

BMJ Open

BMJ Open is committed to open peer review. As part of this commitment we make the peer review history of every article we publish publicly available.

When an article is published we post the peer reviewers' comments and the authors' responses online. We also post the versions of the paper that were used during peer review. These are the versions that the peer review comments apply to.

The versions of the paper that follow are the versions that were submitted during the peer review process. They are not the versions of record or the final published versions. They should not be cited or distributed as the published version of this manuscript.

BMJ Open is an open access journal and the full, final, typeset and author-corrected version of record of the manuscript is available on our site with no access controls, subscription charges or pay-per-view fees (<http://bmjopen.bmj.com>).

If you have any questions on BMJ Open's open peer review process please email info.bmjopen@bmj.com

BMJ Open

Information on, knowledge and utilization of support services during pregnancy and after childbirth: cross-sectional analyses of determinants using data from the KUNO Kids birth cohort study

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2020-037745
Article Type:	Original research
Date Submitted by the Author:	14-Feb-2020
Complete List of Authors:	Brandstetter, Susanne; University Children's Hospital Regensburg (KUNO-Clinics), University of Regensburg Rothfuß, David; Coordinating Center for Early Interventions, City of Regensburg Seelbach-Göbel, Birgit ; Clinic of Obstetrics and Gynecology St. Hedwig, University of Regensburg Melter, Michael; University Children's Hospital Regensburg (KUNO-Clinics), University of Regensburg Kabesch, Michael; University Children's Hospital Regensburg (KUNO-Clinics), University of Regensburg Apfelbacher, Christian; University Children's Hospital Regensburg (KUNO-Clinics), University of Regensburg
Keywords:	EPIDEMIOLOGY, Maternal medicine < OBSTETRICS, Community child health < PAEDIATRICS, PUBLIC HEALTH

SCHOLARONE™
Manuscripts



I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our [licence](#).

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which [Creative Commons](#) licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

1
2
3 **Information on, knowledge and utilization of support services during pregnancy and after**
4 **childbirth: cross-sectional analyses of determinants using data from the KUNO Kids birth cohort**
5 **study**
6
7

8
9 *Susanne Brandstetter (1), David Rothfuß (2), Birgit Seelbach-Göbel (3), Michael Melter (1), Michael*
10 *Kabesch (1), Christian Apfelbacher (1, 4) and the KUNO Kids study group*

11
12 *1) University Children's Hospital Regensburg (KUNO-Clinics), University of Regensburg, Regensburg,*
13 *Germany*

14
15 *2) Coordinating Center for Early Interventions, City of Regensburg, Regensburg, Germany*

16
17 *3) Clinic of Obstetrics and Gynecology St. Hedwig, University of Regensburg, Regensburg, Germany*

18
19 *4) Institute of Social Medicine and Health Systems Research, Otto von Guericke University*
20 *Magdeburg, Magdeburg, Germany*

21
22
23
24
25 *Corresponding author:*

26
27 *Dr. Susanne Brandstetter*

28
29 *University Children's Hospital Regensburg (KUNO-Clinics), University of Regensburg*

30
31 *Klinik St. Hedwig, Steinmetzstraße 1-3, 93049 Regensburg, Germany*

32
33 *E-mail: susanne.brandstetter@ukr.de*

34
35 *Telephone number: 0049-941-3695826*

36
37 *Word count: 2963*
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

ABSTRACT

Background: Pregnancy and the transition to parenthood can be characterized by health related and psychosocial problems. A large variety of antenatal and perinatal support services is available for pregnant women and new mothers in Germany. This study investigated mothers' knowledge and utilization of services as well as determinants of knowledge and service utilization.

Methods: 2455 mothers, who participated with their newborn child in the KUNO Kids birth cohort study, provided information on socio-demographic characteristics, knowledge and utilization of support services (e.g. midwife, pregnancy counselling centre). Data were collected during the hospital stay after delivery. Multivariable logistic regression modelling was performed for analysing predictors of knowledge and utilization of services.

Results: The vast majority of mothers knew at least some support services. Two thirds had utilized the services provided by midwives during pregnancy and about one quarter of women had utilized other support services. Good knowledge of services was significantly associated with higher education, higher health literacy and multiparity. Migration background was significantly associated with poorer knowledge of services. Determinants of service utilization differed with regard to the services considered.

Conclusions: Overall, mothers had a good level of knowledge of antenatal and perinatal support services. However, we found that some groups of women were less well informed. This inequality in social determinants of knowledge of services was also partly reflected in differences in service utilization during pregnancy.

Key words: antenatal services; perinatal services; mothers; health service utilization; knowledge; midwives; psychosocial services

Strengths and limitations of this study

- This study used data from a large sample of mothers who were comprehensively characterized.
- This study succeeded at assessing data at a crucial point of time – during the first days after delivery of a child.
- A large variety of different support services was considered.
- Findings on service utilization must be interpreted with caution as women's objective need for service use was not assessed in the study.
- The study sample is restricted to women who agreed to participate with their newborn child in a birth cohort study and selection bias cannot be excluded.

INTRODUCTION

Pregnancy and the transition to parenthood are important life events for expectant parents. While these periods are characterized by manifold requirements and adjustments of everyday life for all expectant parents some people may also be confronted with major psychosocial challenges.

Problems can arise from the health of the woman or the child, partnership, financial situation, consequences of parenthood for employment and housing as well as dealing with expectations of family members and the society. Particularly vulnerable women may experience an exacerbation of problems during pregnancy and could potentially benefit from professional support during the antenatal and perinatal period.

In Germany, medical antenatal care for pregnant women is typically provided by physicians specialized in obstetrics/gynaecology. These services are highly utilized;¹ the majority of women is using even more than the recommended antenatal care visits.² After childbirth, child health check-up examinations are provided by paediatricians or general practitioners. Overall, utilization of child health check-ups is high, particularly for those examinations which are directed to very young children: According to the representative KiGGS survey (wave 1: 2009-2012), 97.5% of children participated in the examination scheduled for the 4th week of life.³ Pregnant women are also encouraged to engage a midwife and to participate in antenatal classes, mostly provided by midwives or nurses. Midwives are working in private practice and the costs for midwifery care are reimbursed by mandatory statutory or private health insurance. In addition to these offers from health care providers, various other support and counselling services exist in Germany intended to cover the needs of women and families during the antenatal and perinatal period.⁴ These services are mostly run by the municipalities, entail both health related and social services, some of them with low barrier, others more difficult to access.

A previous study has investigated parental knowledge and utilization of a wide variety of services for pregnancy and early childhood in Germany.⁵ Between 2014 and 2015, about 8000 parents of children between four weeks and three years of age were included in the study; recruitment of parents took place during their visit to a paediatrician. The authors found a social gradient in knowledge of services and programmes – parents with higher education knew more of the services and programmes – and a differential effect of education on utilization of programmes: While services provided from midwives and educational classes for parents were more often used by families with higher education, families with lower education more often utilized counselling services such as pregnancy counselling centre or family support services. While that study has dealt with knowledge and utilization of parents during their child's first years of life the present study focuses on the situation of mothers immediately after the birth of a child. We analyse data from a large birth cohort

1
2
3 study and aim at describing which services are known by new mothers after the birth of a child and
4 which services were already utilized during pregnancy. In addition, determinants of knowledge and
5 utilization of services will be explored.
6
7
8
9
10
11
12

13 **METHODS**

14 **Design**

15
16
17 The KUNO Kids study is an ongoing birth cohort study situated in Regensburg, Eastern Bavaria
18 (Germany). Rationale, design and sample characteristics of the KUNO Kids study have already been
19 described elsewhere.⁶ Briefly, mothers giving birth in the St Hedwig clinic (the university maternity
20 and children's hospital in the study region) were asked to participate in the study. Data collection
21 included an interview with questions about knowledge and utilization of antenatal and perinatal
22 services as well as questions regarding socio-demographic and psychosocial information. The study
23 has been approved by the Ethics Committee of the University of Regensburg (file number: 14-101-
24 0347).
25
26
27
28
29
30
31

32 **Sample**

33
34 The study sample includes mothers who gave birth between July 2015 and June 2018. Mothers were
35 eligible for participation in the study if they were adults and provided written informed consent.
36 Basic German language proficiency was considered necessary for understanding the study
37 procedures. There were no exclusion criteria with regard to health or illness of mother or child. 2520
38 mothers were included in the study sample, of whom 2494 participated in data assessment relevant
39 for this analysis.
40
41
42
43
44

45 **Measures and assessment**

46
47 Outcomes: Knowledge of antenatal and perinatal support services as well as utilization of antenatal
48 support services were assessed. Mothers were asked whether they knew a specific service and - for
49 those services which can be used during pregnancy - whether they had utilized them. The services
50 considered in this study comprised
51

- 52 - midwife: antenatal and perinatal health care for mother and child,
- 53 - paediatric nurse: care and support for families with infants with disabilities or diseases
- 54 - pregnancy counselling centre: counselling services with a focus on financial support, family
55 conflicts, unwanted pregnancy
56
57
58
59
60

- 1
- 2
- 3 - counselling centre for breastfeeding: counselling for breastfeeding and child nutrition
- 4
- 5 - counselling centre for infant crying: counselling for families with infants who cry intensely and
- 6 persistently
- 7
- 8 - family centre/family support services: counselling and advice for families
- 9
- 10 - coordinating child protection office (“KOKI”): comprehensive support for families at risk
- 11
- 12 - youth welfare office: counselling with focus on care, education and protection of the child
- 13
- 14 - education counselling centre: counselling with focus on child care and education
- 15
- 16 - community centre/projects: various offers, located in the neighbourhood
- 17
- 18 - “fit for family”: regional programmes provided by nurses/midwives during pregnancy and infancy
- 19 - and other.

20 The selection of services considered in this study reflects the offers widely available in Germany and
21 additionally those offers which are particularly available in the study region.

22 Further, it was assessed through which sources mothers received information about these services
23 (obstetrician/gynaecologist, midwife, hospital, paediatrician, family/friends, searching for oneself,
24 other).

25 Determinants of knowledge and utilization of services: Sociodemographic information, parity, health
26 literacy and health insurance status were considered potentially determining variables of knowledge
27 and utilization of services. Sociodemographic variables included age (years), marital status (married
28 and living with husband, unmarried and living together with partner, unmarried and living without
29 partner/divorced /widowed), migration background (born in Germany, born outside of Germany),
30 educational level (< 10 years of schooling, 10 years of schooling, university entrance level) and
31 employment before giving birth (yes, no). Parity was categorized into primiparous vs. multiparous.

32 Women’s health literacy was assessed using the health care scale of the HLS-EU questionnaire.⁷

33 Health insurance status was categorized into statutory health insurance vs. private or other health
34 insurance.

35 Data were collected by trained medical students using a computer-assisted personal interview (CAPI).

36 Data collection took place during the hospital stay of mother and child after birth.

37 **Statistics**

38 Characteristics of the study sample are described using means and standard deviation for metric
39 variables and percentages and frequencies for categorical variables. Missing values were not
40 imputed. First, knowledge and utilization of services as well as information sources about services
41 are presented by descriptive statistics. Then, regression modelling was performed for analysing
42 predictors of knowledge and utilization of services. For all determinants univariable logistic
43

1
2
3 regression models with knowledge and utilization as outcomes were calculated, respectively.
4 Variables which were associated with the outcome in univariable analysis (criterion $p \leq .2$) were
5 entered into the multivariable model. All analyses were performed using SPSS.23.
6
7

8 **Patient and public involvement**

9
10 Patients were not involved in the design and conduct of this study. Findings of this study will be
11 disseminated to study participants by regular newsletters which summarize novel findings gained
12 from the KUNO Kids study.
13
14
15

16 **RESULTS**

17 **Descriptive results**

18
19 The characteristics of the study sample are summarized in an online supplementary table. 2455
20 women provided data on knowledge and utilization of antenatal and perinatal social and health
21 related services (see figure 1). More than 90% of mothers knew the services offered by midwives and
22 youth welfare offices, however, only about 30% knew the coordinating child protection office and
23 community projects. The median number of services known was 8 (IQR: 6-9).
24
25

26
27 Figure 2 gives an overview on which of the social and health related services had already been used
28 by study participants during pregnancy. By far the most frequently used services were those
29 provided by midwives: Two thirds of women (68.4%) reported to have used them. Pregnancy
30 counselling office and the youth welfare service were used by 14.0% and 9.9% of mothers,
31 respectively. 23.6% of women reported to have used at least one of the antenatal services (excluding
32 the use of midwives).
33
34

35
36 When mothers were asked about the sources of information they had used to learn about the
37 various social and health related services the most frequently reported answer was that they had
38 researched on their own (72.8%), followed by information provided through family and friends
39 (56.3%). Health care professionals were named as information source by 20 to 50% of study
40 participants: gynaecologist/obstetrician (46.9%), paediatrician (13.1%), hospital (30.2%), midwife
41 (30.8%). Overall, two thirds of women reported that they have been informed about antenatal and
42 perinatal social and health related services by a health care professional.
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Analytical results

Tables 1 to 3 show the results of the univariable and multivariable logistic regression analyses.

Good knowledge of services was defined by median split as knowing at least 8 distinct services. In the multivariable model, higher education (OR (odds ratio): 1.37, 95% CI (95% confidence interval): 1.13-1.66), no migration background (OR: 2.18, 95% CI: 1.71-2.80) and higher health literacy (OR: 1.04, 95% CI: 1.03-1.06) significantly increased the chance of good knowledge of services, while being primiparous (OR: 0.69, 95% CI: 0.58-0.83) and lower education significantly reduced the chance (OR: 0.66, 95% CI: 0.49-0.88) (see table 1).

Table 1: Determinants of good knowledge of antenatal and perinatal social services: univariable and multivariable logistic regression analyses

	<i>univariable</i>			<i>multivariable</i>		
	OR	95% CI	<i>p</i>	OR	95% CI	<i>p</i>
Age (years)	1.052	1.034-1.071	<.001	1.020	1.000-1.041	.055
Primiparous (vs. multiparous)	0.692	0.598-0.812	<.001	0.691	0.576-0.830	<.001
Marital status						
Married, living together with husband	1.203	0.719-2.012	.482			
Unmarried, living together with partner	0.795	0.464-1.361	.403			
Unmarried and without partner, divorced or widowed	ref.					
Educational level						
Low (< 10 years of schooling)	0.597	0.451-0.790	<.001	0.658	0.490-0.884	.005
Medium (10 years of schooling)	ref.			ref.		
High (university entrance level)	1.393	1.169-1.662	<.001	1.367	1.125-1.662	.002
Employed before giving birth	1.285	1.010-1.634	.041	1.118	0.857-1.458	.413
Born in Germany	2.194	1.749-2.753	<.001	2.184	1.706-2.796	<.001
Statutory health insurance (vs. private or other health insurance)	0.581	0.461-0.734	<.001	1.223	0.949-1.576	.120
Health literacy	1.052	1.040-1.065	<.001	1.044	1.032-1.057	<.001

Notes: Multivariable analysis: N=2349; Nagelkerke's R²: .10

Good knowledge of services was defined by median split as knowledge of at least 8 services.

OR: Odds Ratio; 95% CI: 95% Confidence Interval; *p*: *p*-value; ref.: reference category

Health literacy: health care scale of the HLS-EU questionnaire

The utilization of antenatal services provided by a midwife was significantly associated with parity, education and migration background. In the multivariable model, first-time mothers (OR: 1.77, 95% CI: 1.48-2.12) were more likely to have utilized the services of midwives as well as women who were born in Germany (OR: 1.53, 95%-CI: 1.20-1.95). When compared with medium educational level a higher educational level was associated with an increased chance of service utilization (OR: 1.37, 95% CI: 1.12-1.67) and a lower educational level was associated with a decreased chance (OR: 0.67, 95% CI: 0.50-0.89) (see table 2).

Table 2: Determinants of utilization of services provided by midwives during pregnancy: univariable and multivariable logistic regression analyses

	<i>univariable</i>			<i>multivariable</i>		
	OR	95% CI	<i>p</i>	OR	95% CI	<i>p</i>
Age (years)	1.003	0.985-1.022	.741			
Primiparous (vs. multiparous)	1.811	1.525-2.151	<.001	1.772	1.479-2.122	<.001
Marital status						
Married, living together with husband	1.819	1.084-3.053	.024	1.587	0.929-2.712	.091
Unmarried, living together with partner	1.701	0.987-2.931	.056	1.357	0.773-2.384	.287
Unmarried and without partner, divorced or widowed	ref.			ref.		
Educational level						
Low (< 10 years of schooling)	0.618	0.467-0.817	.001	0.671	0.504-0.893	.006
Medium (10 years of schooling)	ref.			ref.		
High (university entrance level)	1.381	1.144-1.668	.001	1.366	1.119-1.668	.002
Employed before giving birth	1.407	1.097-1.804	.007	1.086	0.835-1.411	.539
Born in Germany	1.556	1.240-1.952	<.001	1.532	1.204-1.949	.001
Statutory health insurance (vs. private or other health insurance)	0.709	0.551-0.913	.008	1.123	0.858-1.471	.399
Health literacy	0.995	0.983-1.007	.394			

Notes: Multivariable analysis: N=2428; Nagelkerke's R²: .06

OR: Odds Ratio; 95% CI: 95% Confidence Interval; p: p-value; ref.: reference category

Health literacy: health care scale of the HLS-EU questionnaire

For the utilization of any antenatal service (excluding the services provided by midwives), the multivariable model yielded statistically significant associations for age, parity, marital status, educational level and health insurance status, with higher age (OR: 0.95, 95% CI: 0.92-0.97), being married or living with a partner (OR: 0.09, 95% CI: 0.05-1.16) and having a statutory health insurance

(OR: 0.64, 95% CI: 0.46-0.90) decreasing the chance of any service utilization, while being primiparous (OR: 1.61, 95% CI: 1.28-2.03) and having a higher educational level (OR: 1.44, 95% CI: 1.13-1.84) (compared to a medium level of education) increased the chance of service utilization (see table 3).

Table 3: Determinants of utilization of any antenatal social service (excluding midwives): univariable and multivariable logistic regression analyses

	<i>univariable</i>			<i>multivariable</i>		
	OR	95% CI	<i>p</i>	OR	95% CI	<i>p</i>
Age (years)	0.920	0.901-0.939	<.001	0.945	0.923-0.969	<.001
Primiparous (vs. multiparous)	2.135	1.749-2.605	<.001	1.608	1.276-2.027	<.001
Marital status						
Married, living together with husband	0.103	0.060-0.176	<.001	0.093	0.053-0.162	<.001
Unmarried, living together with partner	0.658	0.378-1.147	.140	0.509	0.286-0.907	.022
Unmarried and without partner, divorced or widowed	ref.			ref.		
Educational level						
Low (< 10 years of schooling)	1.763	1.299-2.393	<.001	1.282	0.902-1.821	.165
Medium (10 years of schooling)	ref.			ref.		
High (university entrance level)	1.125	0.911-1.390	.274	1.443	1.132-1.840	.003
Employed before giving birth	0.771	0.589-1.010	.059	0.763	0.555-1.048	.095
Born in Germany	0.918	0.711-1.185	.512			
Statutory health insurance (vs. private or other health insurance)	1.832	1.355-2.477	<.001	0.641	0.458-0.896	.009
Health literacy	1.000	0.987-1.013	.946			

Notes: Multivariable analysis: N=2400; Nagelkerke's R²: .22

OR: Odds Ratio; 95% CI: 95% Confidence Interval; p: p-value; ref.: reference category

Health literacy: health care scale of the HLS-EU questionnaire

DISCUSSION

This study investigated knowledge and utilization of antenatal and perinatal support services among a large sample of mothers of newborns. Overall, knowledge of support services was high and the vast majority of new mothers knew at least a few services. However, some specific services were not well known and sociodemographic factors were found to be associated with both knowledge and utilization of services.

Findings on knowledge and utilization of support services must not be interpreted without considering the context of the national health care and welfare system: In Germany, on the one hand, the situation for pregnant women and new mothers is characterized by the availability of comprehensive and highly specialized medical and social care services whose use is free of charge or reimbursed by (mandatory) health insurance. On the other hand, the system is very complex, collaboration between service providers from different sectors or disciplines can be limited and navigating through the system may be challenging for some women.⁴ This is also reflected by inequalities in service utilization: Large scale surveys found a social gradient in utilization of antenatal visits⁸ and of health check-up examinations for children.³

Our study also revealed a social gradient: women with a higher level of education and without migration background were more likely to have good knowledge of the support services considered in our study. These results corroborate previous findings by Eickhorst and colleagues who knowledge of services among parents of children between 0-3 years of age in Germany⁵ and found that education and migration background were determinants of knowledge of psychosocial support services.

Depending on which services were considered our study yielded different factors associated with the utilization of services. While the use of a midwife during pregnancy was associated with variables indicative of higher social status (higher education, no migration background) the most important predictor for the use of any other support service was marital status. Women who were divorced or living without a partner were much more likely to have used any antenatal social service. A possible explanation for this finding is that these women experienced and also anticipated strains they could not cope without a partner.

Moreover, we found that first-time mothers were less likely to have good knowledge of the different support services suggesting that mothers develop a more comprehensive knowledge about services during parenthood. However, despite first-time mothers' poorer knowledge they were also more likely to use both the midwife or any other antenatal service. This corresponds to the results of a

1
2
3 study from Sweden which analysed parity and health service utilization and found that first-time
4 mothers used child health services more often.⁹
5
6

7 The services provided by midwives are of particular interest since these services were by far the best
8 known and also the most utilized services investigated in our study. This is in line with findings from
9 the abovementioned study from Germany.⁵ Nevertheless, about one third of women in our study
10 reported to have not used the services of a midwife before delivery. As already mentioned antenatal
11 midwifery care is reimbursed by health insurance in Germany; however, pregnant women are
12 supposed to engage a midwife on their own. Our study findings do not allow conclusions about
13 whether women did not want to engage a midwife or whether there were any other barriers. While
14 the association with parity suggests that mothers who had already given birth to a child before might
15 have had the perception to be less in need of a midwife there were also associations with lower level
16 of education and migration background suggesting difficulties in accessibility of services. With regard
17 to the latter a focus group with pregnant women and new mothers revealed that the knowledge
18 about specific offers and competences of midwives is scarce and that access to and availability of
19 midwives can be limited in Germany.¹⁰
20
21
22
23
24
25
26
27
28

29 With regard to our findings on information sources about social services which were recalled by
30 mothers it is remarkable that the medical professions and institutions were not the predominant
31 source for information. Less than half of study participants mentioned that information on social
32 services had been provided by their gynaecologist/obstetrician.
33
34
35
36

37 The design of the German health care and welfare system has led to a wide variety of available
38 services for expectant and new mothers and one might argue whether women are really supposed to
39 know all the different services. Provided that all health/social care professionals are well trained and
40 have the capabilities to recognize the different needs of women (e.g. practical support, medical care,
41 mental health care) and given that utilization rates of medical antenatal care¹ and child health check-
42 up examinations are very high³ it does not seem to be necessary that every woman is an expert
43 herself for antenatal and perinatal services. However, the services differ widely in scope and not all
44 providers of services are equally equipped for meeting the different needs: for instance,
45 paediatricians in Germany were found to be reluctant and to struggle to address psychosocial
46 problems during the child health check-up examinations.^{11 12} This was also shown for other health
47 professionals in studies from Ireland and Canada: Midwives and nurses experienced many barriers
48 when dealing with mental health issues of their patients.^{13 14}
49
50
51
52
53
54
55
56

57 Finally, any interventional measure which seeks to improve knowledge of and to facilitate access to
58 services will need to be sensitive to the local social contexts. Many social services are rooted in the
59
60

1
2
3 community and build on the local and regional infrastructure. Moreover, measures are needed which
4 also reach women and families in different life circumstances such as migrants or refugees.
5
6

7 **Strengths and limitations**

8
9 This study succeeded at assessing mothers' knowledge of services at a crucial point of time:
10 Interviews were performed at the first days after delivery, before mother and newborn were
11 referred from the hospital to their home. It is important to understand whether mothers are aware
12 of the services available when they return to their home with their newborn child. Due to the large
13 sample size we could perform multivariable analysis considering various determining factors of
14 knowledge and service utilization.
15
16
17
18
19

20 However, the data used for this analysis was gathered as part of a comprehensive study on child
21 health. Therefore, providing written informed consent was a prerequisite for participating in this
22 study. This led to the exclusion of underaged mothers and of mothers who could not understand the
23 information on study procedures presented in German language. Regarding knowledge and
24 utilization of antenatal and perinatal services, this approach might have excluded women with
25 particular need for those services and our study might overestimate the extent of both knowledge
26 and utilization of services. All data was assessed using self-report measurement instruments and
27 might be prone to social desirability and/or recall bias. Moreover, caution must be taken when
28 interpreting our findings on the frequency of service utilization. The women's need for service was
29 not assessed in our study and we cannot draw any conclusions about whether the proportion of
30 women who utilized services was adequate or too low with regard to objective need factors as
31 assessed by psychosocial risk screening.
32
33
34
35
36
37
38
39
40

41 **Conclusion**

42
43 New mothers have a good level of knowledge of antenatal and perinatal support services. However,
44 some services are only known by about one third of mothers. Social determinants of knowledge and
45 of utilization of services suggest inequality with regard to the preconditions for service utilization and
46 call for interventional measures targeting particularly first-time mothers and socially disadvantaged
47 women to improve knowledge of and facilitate access to support services during pregnancy and early
48 childhood.
49
50
51
52
53
54
55
56
57
58
59
60

1
2
3 **Contributors:** SB designed the study, performed data analysis, interpreted the study findings, drafted
4 the manuscript and critically evaluated the manuscript. DR contributed to the design of the study,
5 helped interpreting the study findings, critically evaluated the manuscript and approved the final
6 manuscript. B S-B contributed to data collection, critically evaluated the manuscript and approved
7 the final manuscript. MM contributed to data collection, critically evaluated the manuscript and
8 approved the final manuscript. MK contributed to the design of the study and data collection. He
9 critically evaluated the manuscript and approved the final manuscript. CA designed the study,
10 interpreted study findings and drafted the manuscript. He contributed to data collection, critically
11 evaluated the manuscript and approved the final manuscript.

12
13 **Funding:** The KUNO-Kids study was funded by research grants of the EU (HEALS: 603946). Further
14 financial support was provided by the University Children's Hospital of the University of Regensburg
15 (KUNO-Clinics) and the clinic "St. Hedwig" (Hospital "Barmherzige Brüder Regensburg").

16
17 **Ethics:** The study has been approved by the Ethics Committee of the University of Regensburg (file
18 number: 14-101-0347). Informed consent was obtained from all individual participants included in
19 the study.

20
21 **Competing interests:** The authors declare that they have no competing interests.

22
23 **Data availability statement:** Data are available upon reasonable request by the corresponding
24 author.

25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 **Acknowledgements**

40
41 We would like to thank all families who participate in the KUNO-Kids birth cohort study as well as all
42 medical students, nurses, midwives, physicians, and researchers who facilitated the recruitment of
43 participants and data collection. Further, we thank all members of the KUNO-Kids study group: Petra
44 Arndt (ZNL Transfercenter of Neuroscience and Learning, University of Ulm, Ulm, Germany), Andrea
45 Baessler (Department of Internal Medicine II, Regensburg University Medical Center, Regensburg,
46 Germany), Mark Berneburg (Department of Dermatology, University Medical Centre Regensburg,
47 Regensburg, Germany), Stephan Böse-O'Reilly (Institute and Clinic for Occupational, Social and
48 Environmental Medicine, University Hospital, LMU Munich, Munich, Germany), Romuald Brunner
49 (Clinic of Child and Adolescent Psychiatry, Psychosomatics and Psychotherapy, Bezirksklinikum
50 Regensburg (medbo), Regensburg, Germany), Wolfgang Buchalla (Department of Conservative
51 Dentistry and Periodontology, University Hospital Regensburg, University of Regensburg,
52 Regensburg, Germany), Sara Fill Malfertheiner (Clinic of Obstetrics and Gynecology St. Hedwig,
53
54
55
56
57
58
59
60

1
2
3 University of Regensburg, Regensburg, Germany), André Franke (Institute of Clinical Molecular
4 Biology, Christian-Albrechts-University of Kiel, Kiel, Germany), Sebastian Häusler (Clinic of Obstetrics
5 and Gynecology St. Hedwig, University of Regensburg, Regensburg, Germany), Iris Heid (Department
6 of Genetic Epidemiology, University of Regensburg, Regensburg, Germany), Caroline Herr (Bavarian
7 Health and Food Safety Authority (LGL), Munich, Germany), Wolfgang Högler (Department of
8 Pediatrics and Adolescent Medicine, Johannes Kepler University Linz, Linz, Austria), Sebastian Kerzel
9 (Department of Pediatric Pneumology and Allergy, University Children's Hospital Regensburg, St.
10 Hedwig Campus, Regensburg, Germany), Michael Koller (Center for Clinical Studies, University
11 Hospital Regensburg, Regensburg, Germany), Michael Leitzmann (Department of Epidemiology and
12 Preventive Medicine, University of Regensburg, Regensburg, Germany), David Rothfuß (City of
13 Regensburg, Coordinating Center for Early Interventions, Regensburg, Germany), Wolfgang Rösch
14 (Department of Pediatric Urology, University Medical Center, Regensburg, Germany), Bianca Schaub
15 (Pediatric Allergology, Dept of Pediatrics, Dr. von Hauner Children's Hospital, University Hospital,
16 LMU Munich, Munich, Germany), Bernhard H.F. Weber (Institute of Human Genetics, University of
17 Regensburg, Regensburg, Germany), Stephan Weidinger (Department of Dermatology, Venereology
18 and Allergy, University Hospital Schleswig-Holstein, Campus Kiel, Kiel, Germany) and Sven Wellmann
19 (Children's Hospital St. Hedwig, University of Regensburg, Regensburg, Germany)
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

REFERENCES

1. Brenne S, David M, Borde T, et al. Are women with and without migration background reached equally well by health services? The example of antenatal care in Berlin. *Bundesgesundheitsblatt-Gesundheitsforschung-Gesundheitsschutz* 2015;58(6):569-76. doi: 10.1007/s00103-015-2141-6
2. Schäfers R, Kolip P. [Zusatzangebote in der Schwangerschaft: Sichere Rundumversorgung oder Geschäft mit der Unsicherheit?]. In: Böcken J, Braun B, Meierjürgen R, eds. *Gesundheitsmonitor 2015: Verlag Bertelsmann Stiftung* 2015:119-50.
3. Rattay P, Starker A, Domanska O, et al. [Trends in the utilization of outpatient medical care in childhood and adolescence: results of the KiGGS study - a comparison of baseline and first follow up (KiGGS Wave 1)]. *Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz* 2014;57(7):878-91. doi: 10.1007/s00103-014-1989-1
4. Renner I, Saint V, Neumann A, et al. Improving psychosocial services for vulnerable families with young children: strengthening links between health and social services in Germany. *BMJ* 2018;363:k4786. doi: 10.1136/bmj.k4786
5. Eickhorst A, Schreier A, Brand C, et al. [Knowledge and use of different support programs in the context of early prevention in relation to family-related psychosocial burden]. *Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz* 2016;59(10):1271-80. doi: 10.1007/s00103-016-2422-8
6. Brandstetter S, Toncheva AA, Niggel J, et al. KUNO-Kids birth cohort study: rationale, design, and cohort description. *Mol Cell Pediatr* 2019;6(1):1. doi: 10.1186/s40348-018-0088-z
7. Sørensen K, Van den Broucke S, Pelikan JM, et al. Measuring health literacy in populations: illuminating the design and development process of the European Health Literacy Survey Questionnaire (HLS-EU-Q). *BMC Public Health* 2013;13:948. doi: 10.1186/1471-2458-13-948 [published Online First: 2013/10/12]
8. Koller D, Lack N, Mielck A. [Social differences in the utilisation of prenatal screening, smoking during pregnancy and birth weight--empirical analysis of data from the Perinatal Study in Bavaria (Germany)]. *Gesundheitswesen* 2009;71(1):10-8. doi: 10.1055/s-0028-1082310
9. Lagerberg D, Magnusson M. Utilization of child health services, stress, social support and child characteristics in primiparous and multiparous mothers of 18-month-old children. *Scand J Public Health* 2013;41(4):374-83. doi: 10.1177/1403494813484397
10. Mattern E, Lohmann S, Ayerle GM. Experiences and wishes of women regarding systemic aspects of midwifery care in Germany: a qualitative study with focus groups. *BMC Pregnancy Childbirth* 2017;17(1):389. doi: 10.1186/s12884-017-1552-9
11. Krippeit L, Belzer F, Martens-Le Bouar H, et al. Communicating psychosocial problems in German well-child visits. What facilitates, what impedes pediatric exploration? A qualitative study. *Patient Educ Couns* 2014;97(2):188-94. doi: 10.1016/j.pec.2014.07.032
12. Barth M. [Pediatrician-parent interaction and early prevention : A review about the limits in addressing psychosocial risks during well-child visits]. *Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz* 2016;59(10):1315-22. doi: 10.1007/s00103-016-2426-4
13. Viveiros CJ, Darling EK. Perceptions of barriers to accessing perinatal mental health care in midwifery: A scoping review. *Midwifery* 2019;70:106-18. doi: 10.1016/j.midw.2018.11.011
14. Higgins A, Downes C, Monahan M, et al. Barriers to midwives and nurses addressing mental health issues with women during the perinatal period: The Mind Mothers study. *J Clin Nurs* 2018;27(9-10):1872-83. doi: 10.1111/jocn.14252

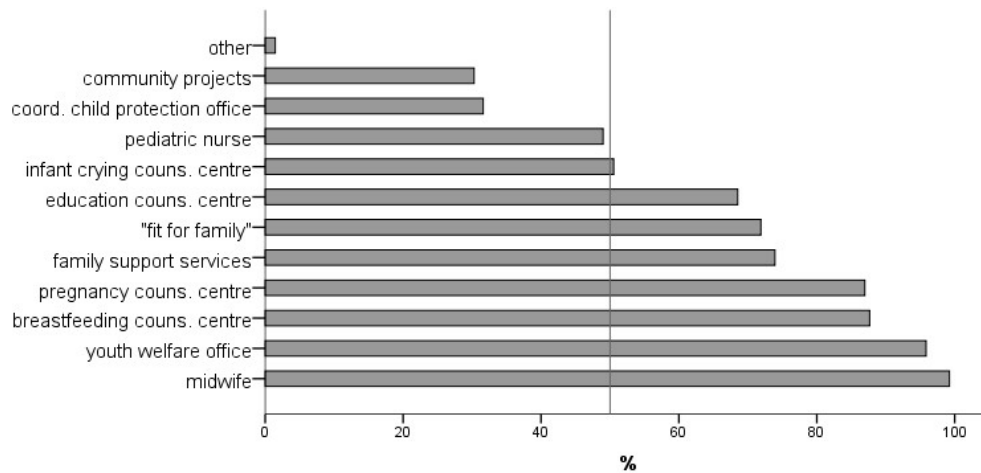
1
2
3
4
5 **FIGURES**
6
7
8
9

10 Figure 1: Proportions of women who know specific antenatal and perinatal health and social
11 services (N=2455)
12
13
14
15
16
17
18
19
20
21
22

23 Figure 2: Proportions of women who utilized specific antenatal health and social services
24 (N=2455)
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

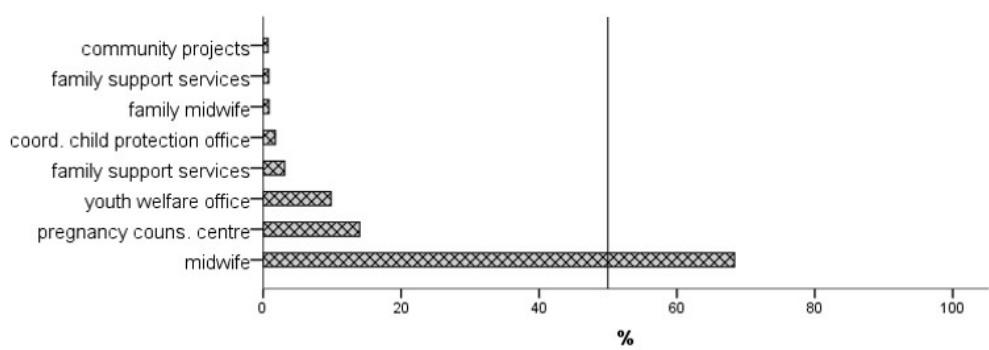
For peer review only

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60



242x121mm (79 x 79 DPI)

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60



279x107mm (69 x 69 DPI)

Online supplementary table

Characteristics of study participants

	<i>N=2494</i>	
Age (years); M (SD)	2464	34.00 (4.59)
Primiparous; N (%)	2477	1385 (55.9)
Marital status	2449	
Married, living together with husband; N (%)		1921 (78.4)
Unmarried, living together with partner; N (%)		468 (19.1)
Unmarried and without partner, divorced or widowed; N (%)		60 (2.4)
Educational level	2439	
Low (< 10 years of schooling); N (%)		274 (11.2)
Medium (10 years of schooling); N (%)		794 (31.8)
High (university entrance level); N (%)		1371 (56.2)
Employed before giving birth; N (%)	2444	2139 (87.5)
Born in Germany; N (%)	2451	2077 (84.7)
Statutory health insurance, N (%)	2443	2080 (85.1)
Health literacy; M (SD)	2403	35.43 (7.24)

Notes: M: mean; SD: standard deviation

Health literacy: health care scale of the HLS-EU questionnaire

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

	Item No	Recommendation	Manuscript page
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	1
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3
Objectives	3	State specific objectives, including any prespecified hypotheses	3, 4
Methods			
Study design	4	Present key elements of study design early in the paper	3, 4
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	4
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants	4
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	4, 5
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	4, 5
Bias	9	Describe any efforts to address potential sources of bias	/
Study size	10	Explain how the study size was arrived at	4
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	4, 5, 6
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	5, 6
		(b) Describe any methods used to examine subgroups and interactions	/
		(c) Explain how missing data were addressed	5
		(d) If applicable, describe analytical methods taking account of sampling strategy	/
		(e) Describe any sensitivity analyses	/
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	4 (sample), 6 results
		(b) Give reasons for non-participation at each stage	/
		(c) Consider use of a flow diagram	

Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	Online supplementary table, 6
		(b) Indicate number of participants with missing data for each variable of interest	Online supplementary table
Outcome data	15*	Report numbers of outcome events or summary measures	6, figure 1
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	Tables 1 -3; 5, 6
		(b) Report category boundaries when continuous variables were categorized	5
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	/
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	/
Discussion			
Key results	18	Summarise key results with reference to study objectives	9
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	11, 12
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	10, 11
Generalisability	21	Discuss the generalisability (external validity) of the study results	12
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	14

*Give information separately for exposed and unexposed groups.

BMJ Open

Information on, knowledge and utilization of support services during pregnancy and after childbirth: cross-sectional analyses of predictors using data from the KUNO Kids health study

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2020-037745.R1
Article Type:	Original research
Date Submitted by the Author:	10-Aug-2020
Complete List of Authors:	Brandstetter, Susanne; University Children's Hospital Regensburg (KUNO-Clinics), University of Regensburg Rothfuß, David; Coordinating Center for Early Interventions, City of Regensburg Seelbach-Göbel, Birgit ; Clinic of Obstetrics and Gynecology St. Hedwig, University of Regensburg Melter, Michael; University Children's Hospital Regensburg (KUNO-Clinics), University of Regensburg Kabesch, Michael; University Children's Hospital Regensburg (KUNO-Clinics), University of Regensburg Apfelbacher, Christian; University Children's Hospital Regensburg (KUNO-Clinics), University of Regensburg
Primary Subject Heading:	Health services research
Secondary Subject Heading:	Epidemiology, Obstetrics and gynaecology, Paediatrics
Keywords:	EPIDEMIOLOGY, Maternal medicine < OBSTETRICS, Community child health < PAEDIATRICS, PUBLIC HEALTH

SCHOLARONE™
Manuscripts



I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our [licence](#).

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which [Creative Commons](#) licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

1
2
3 **Information on, knowledge and utilization of support services during pregnancy and after**
4 **childbirth: cross-sectional analyses of predictors using data from the KUNO Kids health study**
5
6

7 *Susanne Brandstetter (1), David Rothfuß (2), Birgit Seelbach-Göbel (3), Michael Melter (1), Michael*
8 *Kabesch (1), Christian Apfelbacher (1, 4) and the KUNO Kids study group*
9

10 *1) University Children's Hospital Regensburg (KUNO-Clinics), University of Regensburg, Regensburg,*
11 *Germany*
12

13 *2) Coordinating Center for Early Interventions, City of Regensburg, Regensburg, Germany*
14

15 *3) Clinic of Obstetrics and Gynecology St. Hedwig, University of Regensburg, Regensburg, Germany*
16

17 *4) Institute of Social Medicine and Health Systems Research, Otto von Guericke University*
18 *Magdeburg, Magdeburg, Germany*
19

20
21
22
23 *Corresponding author:*

24 *Dr. Susanne Brandstetter*

25 *University Children's Hospital Regensburg (KUNO-Clinics), University of Regensburg*
26

27 *Klinik St. Hedwig, Steinmetzstraße 1-3, 93049 Regensburg, Germany*
28

29 *E-mail: susanne.brandstetter@ukr.de*
30

31 *Telephone number: 0049-941-3695826*
32
33
34

35 *Word count: 2963*
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

ABSTRACT

Objectives: To investigate mothers' knowledge and utilization of antenatal and perinatal support services as well as predictors of knowledge and service utilization.

Design: Cross-sectional study

Setting: Prospective birth cohort in Regensburg, Eastern Bavaria, Germany

Participants: 2455 mothers after delivery

Outcome measures: Participants' knowledge of distinct antenatal and perinatal support services (poor vs. good, defined by median split). Participants' use of antenatal services provided by midwife (yes, no) and of any other antenatal support services (yes, no).

Results: The vast majority of mothers knew at least some support services. Two thirds of women (68.4%) reported to have used the services provided by midwives. 23.6% of women reported to have used at least one of the other antenatal services. Good knowledge of services was associated with higher education (OR (odds ratio): 1.37, 95% CI (95% confidence interval): 1.13-1.67), no migration background (OR: 2.26, 95% CI: 1.76-2.90), better health literacy (OR: 1.04, 95% CI: 1.03-1.06), while being primiparous (OR: 0.72, 95% CI: 0.60-0.86) and being unmarried/living with a partner (OR: 0.71; 95% CI: 0.57-0.89) reduced the chance. Predictors of service utilization differed with regard to the services considered.

Conclusions: Overall, mothers had a good level of knowledge of antenatal and perinatal support services. However, we found that some groups of women were less well informed. This inequality in social predictors of knowledge of services was also partly reflected in differences in service utilization during pregnancy.

Key words: antenatal services; perinatal services; mothers; health service utilization; knowledge; midwives; psychosocial services

Strengths and limitations of this study

- This study used data from a large sample of mothers who were comprehensively characterized.
- This study succeeded at assessing data at a crucial point of time – during the first days after delivery of a child.
- A large variety of different support services was considered.

- Findings on service utilization must be interpreted with caution as women's objective need for service use was not assessed in the study.
- The study sample is restricted to women who agreed to participate with their newborn child in a birth cohort study and selection bias cannot be excluded.

For peer review only

INTRODUCTION

Pregnancy and the transition to parenthood are important life events for expectant parents. While these periods are characterized by manifold requirements and adjustments of everyday life for all expectant parents some people may also be confronted with major psychosocial challenges.

Problems can arise from the health of the woman or the child, partnership, financial situation, consequences of parenthood for employment and housing as well as dealing with expectations of family members and the society. Particularly vulnerable women may experience an exacerbation of problems during pregnancy and could potentially benefit from professional support during the antenatal and perinatal period.

In Germany, medical antenatal care for pregnant women is typically provided by physicians specialized in obstetrics/gynaecology. These services are highly utilized;¹ the majority of women is using even more than the recommended antenatal care visits.² After childbirth, child health check-up examinations are provided by paediatricians or general practitioners. Overall, utilization of child health check-ups is high, particularly for those examinations which are directed to very young children: According to the representative KiGGS survey (wave 1: 2009-2012), 97.5% of children participated in the examination scheduled for the 4th week of life.³ Pregnant women are also encouraged to engage a midwife and to participate in antenatal classes, mostly provided by midwives or nurses. Midwives are working in private practice and the costs for midwifery care are reimbursed by mandatory statutory or private health insurance. In addition to these offers from health care providers, various other support and counselling services exist in Germany intended to cover the needs of women and families during the antenatal and perinatal period.⁴ These services are mostly run by the municipalities, entail both health related and social services, some of them with low barrier, others more difficult to access.

A previous study by Eickhorst and colleagues investigated parents' knowledge and use of a wide variety of services for pregnancy and early childhood in Germany.⁵ Between 2014 and 2015, about 8000 parents of children between four weeks and three years of age were included in the study; recruitment of parents took place during their visit to a paediatrician. The authors found a social gradient in knowledge of services and programmes – parents with a higher level of education (considering both school and professional education) knew more of the services and programmes – and a differential effect of education on utilization of programmes: While services provided from midwives and educational classes for parents were more often used by families with higher level of education, families with lower level of education more often utilized counselling services such as pregnancy counselling centre or family support services. That study has dealt with knowledge and utilization of parents during their child's first years of life when parents might have had many

1
2
3 contacts to health care providers and might have had manifold opportunities to learn about services
4 and programmes. In contrast, the present study focuses on the situation of mothers immediately
5 after the birth of a child. We consider this a crucially important point in time: mothers are about to
6 be discharged from hospital to their home and have to manage the transition to parenthood. It is of
7 uppermost importance that they know which support services are available for them. Therefore we
8 aimed at describing which services are known by mothers after the birth of a child and which services
9 were already utilized during pregnancy, using data from a large birth cohort study. In addition,
10 predictors of knowledge and utilization of services were explored.
11
12
13
14
15
16
17
18
19
20
21

22 **METHODS**

23 **Design**

24
25 The KUNO Kids health study is an ongoing birth cohort study situated in Regensburg, Eastern Bavaria
26 (Germany). Rationale and design of the study have already been described elsewhere.⁶ Briefly, adult
27 mothers giving birth in the St Hedwig clinic (the university maternity and children's hospital in the
28 study region) are asked to participate in the study. Basic German language proficiency is considered
29 necessary for understanding the study procedures. There are no exclusion criteria with regard to
30 health or illness of mother or child. Data collection includes an interview with questions about
31 knowledge and utilization of antenatal and perinatal services as well as questions regarding socio-
32 demographic and psychosocial information. Data are collected by trained medical students using a
33 computer-assisted personal interview (CAPI) during the hospital stay of mother and child after birth.
34 The study has been approved by the Ethics Committee of the University of Regensburg (file number:
35 14-101-0347). Written informed consent is obtained from each mother.
36
37
38
39
40
41
42
43
44

45 **Sample**

46
47 The study sample includes mothers who gave birth between July 2015 and June 2018. 2520 mothers
48 were included in the study sample, of whom 2494 participated in data assessment relevant for this
49 analysis.
50
51
52

53 **Measurement of outcomes and predictors**

54
55 Outcomes: Knowledge of antenatal and perinatal support services as well as utilization of antenatal
56 support services were assessed. Mothers were asked whether they knew a specific service (yes, no)
57 and - for those services which can be used during pregnancy - whether they had utilized them (yes,
58
59
60

no). The services considered in this study comprised

- midwife: antenatal and perinatal health care for mother and child,
- paediatric nurse: care and support for families with infants with disabilities or diseases
- pregnancy counselling centre: counselling services with a focus on financial support, family conflicts, unwanted pregnancy
- counselling centre for breastfeeding: counselling for breastfeeding and child nutrition
- counselling centre for infant crying: counselling for families with infants who cry intensely and persistently
- family centre/family support services: counselling and advice for families
- coordinating child protection office (“KOKI”): comprehensive support for families at risk
- youth welfare office: counselling with focus on care, education and protection of the child
- education counselling centre: counselling with focus on child care and education
- community centre/projects: various offers, located in the neighbourhood
- “fit for family”: regional programmes provided by nurses/midwives during pregnancy and infancy
- and other.

The selection of services considered in this study reflects the offers widely available in Germany and additionally those offers which are particularly available in the study region.

Further, it was assessed through which sources mothers received information about these services (obstetrician/gynaecologist, midwife, hospital, paediatrician, family/friends, searching for oneself, other).

Predictors of knowledge and utilization of services: Sociodemographic information, parity, health literacy and health insurance status were considered potentially predictive variables of knowledge and utilization of services. Sociodemographic variables included age (years), marital status (married and living with husband, unmarried and living together with partner, unmarried and living without partner/divorced /widowed), migration background (born in Germany, born outside of Germany), educational level (< 10 years of schooling, 10 years of schooling, university entrance level) and employment before giving birth (yes, no). Parity was categorized into primiparous vs. multiparous. Women’s health literacy was assessed using the health care scale of the HLS-EU questionnaire.⁷ Health insurance status was categorized into statutory health insurance vs. private or other health insurance.

Statistics

Characteristics of the study sample are described using means and standard deviation for metric variables and percentages and frequencies for categorical variables. Missing values were not

1
2
3 imputed. First, knowledge and utilization of services as well as information sources about services
4 are presented by descriptive statistics. Then, variables on knowledge and utilization of services were
5 aggregated in order to use them as outcome variables in prediction modelling. A variable indicating
6 the total number of services known was created. Median split was used to derive two categories
7 (poor vs. good knowledge). Regarding the use of services, two variables were built: the use of
8 services provided by midwives (yes, no) and the use of any other antenatal service (yes, no). Finally,
9 predictive regression modelling was performed for analysing predictors of knowledge and utilization
10 of services. For all predictors univariable logistic regression models with knowledge and utilization as
11 outcomes were calculated, respectively. Variables which were associated with the outcome in
12 univariable analysis (criterion $p \leq .2$) were entered into the multivariable model. All analyses were
13 performed using SPSS.23.

21 22 **Patient and public involvement**

23
24 Parents were not involved in the design and conduct of this study. Findings of this study will be
25 disseminated to study participants by regular newsletters which summarize novel findings gained
26 from the KUNO Kids health study.
27
28
29
30
31
32
33

34 **RESULTS**

35 36 **Descriptive results**

37
38 The characteristics of the study sample are summarized in an online supplementary table. 2455
39 women provided data on knowledge and utilization of antenatal and perinatal social and health
40 related services (see figure 1). More than 90% of mothers knew the services offered by midwives and
41 youth welfare offices, however, only about 30% knew the coordinating child protection office and
42 community projects. The median number of services known was 8 (IQR: 6-9).
43
44
45
46
47

48 Figure 2 gives an overview on which of the social and health related services had already been used
49 by study participants during pregnancy. By far the most frequently used services were those
50 provided by midwives: Two thirds of women (68.4%) reported to have used them. Pregnancy
51 counselling office and the youth welfare service were used by 14.0% and 9.9% of mothers,
52 respectively. 23.6% of women reported to have used at least one of the antenatal services (excluding
53 the use of midwives).
54
55
56
57

58 When mothers were asked about the sources of information they had used to learn about the
59 various social and health related services the most frequently reported answer was that they had
60

1
2
3 researched on their own (72.8%), followed by information provided through family and friends
4 (56.3%). Health care professionals were named as information source by 20 to 50% of study
5 participants: gynaecologist/obstetrician (46.9%), paediatrician (13.1%), hospital (30.2%), midwife
6 (30.8%). Overall, two thirds of women reported that they had been informed about antenatal and
7 perinatal social and health related services by a health care professional.
8
9
10
11
12
13
14
15
16

17 Analytical results

18
19 Tables 1 to 3 show the results of the univariable and multivariable logistic regression analyses.

20
21 *Good knowledge of services* was defined by median split as knowing at least 8 distinct services. In the
22 multivariable model, higher education (OR (odds ratio): 1.37, 95% CI (95% confidence interval): 1.13-
23 1.67), no migration background (OR: 2.26, 95% CI: 1.76-2.90) and better health literacy (OR: 1.04,
24 95% CI: 1.03-1.06) significantly increased the chance of good knowledge of services, while being
25 primiparous (OR: 0.72, 95% CI: 0.60-0.86), being unmarried/living with a partner (OR: 0.71; 95% CI:
26 0.57-0.89) and lower education significantly reduced the chance (OR: 0.68, 95% CI: 0.51-0.92) (see
27 table 1).
28
29
30
31
32
33

34 **Table 1: Predictors of good knowledge of antenatal and perinatal social services: univariable and**
35 **multivariable logistic regression analyses**

	<i>univariable</i>			<i>multivariable</i>		
	OR	95% CI	<i>p</i>	OR	95% CI	<i>p</i>
Age (years)	1.05	1.03-1.07	<.001	1.02	1.00-1.04	.055
Primiparous (vs. multiparous)	0.69	0.60-0.81	<.001	0.72	0.60-0.86	<.001
Marital status ^a						
Married, living together with husband	ref.			ref.		
Unmarried, living together with partner	0.66	0.54-0.81	<.001	0.71	0.57-0.89	.003
Unmarried and without partner, divorced or widowed	0.83	0.50-1.39	.482	0.99	0.57-1.71	.960
Educational level ^b						
Low (< 10 years of schooling)	0.60	0.45-0.79	<.001	0.68	0.51-0.92	.011
Medium (10 years of schooling)	ref.			ref.		
High (university entrance level)	1.39	1.17-1.66	<.001	1.37	1.13-1.67	.002
Employed before giving birth	1.28	1.01-1.63	.041	1.12	0.86-1.47	.389
Born in Germany	2.19	1.75-2.75	<.001	2.26	1.76-2.90	<.001

Statutory health insurance (vs. private or other health insurance)	0.58	0.46-0.73	<.001	1.20	0.93-1.53	.163
Health literacy	1.05	1.04-1.06	<.001	1.04	1.03-1.06	<.001

Notes: Multivariable analysis: N=2349; Nagelkerke's R²: .10

^a: univariable analysis: omnibus test: $\chi^2=16.22$ (df=2), p<.001; ^b: univariable analysis: omnibus test: $\chi^2=44.94$ (df=2), p<.001

Good knowledge of services was defined by median split as knowledge of at least 8 services.

OR: Odds Ratio; 95% CI: 95% Confidence Interval; p: p-value; ref.: reference category

Health literacy: health care scale of the HLS-EU questionnaire

The utilization of antenatal services provided by a midwife was significantly associated with parity, education and migration background. In the multivariable model, first-time mothers (OR: 1.77, 95% CI: 1.48-2.12) were more likely to have utilized the services of midwives as well as women who were born in Germany (OR: 1.53, 95%-CI: 1.20-1.95). When compared with medium educational level a higher educational level was associated with an increased chance of service utilization (OR: 1.37, 95% CI: 1.12-1.67) and a lower educational level was associated with a decreased chance (OR: 0.67, 95% CI: 0.50-0.89) (see table 2).

Table 2: Predictors of utilization of services provided by midwives during pregnancy: univariable and multivariable logistic regression analyses

	univariable			multivariable		
	OR	95% CI	p	OR	95% CI	p
Age (years)	1.00	0.98-1.02	.741			
Primiparous (vs. multiparous)	1.81	1.52-2.15	<.001	1.77	1.48-2.12	<.001
Marital status ^a						
Married, living together with husband	ref.			ref.		
Unmarried, living together with partner	0.93	0.75-1.16	.543	0.85	0.68-1.07	.180
Unmarried and without partner, divorced or widowed	0.55	0.32-0.92	.024	0.63	0.37-1.08	.091
Educational level ^b						
Low (< 10 years of schooling)	0.62	0.47-0.82	.001	0.67	0.50-0.89	.006
Medium (10 years of schooling)	ref.			ref.		
High (university entrance level)	1.38	1.14-1.67	.001	1.37	1.12-1.67	.002
Employed before giving birth	1.41	1.10-1.80	.007	1.09	0.83-1.41	.539
Born in Germany	1.56	1.24-1.95	<.001	1.53	1.20-1.95	.001
Statutory health insurance (vs. private or other health insurance)	0.71	0.55-0.91	.008	1.12	0.86-1.47	.399

Health literacy 0.99 0.98-1.01 .394

Notes: Multivariable analysis: N=2428; Nagelkerke's R²: .06

^a: univariable analysis: omnibus test: $\chi^2=5.15$ (df=2), p=.076; ^b: univariable analysis: omnibus test: $\chi^2=37.92$ (df=2), p<.001

OR: Odds Ratio; 95% CI: 95% Confidence Interval; p: p-value; ref.: reference category

Health literacy: health care scale of the HLS-EU questionnaire

For the utilization of any antenatal service (excluding the services provided by midwives), the multivariable model yielded statistically significant associations for age, parity, marital status, educational level and health insurance status, with higher age (OR: 0.95, 95% CI: 0.92-0.97) and having a statutory health insurance (OR: 0.64, 95% CI: 0.46-0.90) decreasing the chance of any service utilization, while being primiparous (OR: 1.61, 95% CI: 1.28-2.03), being unmarried/living with a partner (OR: 5.48, 95% CI: 4.36-6.90), living without a partner/being divorced/widowed (OR: 10.78, 95% CI: 6.15-18.87) and having a higher educational level (OR: 1.44, 95% CI: 1.13-1.84) (compared to a medium level of education) increased the chance of service utilization (see table 3).

Table 3: Predictors of utilization of any antenatal social service (excluding midwives): univariable and multivariable logistic regression analyses

	univariable			multivariable		
	OR	95% CI	p	OR	95% CI	p
Age (years)	0.92	0.90-0.94	<.001	0.94	0.92-0.97	<.001
Primiparous (vs. multiparous)	2.13	1.75-2.60	<.001	1.61	1.28-2.03	<.001
Marital status ^a						
Married, living together with husband	ref.			ref.		
Unmarried, living together with partner	6.42	5.15-8.00	<.001	5.48	4.36-6.90	<.001
Unmarried and without partner, divorced or widowed	9.75	5.68-16.73	<.001	10.78	6.15-18.87	<.001
Educational level ^b						
Low (< 10 years of schooling)	1.76	1.30-2.39	<.001	1.28	0.90-1.82	.165
Medium (10 years of schooling)	ref.			ref.		
High (university entrance level)	1.12	0.91-1.39	.274	1.44	1.13-1.84	.003
Employed before giving birth	0.77	0.59-1.01	.059	0.76	0.55-1.05	.095
Born in Germany	0.92	0.71-1.18	.512			
Statutory health insurance (vs. private or other health insurance)	1.83	1.35-2.48	<.001	0.64	0.46-0.90	.009
Health literacy	1.00	0.99-1.01	.946			

Notes: Multivariable analysis: N=2400; Nagelkerke's R²: .22

^a: univariable analysis: omnibus test: $\chi^2=319.05$ (df=2), p<.001; ^b: univariable analysis: omnibus test:

1
2
3 $\chi^2=13.07$ (df=2), p=.001

4 OR: Odds Ratio; 95% CI: 95% Confidence Interval; p: p-value; ref.: reference category

5 Health literacy: health care scale of the HLS-EU questionnaire
6
7
8
9

10 11 **DISCUSSION**

12
13 This study investigated knowledge and utilization of antenatal and perinatal support services among
14 a large sample of mothers of newborns. The most important findings are as follows: Knowledge of
15 support services was high and the vast majority of mothers knew at least a few services. However,
16 some specific services were not well known and sociodemographic factors were found to be
17 associated with both knowledge and utilization of services. The most frequently reported source of
18 information about support services was women's own research and information seeking.
19

20
21 Our study revealed a social gradient: women with a higher level of education and without migration
22 background were more likely to have good knowledge of the support services considered in our
23 study. These results corroborate previous findings by Eickhorst and colleagues who investigated
24 knowledge of services among parents of children between 0-3 years of age in Germany⁵ and found
25 that education and migration background were determinants of knowledge of psychosocial support
26 services.
27

28
29 Depending on which services were considered our study yielded different factors associated with the
30 utilization of services. While the use of a midwife during pregnancy was associated with variables
31 indicative of higher social status (higher education, no migration background) the most important
32 predictor for the use of any other support service was marital status. Women who were divorced or
33 living without a partner were much more likely to have used any antenatal social service. A possible
34 explanation for this finding is that these women experienced and also anticipated strains they could
35 not have coped with without a partner.
36

37
38 Moreover, we found that first-time mothers were less likely to have good knowledge of the different
39 support services suggesting that mothers develop a more comprehensive knowledge about services
40 during parenthood. However, despite first-time mothers' poorer knowledge they were also more
41 likely to use both the midwife or any other antenatal service. This corresponds to the results of a
42 study from Sweden which analysed parity and health service utilization and found that first-time
43 mothers used child health services more often.⁸
44

45
46 Overall, the predictive models for knowledge or utilization of services in our study explained only
47 small proportions of the variance observed between study participants (6-22%). This indicates that
48
49
50
51
52
53
54
55
56
57
58
59
60

1
2
3 variables beyond individual characteristics and social factors considered in our study are likely to be
4 relevant for the prediction of knowledge and use of antenatal and perinatal services.
5
6

7 The services provided by midwives are of particular interest since these services were by far the best
8 known and also the most utilized services investigated in our study. This is in line with findings from
9 the abovementioned study from Germany.⁵ Nevertheless, about one third of women in our study
10 reported to have not used the services of a midwife before delivery. As already mentioned antenatal
11 midwifery care is reimbursed by health insurance in Germany; however, pregnant women are
12 supposed to engage a midwife on their own. Our findings do not allow to draw conclusions as to
13 whether women did not wish to engage a midwife or whether there were other barriers. While the
14 association with parity suggests that mothers who had already given birth to a child before might
15 have had the perception to be less in need of a midwife there were also associations with lower level
16 of education and migration background suggesting difficulties in accessibility of services. With regard
17 to the latter a focus group with pregnant women and mothers revealed that the knowledge about
18 specific offers and competences of midwives is scarce and that access to and availability of midwives
19 can be limited in Germany.⁹
20
21
22
23
24
25
26
27
28

29 Remarkably, our findings on information sources about social services which were recalled by
30 mothers show that the medical professions and institutions were not the predominant source for
31 information. Less than half of study participants mentioned that their gynaecologist/obstetrician had
32 provided information on support services.
33
34
35
36
37
38

39 Findings on knowledge and utilization of support services must not be interpreted without
40 considering the context of the national health care and welfare system: In Germany, on the one
41 hand, the situation for pregnant women and mothers of infants is characterized by the availability of
42 comprehensive and highly specialized medical and social care services whose use is free of charge or
43 reimbursed by (mandatory) health insurance. On the other hand, the system is very complex and -
44 despite some efforts during the past years - still remarkably fragmented. This applies to the division
45 between the medical and the social sector, ambulatory and stationary health care, as well as to
46 providers from different professional backgrounds who might pursue distinct goals and assume
47 different perspectives.¹⁰ Fragmentation can cause over-utilization since people use different services
48 simultaneously and important information for patient care and counselling can be lost if transitions
49 are not standardized and communication between providers is not clearly structured. In addition,
50 navigating through the system may be challenging for some women as pertaining inequalities in
51 service utilization suggest: Large scale surveys found a social gradient in utilization of medical
52
53
54
55
56
57
58
59
60

1
2
3 antenatal visits¹¹, non-medical antenatal visits ¹² and of health check-up examinations for children.³
4 Women's difficulties in accessing antenatal and postnatal care were also described by qualitative
5 studies. ^{9 13}
6
7

8
9 In the light of this, already in 2006, the Early Childhood Intervention Programme ("Frühe Hilfen") was
10 implemented in Germany.⁴ It aims at the provision of psychosocial services by establishing structures
11 which facilitate the cooperation of different service providers. However, collaboration and
12 cooperation across and between sectors and disciplines remains a challenge, ¹⁴ corroborating
13 findings from other countries and health systems. ^{15 16} Only about one third of participants in our
14 study knew the institution which coordinates the services of the Early Childhood Intervention
15 Programme (coordinating child protection office).
16
17
18
19

20
21 One might argue as to whether women are really supposed to know all the different services which
22 are available to pregnant women and mothers. Provided that all health/social care professionals are
23 well trained and have the capabilities to recognize the different needs of women (e.g. practical
24 support, medical care, mental health care) and given that utilization rates of medical antenatal care¹
25 and child health check-up examinations are very high³ it does not seem to be necessary that every
26 woman is an expert herself for all antenatal and perinatal services available. However, the services
27 differ widely in scope and not all providers of services are equally equipped for meeting the different
28 needs: for instance, paediatricians in Germany were found to be reluctant and to struggle to address
29 psychosocial problems during the child health check-up examinations.^{17 18} This was also shown for
30 other health professionals in studies from Ireland and Canada: Midwives and nurses experienced
31 many barriers when dealing with mental health issues of their patients.^{19 20}
32
33
34
35
36
37
38
39

40
41 It would be desirable for the health and social care system to be designed in a way that enables
42 women to identify and to access support so that access becomes less dependent on individual
43 women's capacity. Different approaches which strengthen the continuity of care or even foster
44 integrated care have been proposed. ^{21 22} While many studies from Germany and other countries
45 with fragmented health services unravelled that mothers prefer continuous and coordinated care ^{9 23}
46 ²⁴ such approaches have not yet been fully implemented in Germany. They would require a re-
47 orientation of health and social services and build on the local and regional infrastructure. Within the
48 existing system the potential for collaboration between the service providers is not sufficiently
49 exploited. Our finding that a remarkable proportion of participants did not receive information about
50 support services through health professionals points in this direction.
51
52
53
54
55
56
57
58
59
60

Strengths and limitations

This study succeeded at assessing mothers' knowledge of services at a crucial point of time:

Interviews were performed at the first days after delivery, before mother and newborn were referred from the hospital to their home. It is important to understand whether mothers are aware of the services available when they return to their home with their newborn child. The large sample size allowed to perform multivariable analysis considering various predictive factors of knowledge and service utilization.

The inclusion criteria applied in KUNO Kids health study led to the exclusion of underaged mothers and of mothers who could not understand the information on study procedures presented in German language. Regarding knowledge and utilization of antenatal and perinatal services, this approach might have excluded women with particular need for those services and our study might overestimate the extent of both knowledge and utilization of services. All data was assessed using self-report measurement instruments which might be prone to social desirability and/or recall bias. Despite data collection was comprehensive and covered many variables potentially relevant for service knowledge or use the proportion of variance explained was small. We cannot exclude that our regression models lacked important predictor variables which would have changed the resulting prediction models remarkably. Moreover, caution must be taken when interpreting our findings on the frequency of service utilization. The women's need for service was not assessed in our study and we cannot draw any conclusions about whether the proportion of women who utilized services was adequate or too low with regard to objective need factors as assessed by psychosocial risk screening. It must be emphasized that both the cross-sectional design of this observational study and the predictive modelling strategy employed do not allow to draw any causal conclusions. Due to the lack of a theoretical model and prespecified analytical pathways our findings on predictors of knowledge and utilization of services cannot be interpreted in terms of single risk factors. However, the study's findings have policy implications and might be useful to inform the development of causal models which should be explored in future studies.

Conclusion

Mothers of infants have a good level of knowledge of antenatal and perinatal support services. However, some services are only known by about one third of mothers. Social determinants of knowledge and of utilization of services suggest inequality with regard to the preconditions for service utilization. We propose better cooperation between the different service providers. This might help facilitating access to support services during pregnancy and early childhood. Particularly,

1
2
3 first-time mothers and socially disadvantaged women who were found to have poorer knowledge of
4 services could benefit from such measures.
5
6
7
8
9
10
11
12
13

14 **Contributors:** SB designed the study, performed data analysis, interpreted the study findings, drafted
15 the manuscript and critically evaluated the manuscript. DR contributed to the design of the study,
16 helped interpreting the study findings, critically evaluated the manuscript and approved the final
17 manuscript. B S-B contributed to data collection, critically evaluated the manuscript and approved
18 the final manuscript. MM contributed to data collection, critically evaluated the manuscript and
19 approved the final manuscript. MK contributed to the design of the study and data collection. He
20 critically evaluated the manuscript and approved the final manuscript. CA designed the study,
21 interpreted study findings and drafted the manuscript. He critically evaluated the manuscript and
22 approved the final manuscript.
23
24
25
26
27
28

29
30 **Funding:** The KUNO-Kids health study was funded by research grants of the EU (HEALS: 603946).
31 Further financial support was provided by the University Children's Hospital of the University of
32 Regensburg (KUNO-Clinics) and the clinic "St. Hedwig" (Hospital "Barmherzige Brüder Regensburg").
33
34

35
36 **Ethics:** The study has been approved by the Ethics Committee of the University of Regensburg (file
37 number: 14-101-0347). Informed consent was obtained from all individual participants included in
38 the study.
39
40

41 **Competing interests:** The authors declare that they have no competing interests.
42
43

44 **Data availability statement:** Deidentified participant data which were analysed for this manuscript
45 can be obtained upon reasonable request from the corresponding author.
46
47
48
49

50 **Acknowledgements**

51
52 We would like to thank all families who participate in the KUNO-Kids birth cohort study as well as all
53 medical students, nurses, midwives, physicians, and researchers who facilitated the recruitment of
54 participants and data collection. Further, we thank all members of the KUNO-Kids study group: Petra
55 Arndt (ZNL Transfercenter of Neuroscience and Learning, University of Ulm, Ulm, Germany), Andrea
56 Baessler (Department of Internal Medicine II, Regensburg University Medical Center, Regensburg,
57 Germany), Mark Berneburg (Department of Dermatology, University Medical Centre Regensburg,
58
59
60

1
2
3 Regensburg, Germany), Stephan Böse-O'Reilly (Institute and Clinic for Occupational, Social and
4 Environmental Medicine, University Hospital, LMU Munich, Munich, Germany), Romuald Brunner
5 (Clinic of Child and Adolescent Psychiatry, Psychosomatics and Psychotherapy, Bezirksklinikum
6 Regensburg (medbo), Regensburg, Germany), Wolfgang Buchalla (Department of Conservative
7 Dentistry and Periodontology, University Hospital Regensburg, University of Regensburg,
8 Regensburg, Germany), Sara Fill Malferteiner (Clinic of Obstetrics and Gynecology St. Hedwig,
9 University of Regensburg, Regensburg, Germany), Andre Franke (Institute of Clinical Molecular
10 Biology, Christian-Albrechts-University of Kiel, Kiel, Germany), Sebastian Häusler (Clinic of Obstetrics
11 and Gynecology St. Hedwig, University of Regensburg, Regensburg, Germany), Iris Heid (Department
12 of Genetic Epidemiology, University of Regensburg, Regensburg, Germany), Caroline Herr (Bavarian
13 Health and Food Safety Authority (LGL), Munich, Germany), Wolfgang Högler (Department of
14 Pediatrics and Adolescent Medicine, Johannes Kepler University Linz, Linz, Austria), Sebastian Kerzel
15 (Department of Pediatric Pneumology and Allergy, University Children's Hospital Regensburg, St.
16 Hedwig Campus, Regensburg, Germany), Michael Koller (Center for Clinical Studies, University
17 Hospital Regensburg, Regensburg, Germany), Michael Leitzmann (Department of Epidemiology and
18 Preventive Medicine, University of Regensburg, Regensburg, Germany), David Rothfuß (City of
19 Regensburg, Coordinating Center for Early Interventions, Regensburg, Germany), Wolfgang Rösch
20 (Department of Pediatric Urology, University Medical Center, Regensburg, Germany), Bianca Schaub
21 (Pediatric Allergology, Dept of Pediatrics, Dr. von Hauner Children's Hospital, University Hospital,
22 LMU Munich, Munich, Germany), Bernhard H.F. Weber (Institute of Human Genetics, University of
23 Regensburg, Regensburg, Germany), Stephan Weidinger (Department of Dermatology, Venereology
24 and Allergy, University Hospital Schleswig-Holstein, Campus Kiel, Kiel, Germany) and Sven Wellmann
25 (Children's Hospital St. Hedwig, University of Regensburg, Regensburg, Germany)
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

REFERENCES

1. Brenne S, David M, Borde T, et al. Are women with and without migration background reached equally well by health services? The example of antenatal care in Berlin. *Bundesgesundheitsblatt-Gesundheitsforschung-Gesundheitsschutz* 2015;58(6):569-76. doi: 10.1007/s00103-015-2141-6
2. Schäfers R, Kolip P. [Zusatzangebote in der Schwangerschaft: Sichere Rundumversorgung oder Geschäft mit der Unsicherheit?]. In: Böcken J, Braun B, Meierjürgen R, eds. *Gesundheitsmonitor 2015*: Verlag Bertelsmann Stiftung 2015:119-50.
3. Rattay P, Starker A, Domanska O, et al. [Trends in the utilization of outpatient medical care in childhood and adolescence: results of the KiGGS study - a comparison of baseline and first follow up (KiGGS Wave 1)]. *Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz* 2014;57(7):878-91. doi: 10.1007/s00103-014-1989-1
4. Renner I, Saint V, Neumann A, et al. Improving psychosocial services for vulnerable families with young children: strengthening links between health and social services in Germany. *BMJ* 2018;363:k4786. doi: 10.1136/bmj.k4786
5. Eickhorst A, Schreier A, Brand C, et al. [Knowledge and use of different support programs in the context of early prevention in relation to family-related psychosocial burden]. *Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz* 2016;59(10):1271-80. doi: 10.1007/s00103-016-2422-8
6. Brandstetter S, Toncheva AA, Niggel J, et al. KUNO-Kids birth cohort study: rationale, design, and cohort description. *Mol Cell Pediatr* 2019;6(1):1. doi: 10.1186/s40348-018-0088-z
7. Sørensen K, Van den Broucke S, Pelikan JM, et al. Measuring health literacy in populations: illuminating the design and development process of the European Health Literacy Survey Questionnaire (HLS-EU-Q). *BMC Public Health* 2013;13:948. doi: 10.1186/1471-2458-13-948 [published Online First: 2013/10/12]
8. Lagerberg D, Magnusson M. Utilization of child health services, stress, social support and child characteristics in primiparous and multiparous mothers of 18-month-old children. *Scand J Public Health* 2013;41(4):374-83. doi: 10.1177/1403494813484397
9. Mattern E, Lohmann S, Ayerle GM. Experiences and wishes of women regarding systemic aspects of midwifery care in Germany: a qualitative study with focus groups. *BMC Pregnancy Childbirth* 2017;17(1):389. doi: 10.1186/s12884-017-1552-9
10. Reiss K, Flothkotter M, Greif NP, et al. [Acceptance of Recommendations of "Healthy Start - Young Family Network" on Infant Nutrition and Nutrition for Breastfeeding Mothers. A Survey of Different Professional Groups]. *Gesundheitswesen* 2018;80(5):482-88. doi: 10.1055/s-0042-116587
11. Koller D, Lack N, Mielck A. [Social differences in the utilisation of prenatal screening, smoking during pregnancy and birth weight--empirical analysis of data from the Perinatal Study in Bavaria (Germany)]. *Gesundheitswesen* 2009;71(1):10-8. doi: 10.1055/s-0028-1082310
12. Ludwig A, Miani C, Breckenkamp J, et al. Are Social Status and Migration Background Associated with Utilization of Non-medical Antenatal Care? Analyses from Two German Studies. *Matern Child Hlth J* 2020;24(7):943-52. doi: 10.1007/s10995-020-02937-z
13. Henry J, Beruf C, Fischer T. Access to Health Care for Pregnant Arabic-Speaking Refugee Women and Mothers in Germany. *Qual Health Res* 2020;30(3):437-47. doi: 10.1177/1049732319873620
14. Renner I, Scharmanski S, van Staa J, et al. [The health sector and early childhood intervention: intersectoral collaboration in research]. *Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz* 2018;61(10):1225-35. doi: 10.1007/s00103-018-2805-0
15. Wiczorek CC, Marent B, Dorner TE, et al. The struggle for inter-professional teamwork and collaboration in maternity care: Austrian health professionals' perspectives on the

- 1
2
3 implementation of the Baby-Friendly Hospital Initiative. *BMC Health Serv Res* 2016;16:91.
4 doi: 10.1186/s12913-016-1336-3
- 5 16. Psaila K, Schmied V, Fowler C, et al. Discontinuities between maternity and child and family
6 health services: health professional's perceptions. *BMC Health Serv Res* 2014;14:4. doi:
7 10.1186/1472-6963-14-4
- 8 17. Krippel L, Belzer F, Martens-Le Bouar H, et al. Communicating psychosocial problems in German
9 well-child visits. What facilitates, what impedes pediatric exploration? A qualitative study.
10 *Patient Educ Couns* 2014;97(2):188-94. doi: 10.1016/j.pec.2014.07.032
- 11 18. Barth M. [Pediatrician-parent interaction and early prevention : A review about the limits in
12 addressing psychosocial risks during well-child visits]. *Bundesgesundheitsblatt*
13 *Gesundheitsforschung Gesundheitsschutz* 2016;59(10):1315-22. doi: 10.1007/s00103-016-
14 2426-4
- 15 19. Viveiros CJ, Darling EK. Perceptions of barriers to accessing perinatal mental health care in
16 midwifery: A scoping review. *Midwifery* 2019;70:106-18. doi: 10.1016/j.midw.2018.11.011
- 17 20. Higgins A, Downes C, Monahan M, et al. Barriers to midwives and nurses addressing mental
18 health issues with women during the perinatal period: The Mind Mothers study. *J Clin Nurs*
19 2018;27(9-10):1872-83. doi: 10.1111/jocn.14252
- 20 21. Sandall J, Soltani H, Gates S, et al. Midwife-led continuity models versus other models of care for
21 childbearing women. *Cochrane Database Syst Rev* 2016;4:CD004667. doi:
22 10.1002/14651858.CD004667.pub5
- 23 22. D'Haenens F, Van Rompaey B, Swinnen E, et al. The effects of continuity of care on the health of
24 mother and child in the postnatal period: a systematic review. *Eur J Public Health* 2019 doi:
25 10.1093/eurpub/ckz082
- 26 23. Kurth E, Krahenbuhl K, Eicher M, et al. Safe start at home: what parents of newborns need after
27 early discharge from hospital - a focus group study. *BMC Health Serv Res* 2016;16:82. doi:
28 10.1186/s12913-016-1300-2
- 29 24. Rayment-Jones H, Harris J, Harden A, et al. How do women with social risk factors experience
30 United Kingdom maternity care? A realist synthesis. *Birth* 2019;46(3):461-74. doi:
31 10.1111/birt.12446
- 32
33
34
35
36
37
38
39
40

FIGURES

41
42
43
44
45 Figure 1: Proportions of women who knew specific antenatal and perinatal health and social
46 services (N=2455)
47

48
49
50
51
52
53
54
55
56 Figure 2: Proportions of women who utilized specific antenatal health and social services
57 (N=2455)
58
59
60

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

For peer review only

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

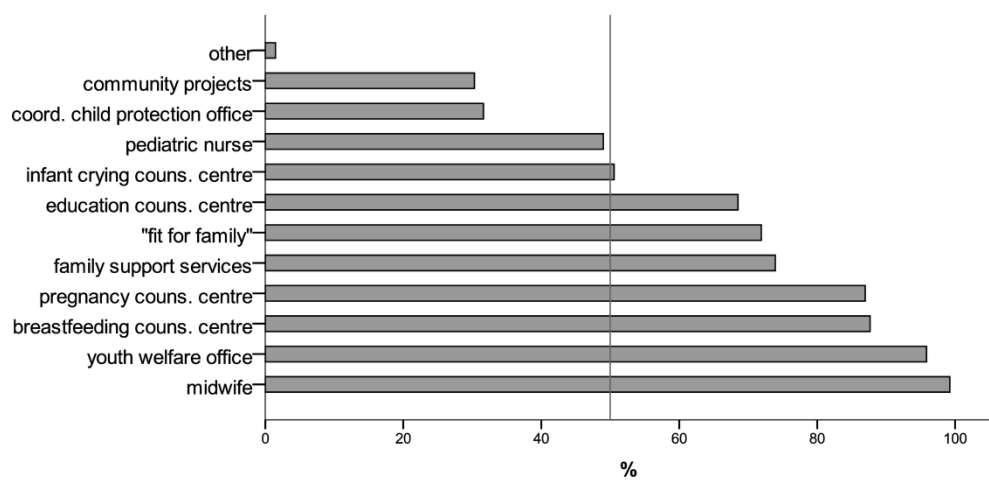


Figure 1: Proportions of women who knew specific antenatal and perinatal health and social services (N=2455)

199x99mm (600 x 600 DPI)

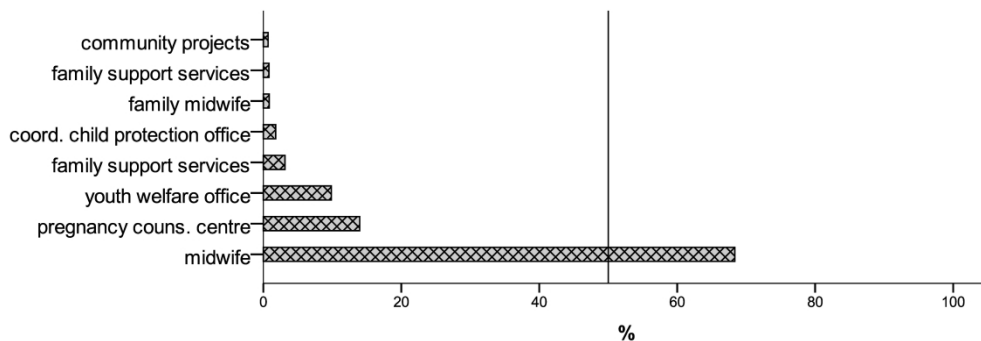


Figure 2: Proportions of women who utilized specific antenatal health and social services (N=2455)

199x69mm (600 x 600 DPI)

Online supplementary table

Characteristics of all study participants and of study participants with data on knowledge and utilization of services

		<i>All participants</i>		<i>Participants with data on knowledge/utilization of services</i>
		<i>N=2494</i>		<i>N=2455</i>
Age (years); M (SD)	2464	34.0 (4.59)	2427	34.0 (4.56)
Primiparous; N (%)	2477	1385 (55.9)	2448	1368 (55.9)
Marital status	2449		2448	
Married, living together with husband; N (%)		1921 (78.4)		1920 (78.4)
Unmarried, living together with partner; N (%)		468 (19.1)		468 (19.1)
Unmarried and without partner, divorced or widowed; N (%)		60 (2.4)		60 (2.5)
Educational level	2439		2438	
Low (< 10 years of schooling); N (%)		274 (11.2)		274 (11.2)
Medium (10 years of schooling); N (%)		794 (32.6)		794 (32.6)
High (university entrance level); N (%)		1371 (56.2)		1370 (56.2)
Employed before giving birth; N (%)	2444	2139 (87.5)	2443	2139 (87.6)
Born in Germany; N (%)	2451	2077 (84.7)	2450	2077 (84.8)
Statutory health insurance, N (%)	2443	2080 (85.1)	2442	2079 (85.1)
Health literacy; M (SD)	2403	35.4 (7.2)	2399	35.4 (7.2)

Notes: M: mean; SD: standard deviation

Health literacy: health care scale of the HLS-EU questionnaire

STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

	Item No	Recommendation	Manuscript page
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	1
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3
Objectives	3	State specific objectives, including any prespecified hypotheses	3, 4
Methods			
Study design	4	Present key elements of study design early in the paper	3, 4
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	4
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants	4
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	4, 5
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	4, 5
Bias	9	Describe any efforts to address potential sources of bias	/
Study size	10	Explain how the study size was arrived at	4
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	4, 5, 6
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	5, 6
		(b) Describe any methods used to examine subgroups and interactions	/
		(c) Explain how missing data were addressed	5
		(d) If applicable, describe analytical methods taking account of sampling strategy	/
		(e) Describe any sensitivity analyses	/
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	4 (sample), 6 results
		(b) Give reasons for non-participation at each stage	/
		(c) Consider use of a flow diagram	

Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	Online supplementary table, 6
		(b) Indicate number of participants with missing data for each variable of interest	Online supplementary table
Outcome data	15*	Report numbers of outcome events or summary measures	6, figure 1
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	Tables 1 -3; 5, 6
		(b) Report category boundaries when continuous variables were categorized	5
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	/
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	/
Discussion			
Key results	18	Summarise key results with reference to study objectives	9
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	11, 12
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	10, 11
Generalisability	21	Discuss the generalisability (external validity) of the study results	12
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	14

*Give information separately for exposed and unexposed groups.