 0.67, 95% CI 0.56 to 0.82). However, after adjusting for other characteristics, in particular parity, this association was attenuated for first-generation women (OR 0.79, 95% CI 0.65 to 0.95) and disappeared for second-generation women. Again, education was significantly associated with the outcome: women with low educational attainment had a 40% lower chance of receiving NA during vaginal delivery than women with high attainment. Self-assessed German language proficiency was negatively associated with the provision of NA (adjusted for migration status), just reaching significance (OR 0.75, 95% CI 0.57 to 0.99).

Women with a strong affinity toward Islam had a significantly lower chance of receiving NA during vaginal delivery compared with women with no/little religious affinity (OR 0.72, 95% CI 0.58 to 0.88). At the same time, their neonatal outcomes (umbilical cord pH ≤7.1: OR 0.80, 95% CI 0.46 to 1.42; transfer to paediatric hospital: OR 0.66, 95% CI 0.49 to 0.90) were equal to, or even better than, those of women with no/little religious affinity (separate logistic models, not shown in the tables; see online supplementary file 4).

DISCUSSION

We examined migration-related differences in healthcare using the example of NA provision during labour. The choice of NA allows assessing underprovision of care and overprovision and responsiveness of the care system. Besides migration status and obstetric variables, we could analyse sociodemographic and socioeconomic characteristics of the pregnant women, which helped us to at least partly disentangle their complex relationship with care provision during childbirth.

The descriptive analysis and the baseline regression model indicated a lower chance of receiving NA during elective/ESCS among immigrant women compared with non-immigrant women. However, this association disappeared completely after adjusting for confounding variables. Thus, we found equal chances of coverage with NA during elective/ESCS among immigrant and non-immigrant women. German language skills were not associated with this outcome. So, there is no evidence for inappropriate care (here, an overprovision of general anaesthesia), for example, due to language barriers, for elective/ESCS in our population of first- and second-generation women.

Table 1 Distribution of sociodemographic characteristics and obstetric indicators (in %, mean, SD), among women delivering, by migration status, Berlin, Germany, 2011/2012

		First-generation immigrants	Second-generation women*	Non-immigrant women	Total
Study population (n)	**n**	**2488**	**839**	**3064**	**6391**
Maternal age					
18–24 years	1333	21.5	34.0	16.8	20.9
25–29 years	1746	29.5	31.9	24.3	27.3
30–34 years	1860	27.3	22.1	32.5	29.1
35+ years	1452	21.8	12.0	26.4	22.7
Mean (SD)		29.7 (5.8)	27.6 (5.4)	30.8 (5.8)	30.0 (5.8)
Educational attainment					
High	2543	34.9	16.7	50.1	39.8
Medium	3072	40.9	74.1	46.7	48.1
Low	776	24.2	9.2	3.2	12.1
Self-assessed German language proficiency					
Sufficient	5739	74.1	99.4	99.9	89.8
Low	652	25.9	0.6	0.1	10.2
Religiousness					
Little affinity to religion	2864	22.8	15.1	70.9	44.8
Strong affinity to Christian/other religion	1287	19.8	8.8	23.5	20.1
Strong affinity to Islam	2240	57.5	76.0	5.6	35.1
Smoking during pregnancy					
No	5106	81.4	71.3	81.1	79.9
Regularly/occasionally	1285	18.6	28.7	18.9	20.1
Maternal prebirth BMI (kg/m^2)					
<25	1175	17.9	13.0	20.3	18.4
25 to <30	4374	69.7	69.6	67.1	68.4
30 to <40	594	9.4	11.9	8.5	9.3
≥40	248	3.0	5.5	4.1	3.9
Mean (SD)		29.4 (5.0)	30.4 (5.3)	29.2 (5.5)	29.5 (5.3)
Parity†					
Nullipara (P0)	3031	35.6	45.7	57.5	47.4
Primipara (P1)	1934	31.5	30.5	29.2	30.3
Bipara (P2)	862	18.3	16.3	8.8	13.5
Multipara (P3 or higher)	564	14.7	7.5	4.4	8.8
High birth weight (≥3740 g, 80th percentile)					
No	5098	79.5	81.9	79.4	79.8
Yes	1293	20.5	18.1	20.6	20.2
Presentation of fetus (vaginal births only)					
Regular cephalic presentation	4058	97.0	97.3	95.9	96.6
Other presentations	144	3.0	2.7	4.1	3.4
Mode of delivery‡					
Vaginal birth (non-instrumental)	3619	61.5	59.8	49.9	55.7
Vaginal birth (vacuum extraction, forceps)	583	7.5	9.8	9.9	9.0
Elective caesarean section	893	12.3	11.5	15.6	13.8
(Urgent) secondary caesarean section§	1296	16.8	18.1	23.0	20.0
Crash caesarean section	104	1.9	0.8	1.6	1.6

Continued

Table 1 Continued

Study population (n)	n	First-generation immigrants 2488	Second-generation women* 839	Non-immigrant women 3064	Total 6391
NA provision by mode of delivery					
Vaginal birth (including instrumental)	1530	26.4	36.3	45.8	36.4
Elective/(urgent) secondary caesarean section§	1928	86.6	85.2	89.6	88.1

*Second generation n=830; third generation n=9.
†Excluding present delivery.
‡Different n (2535; 846; 3114; total=6495) in the three groups of women because crash caesarean sections are included.
§Excluding crash caesarean section.
BMI, body mass index; NA, neuraxial anaesthesia.

In vaginal deliveries, labour pain relief with NA is provided equitably for second-generation women compared with non-immigrant women. This may be due to measures aiming to increase the representation of minorities in the healthcare system and to evidence-based guidelines[27] which are in place in the setting where we conducted our study. First-generation immigrant women, however, have a lower chance of coverage, so underprovision of care for this group due to persisting language barriers or insufficient information cannot be ruled out. As this association was markedly attenuated by controlling for confounding variables, residual confounding remains an alternative explanation.

This finding is partly in line with previous investigations of ethnic differences in the management of labour pain. In many studies, ethnic minority/immigrant women were less likely to receive NA pain relief during labour than women of the majority population.[7–9 11] These studies, however, could not control for all the covariates available in our study.

The disparities we observed in NA provision during vaginal delivery were also associated with social determinants. Women with a lower educational level had a significantly lower chance of receiving NA—irrespective of their migration status. This reflects the well-known 'health gap',[28] here extending it to obstetric pain relief. So far, only few international studies have demonstrated the importance of social determinants in NA provision. Koteles *et al*[29] found that women who have a higher educational level and a higher income and are employed also have a higher chance of receiving epidural anaesthesia. Räisänen *et al*[30] reported a lower coverage with epidural anaesthesia among lower class workers compared with upper class white collar workers. Husarova *et al*[11] found increased odds of not receiving any analgesia during delivery in non-European women but could not control for confounders such as educational achievements and language skills.[11] A study investigating both socioeconomic and migration status in pregnancy care (although not in NA provision) found that, in the United Kingdom, the uptake of maternity care was strongly influenced by educational level, social class and ethnicity but only inconsistently by migration status.[31]

Women with strong religious ties toward Islam also had a significantly lower chance to receive NA during vaginal delivery; this association could not be explained by their migrant status or German language skills as both were controlled for. In a review, Unruh[21] found that, for some patients, spirituality and religious affiliation are indeed important aspects of pain acceptance. If religious affinity or other reasons for assigning meaning to labour pain[20] lead to a refusal of pain relief during vaginal delivery and (as is the case here) neonatal outcomes are equal or better, then this indicates a responsive healthcare setting rather than underprovision of care, as the preferences of these women are met. More research is needed, however, on the relationship between patient and caregiver and the patients' involvement in decision making. The 'cultural gap' between caregiver and patient strongly influences the caregiver's accuracy in the interpretation of the patient's pain[32] and satisfaction with pain relief during delivery.[33] Finally, women's expectations (and thereby predelivery preferences) and actual experiences of labour pain may not always match.[20 34] This makes informed consent and shared decision taking even more important. While this is appreciated in an egalitarian medical culture such as Germany's,[3] it may be challenging for immigrant women:[35] in a paternalistic medical culture such as Turkey, decisions are seen as the responsibility of the doctor. In addition, language barriers remain an issue, although (fortunately) a less general one than in the study by Toledo *et al*,[10] not affecting second-generation women, and not elective/ESCS.

In our study, perinatal data were collected in a highly standardised way. Our questionnaire comprised mostly validated instruments. We dealt with missing data by imputation or by excluding the respective datasets, thus minimising the risk of major bias. We achieved a response rate of almost 90%, which is high for studies enrolling immigrants. Still, the absolute number of immigrant women was too small to allow for stratified analyses by country of origin. This is a limitation as there might be differences between immigrant groups. Along the same line, as we used data of only three hospitals in one city, generalising the findings to Germany as a whole is not

Table 2 Chance (ORs) of receiving NA for elective/(urgent) secondary caesarean section, by migration status, Berlin/Germany, 2011/2012

Baseline model n=2189 caesarean sections n=1928 NAs (vs general anaesthesia)	n	OR	95% CI	p Value
Migration status				
Non-immigrant women	1201	1.00		
First-generation immigrants	738	0.75	0.56 to 0.99	0.0448
Second-generation women	250	0.67	0.45 to 0.99	0.0459
Final model n=2189 caesarean sections n=1928 NAs (vs general anaesthesia)	n	OR	95% CI	p Value
Migration status				
Non-immigrant women	1201	1.00		
First-generation immigrants	738	0.93	0.65 to 1.33	0.6891
Second-generation women	250	0.92	0.58 to 1.48	0.7418
Age groups				
18–24 years	341	1.00		
25–29 years	538	0.82	0.54 to 1.23	0.3359
30–34 years	682	0.80	0.52 to 1.23	0.3063
35+ years	628	1.07	0.68 to 1.69	0.7719
Educational attainment				
High	978	1.00		
Medium	1037	0.53	0.38 to 0.75	0.0003
Low	174	0.42	0.25 to 0.70	0.0009
Religiousness				
Little affinity to religion	1123	1.00		
Strong affinity to Christian/other religion	516	0.94	0.66 to 1.35	0.7473
Strong affinity to Islam	550	0.89	0.60 to 1.31	0.5451
Self-assessed German language proficiency				
Sufficient	2020	1.00		
Low	169	0.99	0.59 to 1.65	0.9538
Smoking during pregnancy				
No	1755	1.00		
Regularly/occasionally	434	0.83	0.60 to 1.14	0.2494
Parity*				
Nullipara (P0)	1154	1.00		
Primipara (P1)	639	1.16	0.84 to 1.62	0.3668
Bipara (P2)	260	0.77	0.52 to 1.16	0.2132
Multipara (P3 or higher)	136	0.61	0.37 to 1.01	0.0532
Maternal prebirth BMI (kg/m^2)				
<25	384	1.00		
25 to <30	1440	1.36	0.96 to 1.93	0.0823
30 to <40	250	1.09	0.67 to 1.76	0.7313
≥40	115	1.03	0.56 to 1.88	0.9224
High birth weight (≥3740 g, 80th percentile)				
No	1796	1.00		
Yes	393	1.69	1.12 to 2.54	0.0118

Model diagnostics:Tjur r^2: 0.0212.
*Excluding present delivery.
†Different denominator to table 1.
BMI, body mass index; NA, neuraxial anaesthesia.

Table 3 Chance (ORs) of receiving NA during vaginal birth (including instrumental), by migration status, Berlin/Germany, 2011/2012

	n	OR	95% CI	p Value
Baseline model n=4202 vaginal deliveries n=1530 NAs (vs no NA)				
Migration status				
Non-immigrant women	1863	1.00		
First-generation immigrant women	1750	0.42	0.37 to 0.49	<0.0001
Second-generation women	589	0.67	0.56 to 0.82	<0.0001
Final model n=4202 vaginal deliveries n=1530 NAs (vs no NA)	**n**	**OR**	**95% CI**	**pValue**
Migration status				
Non-immigrant women	1863	1.00		
First-generation immigrant women	1750	0.79	0.65 to 0.95	0.0111
Second-generation women	589	1.05	0.82 to 1.34	0.6936
Age groups				
18–24 years	992	1.00		
25–29 years	1208	0.97	0.80 to 1.17	0.7176
30–34 years	1178	0.96	0.78 to 1.19	0.7303
35+ years	824	1.38	1.09 to 1.76	0.0074
Educational attainment				
High	1565	1.00		
Medium	2035	0.86	0.72 to 1.01	0.0625
Low	602	0.62	0.47 to 0.82	0.0008
Religiousness				
Little affinity to religion	1741	1.00		
Strong affinity to Christian/other religion	771	1.10	0.91 to 1.33	0.3076
Strong affinity to Islam	1690	0.77	0.63 to 0.94	0.0107
Self-assessed German language proficiency				
Sufficient	3719	1.00		
Low	483	0.76	0.58 to 0.99	0.0418
Smoking during pregnancy				
No	3351	1.00		
Regularly/occasionally	851	1.34	1.12 to 1.60	0.0016
Parity*				
Nullipara (P0)	1877	1.00		
Primipara (P1)	1295	0.34	0.29 to 0.39	<0.0001
Bipara (P2)	602	0.25	0.19 to 0.31	<0.0001
Multipara (P3 or higher)	428	0.15	0.11 to 0.22	<0.0001
Maternal prebirth BMI (kg/m^2)				
<25	791	1.00		
25 to <30	2934	0.96	0.81 to 1.15	0.6777
30 to <40	344	0.85	0.63 to 1.14	0.2804
≥40	133	1.20	0.80 to 1.81	0.3875
High birth weight (≥3740 g, 80th percentile)				
No	3302	1.00		
Yes	900	1.26	1.07 to 1.50	0.0067

Continued

Table 3 Continued

	n	OR	95% CI	p Value
Presentation of fetus				
Regular cephalic presentation	4058	1.00		
Other presentations	144	1.35	0.94 to 1.94	0.1074

Model diagnostics:Tjur r^2: 0.1329.
*Excluding present delivery.
BMI, body mass index; NA, neuraxial anaesthesia.

possible. Also, we used only one main outcome indicator (NA provision). While this indicator was not identified in expert discussions or Delphi processes,[6] it is routinely collected and thus widely available. A limitation of this indicator is that there is some overlap between appropriateness of care and responsiveness of a healthcare system. However, there is a lack of alternative indicators that are informative in both respects, meaning that they show sufficient variance as well as international evidence for overutilisation/underutilisation.[7–11] Another limitation is that we could not analyse (rare) individual medical contraindications for NA, aside from technical aspects such as high BMI, and had to assume that they are equally distributed between the study groups. Religiousness was the best available proxy variable for ascribing meaning to labour pain and thus influencing preferences, but it is an imperfect one and should in the future be replaced by questions on women's preferences. Finally and in spite of our mediation analysis, we might not have been able to fully disentangle the effects of migrant status, educational status and language skills given the indicators available. That we found no evidence of a mediating effect is a surprising finding that opens new questions (as often happens in observational studies). Future research should investigate possible mediation using more refined indicators.

In summary, previously published evidence indicating that immigrants or ethnic minorities are less likely to receive the healthcare they need, relative to the respective majority populations, requires closer scrutiny. Our study of NA provision shows a more complex picture: not all differences we found were differentials and not all inequalities could be interpreted as inequities. Previous studies possibly took a too narrow approach, focusing only on the observed difference without fully elucidating its context[9 11] or even calling it a differential straight away.[8] Future studies on healthcare provision for immigrants should also focus on possible overprovision of care (rather than only underprovision) and on system responsiveness as a possible explanation for differences; this requires explicitly asking for patients' preferences.

The disparities we observed in pain relief during vaginal delivery were only partly associated with migration status. However, all women—including non-migrants—with a lower educational attainment experienced a significantly lower chance of receiving NA. Thus, when it comes to providing the best possible health for all pregnant women, not only language barriers need to be overcome and quality of information improved[20]; additional investments outside the healthcare system are required, addressing other social determinants such as general education—a difficult task to undertake but also a crucial one.

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Comparing provision and appropriateness of health care between immigrants and non-immigrants in Germany using the example of neuraxial anaesthesia during labour: cross-sectional study

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