Depression at 2 Months Postpartum:

Results From the French National Perinatal Survey

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Abstract

Objective: Estimate nationwide postpartum depression (PPD) at 2 months prevalence and its related risk factors.

Methods: The representative study sample comprised 7,133 women who were included in a national perinatal population-based survey of all women who gave birth in France in March 2021. Data on maternal characteristics, course of pregnancy/delivery, and child's health were collected from face-to-face interviews in maternity wards and/or medical records and a self-questionnaire (including the Edinburgh Postnatal Depression Scale [EPDS]) at 2 months postpartum. Women with an EPDS score ≥13 were considered to have PPD. Poisson regression models with robust variance were used to estimate adjusted prevalence ratios (aPRs) for PPD.

Results: PPD prevalence at 2 months was 16.7% (95% CI, [15.7–17.7]). Factors significantly associated with PPD were (1) age ≤29 or ≥40 years (maximum aPR = 1.41 95% CI, [1.12–1.77] obtained for 15- to 24-year-olds vs 35- to 39-year-olds); (2) being born in North Africa (1.29 [1.02–1.64] vs France); (3) having a lower level of health literacy (1.23 [1.14–1.35]); (4) having a history of psychological (1.45 [1.24–1.69]) or psychiatric (1.52 [1.23–1.88]) care since adolescence (vs none); (5) receiving little/no support or good support during pregnancy (1.80 [1.52–2.14] and 1.31 [1.15–1.48] vs receiving very good support); (6) reporting feelings of sadness (1.92 [1.65–2.25]), anhedonia (1.69 [1.36–2.11]), or both (2.61 [2.26–3.01]) during pregnancy (vs none of these feelings); and (7) having had an instrumental vaginal delivery (1.18 [1.01–1.38] vs spontaneous vaginal delivery).

Conclusion: These findings on PPD (prevalence and profile of women at higher risk) could guide clinicians and policies on early identification and preventive support for women in the perinatal period.

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The months following childbirth correspond to a time of high vulnerability for women with regard to the possibility of psychiatric disorder onset or relapse.[1] Postpartum depression (PPD) is one of the leading complications for women after childbirth and occurs in between 10% and 20% of mothers worldwide.[2,3]

PPD is a major public health issue because of its frequency and because of potentially harmful consequences for the mother (with a risk of maternal suicide[4]), the mother-child dyad, and the child's development.[5,6] These various consequences underline the importance of public health prevention strategies for women at higher risk of PPD and for affected mothers and the need for early detection, intervention, and support. Treatments exist and can significantly improve the health of mothers and their families.

PPD risk factors have been extensively described. Some are linked to biological changes during pregnancy.[7] Others are associated with medical history (in particular psychiatric or obstetrical history[8–11]), medical problems during pregnancy or delivery,[9,11–13] child's characteristics (self-regulation difficulties, state of health…), self-perceived social support or from partners,[8,11,13] and demographic or socioeconomic characteristics.[10–12,14] As all these factors are closely interrelated, suitable models are required to measure their specific and independent role in PPD.

To date, few studies on PPD have been conducted at the national population level, and few have taken into account the interrelationships between the different risk factors described above. Most of the nationally representative cohort studies are based on relatively old national databases (≤2010).[13,15,16] Thus, as they only included diagnosed PPD assigned during hospitalization or hospital outpatient care, the prevalence of PPD among mothers was underestimated.

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Clinical Points

- One in 6 women seen in clinical practice who have given birth to a liveborn child may have postpartum depression at 2 months postpartum. The Edinburgh Postnatal Depression Scale can be used to assess this.
- Clinicians should watch for the following characteristics in postpartum women: depressive symptoms during pregnancy, history of mental health care, inadequate self-perceived support, low health literacy, young/advanced maternal age, migrant background, and non-spontaneous vaginal delivery.

In France, only 4 cohorts to date have been used to analyze the factors associated with PPD at 2 months. However, none was representative of all the women giving birth in the country, and 3 of the studies were carried out in a few maternity departments with small sample sizes.[9,17–19] The 2021 edition of the repeated French National Population-based Perinatal Survey (2021 ENP), which produces and follows perinatal health indicators in France, provided, for the first time, the opportunity to explore the issue of depression in women at 2 months postpartum.[20]

The aims of the present study were to (1) estimate the prevalence of PPD in mothers in France at 2 months using the 2021 ENP and (2) identify the characteristics associated with a higher risk of PPD in mothers at this same time point.

METHODS

Survey Methodology and Data Collected

The target population was all women giving birth in France in 2021. The 2021 ENP is based on the census of women (≥15 years) who gave birth in France in the same week in March 2021 in all maternity units and birth centers. All women who delivered after at least 22 weeks of amenorrhea and/or had a newborn weighting at least 500 g were eligible. Details and inference to the target population were reported in previous publications.[20,21]

Data were collected at 2 times: (1) at the maternity ward in a face-to-face interview with a midwife and/or from the mother's medical file and (2) at 2 months postpartum, via a telephone interview or an online questionnaire depending on the respondent's preference. Two-thirds (67.5%) of the women interviewed in maternity wards responded to the 2-month postpartum questionnaire.

The interview at the maternity ward collected data on respondents' demographic and socioeconomic characteristics, behavior before and during pregnancy, and the course of medical surveillance during the prenatal period. The data collected from medical records included maternal history, the course of the pregnancy and of the delivery, and the health status of the child. The 2-month postpartum questionnaire collected data on their experience of pregnancy and delivery, the organization of their return to home, their health (with, in particular, the Edinburgh Postnatal Depression Scale [EPDS; see below]), and that of their children.

Participants

For the present analysis, among the 12,723 women included in the 2021 ENP during their maternity stay in metropolitan France, we selected the 7,133 who were interviewed at the maternity and responded to all the 10 EPDS questions of the 2-month postpartum questionnaire (Figure 1). We excluded those women (1) who had not responded to the face-to-face interview at the maternity ward (n = 1,765) and/or at the 2-month postpartum questionnaire (n = 3,564) and (2) who did not answer any or some of the 10 EPDS questions (given their small number: 3.5% of respondents at 2 months).

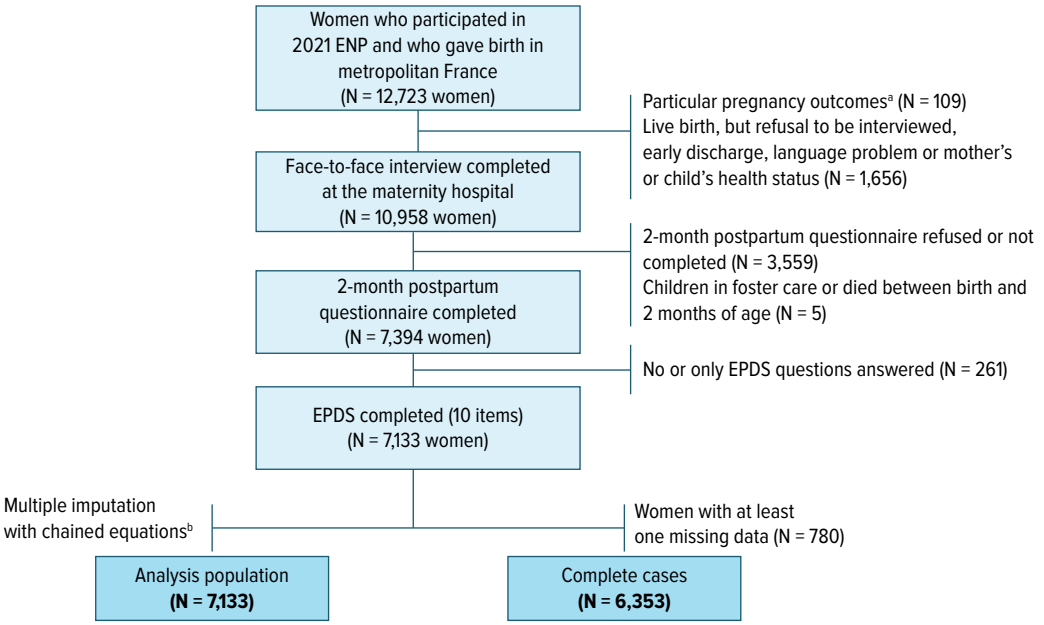
Postpartum depression (PPD). In this study, depressive symptomatology was assessed at 2 months postpartum; this time point is frequently used as mentioned in international literature.[22] Indeed, international nosographies consider that perinatal psychiatric disorders occur during pregnancy and up to 4 (*DSM-5*) or 6 weeks (*International Statistical Classification of Diseases, Eleventh Revision [ICD-11]*) after delivery and whose symptoms have lasted for at least 2 weeks. Then, by testing symptomatology occurring at 2 months postpartum, we are in agreement with the *ICD-11* definition. We used the EPDS, the most widely used tool for assessing perinatal depression in the world. It has been validated in French[23] and comprises a 10-item self-administered questionnaire, with each item scoring from 0 to 3.[24] A recent meta-analysis based on 58 studies recommended using a score ≥13 to identify women who are highly symptomatic and, therefore, are at higher risk of PPD (sensitivity: 66%, specificity: 95% compared to semi-structured interviews).[25] In the present study, an EPDS score ≥13 was considered to be a proxy of PPD. Furthermore, in our study, the prevalence of PPD did not differ according to the type of questionnaire (web or telephone-based) ($P = .314$), suggesting that the psychometric properties of the EPDS are maintained even if administered by telephone.

Covariates

Studied variables were divided into 5 main themes (see below and Table 1 and Supplementary Table 1 for more details).

Maternal demographic and socioeconomic characteristics. Age at childbirth, country of birth, living with a partner, education level, monthly household financial income, social security health care insurance coverage, professional activity during pregnancy, and

Figure 1.
Flowchart of the Study Analysis, the 2021 ENP, France



[a]Stillbirths, abortions, and secret births.
[b]Mechanism of non-response was "missing at random" or "missing not at random," which justified the use of multiple imputation; auxiliary variables used to perform multiple imputation by chain reaction were: monthly household income (in euros), social national security health care insurance, and prematurity.
Abbreviations: ENP = French National Population-based Perinatal Survey, EPDS = Edinburgh Postpartum Depression Scale.

health literacy during pregnancy (mean score of the Health Literacy Questionnaire's sixth domain, "Ability to actively engage with healthcare providers"[26]).

Medical history. History of medical termination of pregnancy and self-declared mental health care history since adolescence. The latter was assessed using the following 3 questionnaire items: (1) "follow-up with a psychologist for at least 3 months," (2) "follow-up with a psychiatrist for at least 3 months," and (3) "hospitalization for a psychological or psychiatric problem." Respondents who answered "yes" to item 2 and/or 3 were considered to have received psychiatric care and/or hospitalization for a psychological/psychiatric reason. Those who answered "yes" only to item 1 were considered to have received psychological care. Respondents who answered "no" to all 3 questions or "no" to items 1 and 2 without providing a reply for item 3 were considered not to have any mental health care history.

Pregnancy-related characteristics. Multiparity, body mass index (BMI) before pregnancy (in kg/m^2), weight change during pregnancy (difference in kg self-declared), self-reported pregnancy-related emergency or walk-in consultation, self-perceived support from loved ones, not having a pregnancy at low obstetrical risk (ie, not meeting the A, A1, and A2 criteria defined in the consensual recommendations of the French National Authority for Health), and finally, declaring feelings of "sadness, despair, hopelessness" and/or "anhedonia" for at least 2 weeks during the pregnancy.

Childbirth-related and child's health characteristics. Mode of delivery, prematurity, birth weight according to gestational age (small, appropriate, or large, defined according to EPOPé curves adjusted for gestational age and sex[27]), and child re-hospitalization(s) during the 2 months after leaving the maternity ward.

Statistical Analysis

Data collected at 2 months postpartum were weighted to compensate correct the non-response bias related to the cohort attrition and to ensure the statistical inference of our results to all women who gave birth in France during the same week in March 2021 as shown in Supplementary Table 2.

As the PPD prevalence is greater than 10% in our study population, we chose to use a Poisson model with robust error variance, which provides in this case estimator more interpretable than logistic regression model.[28] Crude prevalence ratios (PRs) and adjusted prevalence ratios (aPRs) of having PPD at 2 months were therefore estimated.[29] The multivariable model included variables selected based on the literature or study hypotheses (conceptual model) and results from bivariate analyses ($P < .2$). Fractional polynomials showed a linear relationship between continuous

Table 1.

Description of Women Included in the Study Sample and Those Suffering From PPD[a] at 2 Months (Prevalence and Crude Prevalence Ratio) in the 2021 ENP, France (n = 7,133)

			PPD prevalence		Crude PPD prevalence ratio (bivariate analyses)[c]		
	%[b]	[95% CI][b]	%[b]	[95% CI][b]	PR[d]	[95% CI][d]	*P* value[d]
Study sample (n = 7,133)	100.0	...	16.7	[15.7–17.7]	...	...	...
Demographic and socioeconomic characteristics							
Age, y[e]							**.000**
15–24 y	10.7	[9.8–11.6]	20.4	[16.7–24.1]	**1.46**	**[1.17–1.83]**	
25–29 y	28.6	[27.4–29.8]	17.6	[15.6–19.6]	**1.26**	**[1.05–1.50]**	
30–34 y	36.4	[35.1–37.6]	15.7	[14.1–17.2]	1.12	[0.95–1.32]	
35–39 y	19.2	[18.2–20.1]	14.0	[12.1–15.9]	1 (ref)		
≥40 y	5.1	[4.6–5.6]	21.5	[17.0–26.0]	**1.54**	**[1.20–1.97]**	
Country of birth							**.000**
France	80.3	[79.2–81.5]	15.4	[14.4–16.4]	1(ref)		
Other European	3.6	[3.0–4.1]	16.0	[10.3–21.6]	1.04	[0.73–1.49]	
North Africa	6.9	[6.1–7.6]	22.8	[18.0–27.5]	**1.48**	**[1.19-1.84]**	
Other African	5.9	[5.2–6.6]	24.5	[19.5–29.4]	**1.59**	**[1.29–1.97]**	
Other country	3.3	[2.7–3.9]	23.3	[13.9–32.8]	**1.52**	**[1.01–2.28]**	
Not living with a partner	4.9	[4.2–5.5]	26.2	[20.3–32.1]	**1.61**	**[1.28–2.04]**	**.000**
Educational level							.071
<Secondary school diploma	19.1	[17.8–20.3]	18.8	[15.8–21.6]	**1.21**	**[1.02–1.45]**	
Secondary school diploma, 1 or 2 y tertiary education	39.2	[38.0–40.5]	17.0	[15.5–18.6]	1.10	[0.97–1.25]	
≥3 y tertiary education	41.7	[40.4–42.9]	15.5	[14.1–16.8]	1 (ref)		
No professional activity during pregnancy	29.6	[28.2–30.9]	21.0	[18.6–23.4]	**1.41**	**[1.24–1.60]**	**.000**
Health literacy[f]	4.5	[+/– 0.6]	4.3	[+/– 0.7]	**1.54**	**[1.41–1.67]**	**.000**
Medical history/history of mental health care since adolescence							
Mental health care history since adolescence[g]							**.000**
None	84.8	[83.8–85.7]	15.2	[14.2–16.3]	1 (ref)		
Psychological care (for at least 3 mo)	9.6	[8.9–10.4]	23.4	[20.0–26.8]	**1.54**	**[1.31–1.81]**	
Psychiatric care (for at least 3 mo) and/or hospitalization for a psychiatric reason	5.6	[4.9–6.2]	27.3	[22.4–32.2]	**1.79**	**[1.47–2.18]**	
Pregnancy							
Multiparity	58.5	[57.2–59.7]	16.8	[15.3–18.0]	0.99	[0.88–1.11]	.908
Not having a pregnancy at low obstetrical risk[h]	28.8	[27.5–29.9]	19.6	[17.4–21.7]	**1.26**	**[1.10–1.43]**	**.000**
Feelings for at least 2 wk during the pregnancy							**.000**
Sadness, despair, hopelessness	12.4	[11.5–13.2]	24.1	[20.8–27.4]	**2.24**	**[1.90–2.63]**	
Anhedonia	6.1	[5.4–6.7]	21.1	[16.7–25.4]	**1.95**	**[1.56–2.45]**	
Both	14.0	[13.0–15.0]	36.8	[33.0–40.6]	**3.42**	**[2.98–3.92]**	
None	67.5	[66.3–68.8]	10.8	[9.8–11.7]	1 (ref)		
Childbirth							
Mode of delivery							**.008**
Spontaneous vaginal	66.5	[65.3–67.7]	15.8	[14.6–16.9]	1 (ref)		
Instrumental vaginal	12.7	[11.9–13.5]	19.4	[16.5–22.2]	**1.23**	**[1.04–1.45]**	
Scheduled cesarean	7.1	[6.4–7.7]	17.7	[13.8–21.7]	1.12	[0.89–1.42]	
Emergency cesarean before labor	3.1	[2.7–3.6]	24.7	[17.6–31.7]	**1.56**	**[1.16–2.10]**	
Emergency cesarean during labor	10.6	[9.8–11.4]	16.3	[13.5–19.1]	1.03	[0.86–1.25]	
Child health							
Prematurity[i]	6.8	[6.0–7.5]	20.3	[15.3–25.3]	1.24	[0.96–1.59]	.102
Child re-hospitalization(s) during the first 2 months after leaving the maternity ward[g]	7.2	[6.5–7.9]	21.4	[16.9–25.9]	**1.31**	**[1.05–1.63]**	**.015**

[a]An EPDS score ≥13 indicated PPD.
[b]Percentage and related 95% confidence interval (95% CI) for qualitative variables, and mean with SD for quantitative variables, obtained after treatment of total and partial nonresponse: weighting and imputation. Percentages are presented per column and per row for all women and women with PPD, respectively.
[c]Significant associations ($P < .05$) are in bold.
[d]Crude PR of PPD at 2 mo, related 95% CI, and global *P* value (Poisson regression with robust error variance, weighted and imputed data).
[e]At childbirth. The reference corresponds to the age group with the lowest prevalence and a sufficient number of women.
[f]Module 6's Health Literacy Questionnaire (HLQ) (ability to engage with health professionals). It comprises 5 questions that generate a mean score ranging from 1 to 5. The higher the mean score, the lower the level of health literacy.
[g]Declared by the mother in the 2-month postpartum questionnaire.
[h]Based on French and international consensus recommendations by the French National Authority for Health.
[i]<37 wk of gestation.
Abbreviations: ENP = French National Population-based Perinatal Survey, PPD = postpartum depression, PR=prevalence ratio.

variables included in the models (health literacy score and BMI) and the prevalence of PPD. The multicollinearity of demographic or socio-economic variables was first assessed using the generalized variance inflation factor. A manual descending stepwise procedure was then applied to identify factors independently and significantly associated with each outcome ($P < .05$).

We imputed missing data for variables with fewer than 15 missing data using the most frequent response modality and taking into account other related information available if necessary. Subsequently, we performed a multiple imputation with chained equations (20 data sets) to take into account the rest of missing data (10.9% global; max = 7.0%; min = 0.2%—see Supplementary Table 3).[30] The imputation model included all variables in the final multivariable model, as well as auxiliary variables known to be associated with the variables to impute (see Figure 1 and Supplementary Table 4). In order to estimate the impact of the multiple imputation with chained equations on the association between the factors studied and PPD, we also performed the multivariable final model on the database before the multiple imputation (ie, complete case analysis) (Figure 1 and Supplementary Table 4).

The final multivariable model was performed on the whole study sample (n = 7,133). As a history of mental health is a recognized major risk factor for PPD, this model was also performed on the subgroup of women with no history of psychological/psychiatric care (n = 5,564).

A sensitivity analysis was performed to check the robustness of the multivariable model for each group (ie, total sample and subgroup with no history of psychological/psychiatric care) by excluding potential early markers of perinatal depression (ie, "Feeling of sadness, despair, hopelessness and/or anhedonia for at least 2 weeks during the pregnancy," "Self-perceived support from loved ones during pregnancy," "Self-declared emergency or walk-in consultation" [see above]).

With the exception of the raw number of respondents, all the results presented are weighted. Unless otherwise indicated, they are also imputed and include percentages and their 95% confidence intervals (95% CIs) for qualitative variables, means with standard deviations (SDs) for quantitative variables, as well as PRs and aPRs, their 95% CIs, and associated P values. PRs are interpreted in the same way as relative risks.[28] PPD prevalences according to different relevant EPDS thresholds (9 to 14) are presented in Supplementary Table 5.

All statistical analyses were performed using Stata software version 16/SE (Stata Corp., College Station, TX).

Institutional and Ethical Approval

2021 ENP was approved by the following organizations: the National Council of Statistical Information (October 14, 2019), the Label Committee (Visa n°2021X701SA, November 23, 2020), the Committee of Ethics and Scientists for Research, Studies and Evaluations (June 12, 2020), a Patient Protection Committee (July 7, 2020), and the National Data Protection Authority (DR-2020-391, December 31, 2020). Mothers included in the 2021 ENP survey were informed of the purpose of the study in the maternity ward participated voluntarily. Parental information was provided to mothers who were under 18 years of age (0.1%) if they provided consent.

RESULTS

The motivations and positive effects of multiple imputations (in particular, increased reliability of the aPR) are presented in Supplementary Tables 3 and 4.

Description of the Study Sample

The main characteristics of the 7,133 women included in our analysis are summarized in Table 1 (Supplementary Table 1 for more characteristics).

A majority were between 25 and 34 years of age (65.0%), 80.3% were born in France, 95.1% lived with a partner, 41.7% had a high level of education (ie, ≥3 years tertiary education), and 70.4% had a professional activity during their pregnancy. Three-fifths (58.5%) of the participants were multiparous.

With regard to a history of mental health care since adolescence, 15.2% reported receiving psychological or psychiatric care (hospitalization and/or therapy for more than 3 months).

Prevalence of PPD at 2 Months in France and Associated Factors

Prevalence. In our study, 16.7% (95% CI, [15.7–17.7]) of the women (n = 7,133) had PPD at 2 months.

Associated factors. In the multivariable analysis, PPD was independently and significantly associated with several risk factors, which can be divided into 4 categories: demographic and socioeconomic characteristics, medical and mental health care history (Table 2), pregnancy-related characteristics, and childbirth-related characteristics (Table 3). Specifically, with regard to the first category, our analysis highlighted that younger and older age (aPR = 1.41, 95% CI, [1.12–1.77] for women age ≤24 years, 1.29 [1.08–1.55] for age 25–29 years, and 1.34 [1.06–1.71] for age ≥40 years vs 35–39 years), being born in North Africa (1.29 [1.02–1.64] vs born in France), and having a poor level of health literacy (1.23 [1.14–1.35]) were all associated with PPD. In terms of medical and mental health care, PPD was more frequent in women who had a history of psychological (1.45 [1.24–1.69] vs no such history) or psychiatric (1.52 [1.23–1.88] vs no such history) care since adolescence. Among the pregnancy-related

Table 2.

Adjusted Factors Associated With PPD[a] at 2 Months; Data From the 2021 ENP, France (n = 7,133)

	Postpartum depression[a] at 2 mo (multivariate analysis)[b]					
	All women (n = 7,133)			Women with no history of mental health care since adolescence (n = 5,564)		
	Adjusted PR[c]	[95% CI]	*P* value[c]	Adjusted PR[c]	[95% CI]	*P* value[c]
Demographic and socioeconomic characteristics						
Age, y[d]			**.013**			**.029**
15–24 y	**1.41**	**[1.12–1.77]**		**1.38**	**[1.04–1.82]**	
25–29 y	**1.29**	**[1.08–1.55]**		**1.32**	**[1.07–1.64]**	
30–34 y	1.16	[0.98–1.36]		1.19	[0.98–1.45]	
35–39 y	1 (ref)			1 (ref)		
≥40 y	**1.34**	**[1.06–1.71]**		**1.50**	**[1.12–2.00]**	
Country of birth			.293			.457
France	1 (ref)			1 (ref)		
Other European	0.92	[0.66–1.29]		0.85	[0.54–1.29]	
North Africa	**1.29**	**[1.02–1.64]**		1.21	[0.94–1.57]	
Other African	1.05	[0.85–1.28]		0.94	[0.74–1.20]	
Other country	1.09	[0.77–1.55]		1.07	[0.74–1.55]	
Not living with a partner	0.98	[0.79–1.22]	.862	1.01	[0.77–1.33]	.931
Educational level			.689			.455
<Secondary school diploma	0.93	[0.78–1.11]		0.90	[0.73–1.11]	
Secondary school diploma and 1 or 2 years tertiary education	1.00	[0.88–1.14]		1.02	[0.88–1.19]	
≥3 years tertiary education	1 (ref)			1 (ref)		
No professional activity during pregnancy	1.03	[0.90–1.19]	.636	1.03	[0.88–1.22]	.682
Health literacy[e]	**1.23**	**[1.14–1.35]**	**.000**	**1.25**	**[1.12–1.37]**	**.000**
Medical history/history of mental health care since adolescence						
History of medical termination of pregnancy	1.29	[0.91–1.84]	.144	1.12	[0.68–1.86]	.645
History of mental health care since adolescence[f]			**.000**			
None	1 (ref)					
Psychological care (for at least 3 mo)	**1.45**	**[1.24–1.69]**				
Psychiatric care (for at least 3 mo) and/or hospitalization for a psychiatric problem	**1.52**	**[1.23–1.88]**				

[a]An EPDS score ≥13 indicated PPD.
[b]Significant associations (*P* < .05) are in bold.
[c]Adjusted PR of PPD at 2 mo, related 95% CI and global *P* value (Poisson regression with robust error variance, weighted and imputed data).
[d]At childbirth. The reference corresponds to the age group with the lowest prevalence and a sufficient number of women.
[e]Domain 6 of the Health Literacy Questionnaire (HLQ) (ability to actively engage with health care providers). It comprises 5 questions that generate a mean score ranging from 1 to 5. The higher the mean score, the lower the level of health literacy.
[f]Declared by the mother in the 2-month postpartum questionnaire (see questions asked in Methods section).
Abbreviations: ENP = French National Population-based Perinatal Survey, PPD = postpartum depression, PR = prevalence ratio.

variables, self-perceived good support (1.31 [1.15–1.48] vs very good) or little or no support (1.80 [1.51–2.14] vs very good) and a feeling of sadness, despair, or hopelessness (1.92 [1.65–2.25]), anhedonia (1.69 [1.36–2.11]), or both (2.61 [2.26–3.01]), for at least 2 weeks during their pregnancy, were also associated with a higher risk of PPD. Finally, with respect to childbirth-related characteristics, instrumental vaginal delivery was associated with a higher risk of PPD (1.18 [1.01–1.38] vs a spontaneous vaginal delivery). In contrast, child health factors were not associated with a higher risk of PPD in their mother, after adjustment for other variables (Table 3).

Sensitivity analysis. The sensitivity analysis conducted on the total sample, excluding potential early markers of antenatal depression as covariates, revealed 3 additional factors associated with PPD: country of birth (sub-Saharan Africa), absence of professional activity, and excessive weight gain (≥23 kg) during pregnancy (Supplementary Table 6).

Factors Associated with PPD Among Women with No History of Mental Health Care since Adolescence

Associated factors. The analysis performed in the subgroup of women (n = 5,564) with no history of mental health care since adolescence showed the same risk factors as those for the whole study sample, with the exception of country of birth. Moreover, having a small for gestational age (SGA) infant at birth appeared to be associated with PPD, despite the 95% CI being close to 1 (Table 2 and 3).

Sensitivity analysis. The sensitivity analysis conducted on this subgroup, excluding potential early markers of antenatal depression as covariates, highlighted 4 additional factors: country of birth (North Africa), excessive weight gain (≥23 kg) during pregnancy, not having a pregnancy at

Table 3.

Adjusted Factors Associated With PPD[a] at 2 Months

	Postpartum depression[a] at 2 mo (multivariate analysis)[b]					
	All women (n = 7,133)			Women with no history of mental health care since adolescence (n = 5,564)		
	Adjusted PR[c]	[95% CI][c]	*P* value[c]	Adjusted PR[c]	[95% CI][c]	*P* value[c]
Pregnancy						
Multiparity	0.95	[0.83–1.08]	.414	0.90	[0.77–1.05]	.178
Body mass index (BMI) (kg/m²) before pregnancy	1.00	[0.99–1.01]	.864	1.00	[0.99–1.02]	.735
Weight change during pregnancy			.133			.473
≤0 kg	1.22	[0.91–1.64]		1.20	[0.84–1.71]	
1–8 kg	1.09	[0.93–1.28]		1.05	[0.88–1.27]	
9–15 kg	1 (ref)			1 (ref)		
16–22 kg	0.95	[0.82–1.10]		1.00	[0.84–1.19]	
≥23 kg	1.27	[0.99–1.61]		1.26	[0.95–1.69]	
Pregnancy-related emergency or walk-in consultation(s)	1.03	[0.92–1.15]	.636	1.06	[0.93–1.21]	.361
Self-perceived social support from loved ones[d]			**.000**			**.000**
Little or none	**1.80**	**[1.51–2.14]**		**2.07**	**[1.70–2.53]**	
Good	**1.31**	**[1.15–1.48]**		**1.44**	**[1.24–1.68]**	
Very good	1 (ref)			1 (ref)		
Not having a pregnancy at low obstetrical risk[e]	1.08	[0.95–1.23]	.232	1.12	[0.96–1.30]	.139
Feelings for at least 2 wk during the pregnancy			**.000**			**.000**
Sadness, despair, hopelessness	**1.92**	**[1.65–2.25]**		**1.81**	**[1.50–2.18]**	
Anhedonia	**1.69**	**[1.36–2.11]**		**1.82**	**[1.44–2.31]**	
Both	**2.61**	**[2.26–3.01]**		**2.61**	**[2.20–3.10]**	
None	1 (ref)			1 (ref)		
Childbirth						
Mode of delivery			.133			.082
Spontaneous vaginal	1 (ref)			1 (ref)		
Instrumental vaginal	**1.18**	**[1.01–1.38]**		**1.23**	**[1.03–1.47]**	
Scheduled cesarean	1.10	[0.88–1.38]		1.06	[0.81–1.40]	
Emergency cesarean before labor	1.19	[0.89–1.59]		1.16	[0.83–1.60]	
Emergency cesarean during labor	0.95	[0.79–1.15]		0.89	[0.72–1.12]	
Child health						
Weight for gestational age[f]			.069			.07
Small for gestational age infant	1.16	[0.98–1.39]		**1.25**	**[1.02–1.53]**	
Appropriate for gestational age infant	1 (ref)			1 (ref)		
Large for gestational age infant	0.87	[0.72–1.07]		0.95	[0.76–1.19]	
Child re-hospitalization(s) during the first 2 mo after leaving maternity ward[g]	1.19	[0.98–1.45]	.080	1.24	[0.99–1.55]	.055

[a]An EPDS score ≥13 indicated PPD.
[b]Significant associations (*P* < .05) are in bold.
[c]Adjusted PR of PPD at 2 mo, related 95% CI, and global *P* value (Poisson regression with robust error variance, and weighted and imputed data).
[d]Based on 1 question asked during the maternity interview: "Concerning your family and friends, would you say that during your pregnancy you were: 1 - very well, 2 - well, 3 - somewhat, 4 - not at all supported, 5 - do not wish to answer?" Responses 3 and 4 were merged for size reasons, and response 5 was considered as missing data.
[e]Based on French and international consensus recommendations by the French National Authority for Health.
[f]Small (>10th percentile), appropriate ([10th–90th percentile]), and large (>90th percentile) defined according to EPOPé curves adjusted for gestational age and sex.
[g]Declared by the mother in the 2-mo postpartum questionnaire (see questions asked in Methods section).
Abbreviations: PPD = postpartum depression, PR = prevalence ratio.

low obstetrical risk, and child re-hospitalization during the 2 months after leaving the maternity ward. Conversely, having an SGA infant was no longer a risk factor for PPD at 2 months (Supplementary Table 6).

DISCUSSION

This study assessed the prevalence of PPD (EPDS score ≥13) at 2 months in France in 2021 and associated factors. Of the 7,133 women studied, 16.7% had PPD. The following factors were independently associated with a higher risk of PPD: age (with a U-shaped curve: higher prevalence in younger and older women, vs 35–39 years old), being born in North Africa (vs France), a poor level of health literacy, having a history of mental health care since adolescence (vs none), not self-perceiving very good support from loved ones during their pregnancy (vs very good support), having felt sadness/despair/hopelessness, anhedonia, or both for at

least 2 weeks during the pregnancy (vs none), and having had an instrumental vaginal delivery (vs spontaneous vaginal delivery).

The prevalence of PPD estimated in this study is consistent with results from the 4 previous French studies on PPD as well as those from several international studies (ie, between 10% and 20%) based on a similar screening symptoms questionnaire.[1,2,9,17,18,31] However, our result was the first representative of all the women giving birth in France and gave recent data about the prevalence of PPD and its associated factors. In our study, the EPDS is used to measure depressive symptoms at 2 months postpartum and can be completed by telephone or online depending on the woman's preference. At the end of the questionnaire, women are invited to look for information on a website dedicated to depression or to consult a health care professional if necessary. In clinical practice, women with moderate or major symptoms of depression (EPDS score ≥10) are referred to a clinician to confirm the diagnosis.

The demographic and socioeconomic characteristics associated with PPD in our study, especially maternal age and women's migratory status (defined as country of birth here), confirm previous findings in the literature. Specifically, other studies also showed a U-shaped curve in the association between maternal age and PPD, with women under 20 and over 40 years of age appearing to be at greater risk of PPD.[12] Similarly, migration was reported as a risk factor for PPD,[10,32] as were other mood disorders.[33] In our study, the migrant association regarded only first-generation migrants from North Africa. This may be related to a lack of power concerning migrants from other countries and/or over-fitting. The impact of migrant status on the probability of PPD could be explained by possible difficulties for immigrant women to adapt to their new environment (eg, family/cultural distance, different access to care). Another hypothesis is that healthcare professionals could provide unequal perinatal care (such as those used by Azria et al[34] in the PreCARE cohort study: the timing of the initiation of care, the number of scheduled prenatal visits, and the performance of scheduled ultrasound examinations) depending on a pregnant woman's ethnic origin.

We found that a lower level of health literacy (more specifically, the ability to actively engage with health providers) was associated with PPD at 2 months. This is not found in previous studies. It has been shown that a better understanding of PPD—in particular its symptoms, risk factors, and treatment—could make it easier to seek early and appropriate treatment.[35]

Our research highlighted that a pregnancy marked by negative emotions such as sadness, despair, hopelessness, and/or anhedonia was associated with PPD at 2 months; these are key symptoms of depression. This finding underlines the well-known fact that a woman presenting depressive symptoms during pregnancy is at high risk of presenting depression postpartum.[13]

Self-perceived support is associated with positive mental health outcomes, whether formal (support from professionals at home, childcare) or informal (support from loved ones).[11,36–38] For example, recent work by Nakamura et al[38] showed, in a subsample of 15,000 mothers from the national French ELFE cohort study, that self-perceived satisfactory partner support was associated with lower EPDS scores of, respectively, 7% in non-migrant women and 11% in first-generation migrant women but not in second-generation migrant women. Our study results echo this finding.

The findings from previous studies on the impact of parity on the probability of PPD are inconsistent; while some authors showed an aggravating role of parity (primiparity or multiparity, depending on the study) in PPD onset,[13,39] others did not.[17] For example, 2 studies carried out in the Canadian and Finnish general populations (approximately 2,500 and 511,000 postpartum women, respectively) showed that parity was a factor predisposing to PPD (adjusted odds ratio [aOR] [95% CI] of 1.59 [1.22–2.08] and 1.24 [1.08–1.41], respectively),[13,39] whereas the work of Barandon *et al.* on nearly 16,000 women in the ELFE survey mentioned above suggested that it was not associated (aOR [95% CI], 1.04 [0.91–1.18]).[17] We also found no association between parity and PPD. Perhaps, the integration of the variable "self-perceived support during the pregnancy" (and probably during the postpartum period) in our multivariable model could explain this result.

Another important aspect of the present analysis is that we found no significant difference in the probability of developing PPD at 2 months between women who had a pregnancy at low obstetrical risk and those who did not. However, the sensitivity analysis indicated a higher probability of PPD in low obstetrical risk pregnancies. This suggests that not having a pregnancy at low obstetrical risk could lead to depressive symptoms during pregnancy and finally to a higher probability of PPD at 2 months.

Finally, in our study, instrumental vaginal delivery, but not cesarean section (whether scheduled, before labor, or during labor), was associated with a higher risk of PPD. Findings from other studies are inconsistent: some showed that cesarean section increased the risk of PPD, others highlighted the aggravating role of instrumental vaginal delivery, while others highlighted the absence of any significant impact of the mode of delivery on PPD onset.[13,16,40] Our results were consistent with those of a Swedish study showing a higher risk of PPD after an instrumental delivery (adjusted relative risk = 1.23 95% CI, [1.09–1.38]) in nearly 694,000 mothers without personal history of depression care[16] and those of a recent French study conducted on 2,811 women who had

a vaginal delivery[18] (aORs of PPD in case of instrumental delivery = 1.4, 95% CI, [1.0–2.0]). One hypothesis is that a childbirth which does not go as expected may lead to significant postpartum stress, providing the basis for subsequent PPD.

Interestingly, prematurity was not associated with PPD at 2 months in our study, reflecting results from the 3,310 women participating in the French IGEDEPP study. This latter showed also that newborn-related onset events (preterm, SGA, and admission to neonatal intensive care unit) were not associated to early-onset or late-onset of PPD (aOR [95% CI] of 1.2 [0.8–1.8] and 1.0 [0.6–1.6], respectively).[9] A recent systematic review and meta-analysis showed that when only population-based studies were considered, it was impossible to make a definitive conclusion about a link between prematurity and PPD.[41]

This study has some strengths: first, it was based on a large population-based national sample, representative of women who gave birth in France in 2021.[20] Second, the data had a very high quality (midwives collected data).

There are some limitations of this study: first, external validity was limited by attrition; nevertheless, we corrected this issue by applying data weighting. Second, the 2021 ENP study was conducted during the third wave of the SARS-CoV-2 pandemic in France. This may have led to an overestimation of PPD prevalence but have not biased the associations found. Third, seasonality (2-month questionnaire completed in spring) could also bias the prevalence of PPD, but not the associations found.[42] Thus, even if these results obtained from a nationwide general population survey are representative of all women giving birth in France, biases may exist. Then, the prevalence of PPD at 2 months should be confirmed. Fourth, we used the EPDS, which is a screening tool, which does not take account diagnostic aspect. This may also led to an overestimation of PPD prevalence. However, the high threshold used should avoid any offset of such overestimation. Fifth, in addition to PPD, which is the most frequent perinatal mental disease, women's mental health in general and other mental health diseases would also have been important to explore. This may be the case in a future edition of the ENP survey. Sixth, self-reporting including some retrospective assessments may subject to potential social desirability and recall biases (particularly for mental health care history). Finally, at the time of these analyses, we did not have information on the use of antidepressants during pregnancy, but future project plan to study this point after linking the 2021 ENP database with the national medico-administrative database.

In 2021, almost 1 in 6 women (delivered after at least 22 weeks of amenorrhea and/or with a live born child weighting at least 500 grams) developed PPD at 2 months in France. Although this prevalence needs to be confirmed outside a pandemic period, this highlights the importance of this disorder in the postpartum period and reinforces the need to assess psychiatric manifestations in the postnatal period (screening for all women several times during the postpartum period to facilitate early detection, diagnosis, referral, and treatment) and the fundamental nature of prevention policies. Primary prevention measures could be developed or reinforced on the basis of factors that, in our study, were associated with PPD onset at 2 months: demographic and socioeconomic factors (migrants, persons self-perceiving less than very-good support), vaginal instrumental delivery, a history of mental health care since adolescence, and depressive symptoms during pregnancy.

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Data Availability Statement: The dataset contains individual data potentially identifying or sensitive patient information (childbirth's data, age, parity, region of

residence, violence, chronic diseases…). It cannot therefore be shared publicly. However, researchers who meet the criteria for access to confidential data can request access to these data by writing to data-mad@santepubliquefrance.fr.

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Supplementary Material

Article Title: Depression at 2 Months Postpartum: Results from the French National Perinatal Survey

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LIST OF SUPPLEMENTARY MATERIAL FOR THE ARTICLE

DISCLAIMER

This Supplementary Material has been provided by the authors as an enhancement to the published article. It has been approved by peer review; however, it has undergone neither editing nor formatting by in-house editorial staff. The material is presented in the manner supplied by the author.

Supplementary Table 1: Description of women included in the study sample and those suffering from PPD[a] at two months (prevalence and crude prevalence ratio); the 2021 ENP, France (n=7,133) (continued).

			PPD prevalence		Crude PPD prevalence ratio (Bivariate analyses)[b]		
	%[c]	[95%CI] [c]	% [c]	[95%CI] [c]	PR[d]	[95%CI] [d]	p-value[d]
Study sample (n=7,133)	100.0	-	16.7	[15.7-17.7]	-	-	-
Demographic and socioeconomic characteristics							
Monthly household income (in euros)							**0.000**
<1500	14.3	[13.2-15.5]	23.3	[19.6-26.9]	**1.63**	**[1.37-1.95]**	
1500-2900	32.8	[31.4-34.1]	17.8	[15.9-19.7]	**1.25**	**[1.09-1.43]**	
>=3000	52.9	[51.5-54.2]	14.3	[13.1-15.4]	1(ref)		
No national social security healthcare insurance	3.8	[3.1-4.4]	25.8	[18.8-32.7]	**1.58**	**[1.20-2.08]**	**0.001**
Medical history / History of mental health care since adolescence							
History of medical termination of pregnancy (MTP)	1.5	[1.2-1.8]	24.0	[15.8-32.2]	**1.45**	**[1.02-2.05]**	**0.038**
Pregnancy							
Body Mass Index (BMI) (kg/m^2) before pregnancy							0.245
<25.0	62.0	[60.7-63.3]	16.0	[14.8-17.3]	1(ref)		
25.0-29.9	23.4	[22.2-24.6]	17.5	[15.2-19.8]	1.09	[0.93-1.27]	
>=30	14.6	[13.6-15.4]	18.3	[15.5-21.0]	1.14	[0.96-1.35]	
Weight change during pregnancy (in kg)							**0.000**
<=0	3.3	[2.9-3.9]	26.1	[19.5-32.8]	**1.68**	**[1.28-2.20]**	
1 to 8	18.6	[17.6-19.7]	18.7	[16.2-21.2]	**1.20**	**[1.03-1.41]**	
9 to 15	51.1	[49.7-52.3]	15.5	[14.2-16.8]	1(ref)		
16 to 22	23.1	[22.0-24.2]	15.4	[13.2-17.4]	0.98	[0.84-1.16]	
>=23	3.9	[3.5-4.4]	22.5	[17.1-27.9]	**1.45**	**[1.12-1.87]**	
Pregnancy-related emergency or walk-in consultation(s)	50.7	[49.4-52.0]	18.5	[17.0-20.0]	**1.25**	**[1.11-1.40]**	**0.000**
Self-perceived support from loved ones[e]							**0.000**
Little or None	9.1	[8.2-9.9]	35.2	[30.1-40.3]	**2.70**	**[2.29-3.19]**	
Good	27.5	[26.4-28.7]	19.1	[17.1-21.2]	**1.47**	**[1.29-1.68]**	
Very good	63.3	[62.1-64.6]	13.0	[12.0-14.0]	1(ref)		
Child health							
Weight for gestational age[f]							**0.018**
Small for gestational age (SGA) infant	12.5	[11.6-13.4]	20.6	[17.3-23.9]	**1.27**	**[1.06-1.51]**	
Appropriate for gestational age (AGA) infant	76.8	[75.6-77.9]	16.3	[15.2-17.4]	1(ref)		
Large for gestational age (LGA) infant	10.7	[9.8-11.5]	15.2	[12.2-18.2]	0.94	[0.76-1.15]	

a An EPDS score >= 13 indicated postpartum depression (PPD)

b Significant associations (p<0.05) are in bold

c Percentage and related 95% confidence interval (95% CI) for qualitative variables, and mean with standard deviation (SD) for quantitative variables, obtained after treatment of total and partial non-response: weighting and imputation. Percentages are presented per column and per row for all women and women with PPD, respectively

d Crude Prevalence Ratio (PR) of PPD at two months, related 95%CI and global p-value (Poisson regression with robust error variance, weighted and imputed data).

e Based on one question asked during the maternity interview : “Concerning your family and friends, would you say that during your pregnancy you were”: i/very-well; ii/well; iii/ somewhat iv/ not at all supported v/ do not wish to answer? Responses iii and iv were pooled together for reasons of size, and response v/ was considered as missing data

f Small (>10th percentile), Appropriate ([10th -90th percentile]) and Large (>90th percentile) defined according to EPOPé curves adjusted for gestational age and sex

Abbreviations: PPD=Postpartum depression, PR=Prevalence Ratio, 95%CI=95% Confidence Interval

Supplementary Table 2: Differences in baseline characteristics between the women who completed the two-month questionnaire including the EPDS (7,133) and those who did not (3,564) before and after weighting; the 2021ENP, France (n=10, 958).

	Unweighted data			**Weighted data**	
	Women responding to two-months follow-up including EPDS (n=7,133)	Women non responding to two-months follow-up (n=3,564)		Women responding to two-months follow-up including EPDS (n=7,133)	Women who answered to the interview at the maternity hospital (n=10,958)
	% [95%CI] [a]	% [95%CI] [a]	p-valued[b]	% [95%CI] [a]	% [95%CI] [a]
Age (in years)[c]			**<0.001**		
15-24	8.6 [8.0-9.3]	15.5 [14.4-16.7]		10.7 [9.9-11.6]	11.1 [10.3-12.0]
25-29	28.0 [26.9-29.0]	28.5 [27.0-30.0]		28.6 [27.4-29.8]	28.6 [27.5-29.8]
30-34	38.0 [36.8-39.1]	32.4 [30.9-34.0]		36.4 [35.1-37.6]	36.1 [34.9-37.3]
35-39	20.2 [19.3-21.2]	17.9 [16.7-19.2]		19.2 [18.2-20.2]	19.0 [18.1-20.0]
>=40	5.2 [4.7-5.8]	5.6 [4.9-6.4]		5.1 [4.6-5.6]	5.1 [4.6-5.7]
Country of birth			**<0.001**		
France	84.5 [83.6-85.3]	69.8 [68.3-71.3]		80.3 [79.2-81.5]	78.7 [77.4-79.8]
Other European country	3.1 [2.7-3.5]	4.7 [4.0-5.4]		3.6 [3.0-4.1]	3.6 [3.1-4.2]
North Africa	4.9 [4.4-5.4]	12.0 [11.0-13.1]		6.9 [6.1-7.6]	7.4 [6.7-8.3]
Other African country	5.0 [4.5-5.6]	7.6 [6.8-8.6]		5.9 [5.2-6.6]	6.7 [6.0-7.5]
Other country	2.5 [2.1-2.9]	5.9 [5.1-6.7]		3.3 [2.7-3.9]	3.6 [3.0-4.3]
Not living with a partner	3.9 [3.5-4.4]	7.4 [6.6-8.3]	**<0.001**	4.9 [4.2-5.5]	5.1 [4.5-5.8]
Educational level			**<0.001**		
>= 3years tertiary education	47.9 [46.8-49.1]	27.9 [26.4-29.4]		41.7 [40.4-42.9]	40.6 [39.4-41.8]
Secondary school diploma and 1 or 2 years tertiary education	38.2 [37.0-39.3]	44.1 [42.4-45.7]		39.2 [38.0-40.5]	39.4 [38.1-40.6]
< Secondary school diploma	13.9 [13.1-14.7]	28.0 [26.6-29.5]		19.1 [17.8-20.3]	20.0 [18.8-21.3]
No professional activity during pregnancy	22.2 [21.2-23.1]	44.7 [43.1-46.3]	**<0.001**	29.6 [28.2-30.9]	30.9 [29.6-32.3]
Mental health care history since adolescence[d]		‘-	‘-		‘-
None	83.6 [82.7-84.5]	‘-	‘-	84.8 [83.8-85.7]	‘-
Psychological care (for at least 3 months)	10.5 [9.8-11.3]	‘-	‘-	9.6 [8.9-10.4]	‘-
Psychiatric care (for at least 3 months) and/or hospitalisation for a psychiatric problem	5.9 [5.3-6.5]	‘-	‘-	5.6 [4.9-6.2]	‘-
Multiparous	55.5 [54.4-56.7]	63.2 [61.6-64.8]	**<0.001**	58.5 [57.2-59.7]	58.9 [57.7-60.1]

a Percentage and related 95%CI for qualitative variables, obtained with or without weighting.
b Significant difference (p<0.05) are in bold.
c At childbirth. The reference corresponds to the age group with the lowest prevalence and a sufficient number of women
d Declared by the mother in the two-month postpartum questionnaire.
Abbreviation: EPDS=Edinburgh Postpartum Depression Scale, 95%CI=95% Confidence Interval

Supplementary Table 3: Missing data in our whole study sample or in the sub-sample of women with postpartum depression[a] at two months (complete cases); the 2021 ENP, France (n=7,133).

	All women (n=7,133) %[b]	**Women with PPD[a] (n=1,121)** %[b]
Total missing data[c]	10.9	13.6
Demographic and socio-economic characteristics		
Age (in years)[d]	No missing data	
Mother's country of birth	1.0	1.1
Not living with a partner	No missing data	
Educational level	No missing data	
Monthly household income (in euros)	2.9	3.9
No social security healthcare insurance	No missing data	
No professional activity during pregnancy	No missing data	
Health literacy[e]	0.5	0.9
Medical history / History of mental health care since adolescence		
History of MTP	0.2	0.3
Mental health care history since adolescence[f]	6.7	7.6
Pregnancy		
Multiparity	No missing data	
BMI (kg/m^2) before pregnancy	0.8	1.2
Weight change during pregnancy (in kg)	1.0	1.5
Pregnancy-related emergency or walk-in declared consultation(s)	No missing data	
Self-perceived support (from loved ones)	0.4	0.7
Not having a pregnancy at low obstetrical risk[g]	No missing data	
Feelings of sadness, despair, hopelessness and/or anhedonia for at least two weeks during the pregnancy	0.2	0.3
Childbirth		
Mode of delivery	No missing data	
Child Health		
Prematurity[h]	No missing data	
Weight for gestational age	0.6	0.9
Child re-hospitalization(s) during the two first months after leaving the maternity ward[f]	7.0	8.7

a An EPDS score >= 13 indicated postpartum depression
b Calculated for the set of variables used in the imputation process
c Calculated for the set of variables used in the final model
d At childbirth
e Domain 6 of the Health Literacy Questionnaire (HLQ) (Ability to actively engage with healthcare providers). It comprises 5 questions which generate a mean score ranging from 1 to 5.
f Self-declared at two months postpartum (see questions asked in Methods section)
g Based on consensual French and international recommendations from the French National Authority for Health
h <37 weeks of gestation

Abbreviations: MTP= medical termination of pregnancy, PPD=Postpartum depression,

Supplementary Table 4: Adjusted factors associated with PPD[a] at two months. Comparison between the results obtained before (complete case) and after multiple imputation; the 2021 ENP, France (n=7,133).

	Postpartum depression[a] at two months (Multivariate analysis)[b]							
	Complete case (n=6,353)				**Multiple imputation[c] (n=7,133)**			
	Adjusted PR [95% CI][d]	p-value [d]	SE [d]	(SE/PR)*100 [d]	Adjusted PR [95% CI] [d]	p-value [d]	SE [d]	(SE/PR)*100 [d]
Demographic and socio-economic characteristics								
Age (in years)[e]		0.085				**0.013**		
15-24	1.25 [0.97-1.60]		0.16	12.73	**1.41 [1.12-1.77]**		0.16	11.69
25-29	**1.22 [1.01-1.47]**		0.12	9.57	**1.29 [1.08-1.55]**		0.12	9.16
30-34	1.13 [0.95-1.33]		0.10	8.57	1.16 [0.98-1.36]		0.10	8.37
35-39	1(ref)		-		1(ref)		-	
>=40	**1.36 [1.06-1.75]**		0.17	12.78	**1.34 [1.05-1.70]**		0.16	12.25
Country of birth		0.310				0.294		
France	1(ref)		-		1(ref)		-	
Others European country	1.03 [0.72-1.46]		0.18	17.93	0.92 [0.66-1.29]		0.16	17.33
North Africa	**1.32 [1.02-1.70]**		0.17	13.03	**1.29 [1.02-1.64]**		0.16	12.20
Other African country	0.98 [0.78-1.23]		0.11	11.38	1.05 [0.85-1.28]		0.11	10.45
Other country	1.03 [0.69-1.54]		0.21	20.46	1.09 [0.77-1.55]		0.19	17.72
Not living with a partner	0.98 [0.78-1.25]	0.898	0.12	12.04	0.98 [0.79-1.22]	0.862	0.11	11.24
Educational level		0.988				0.689		
< Secondary school diploma	0.99 [0.82-1.19]		0.10	9.66	0.93 [0.78-1.11]		0.08	9.10
Secondary school diploma and 1 or 2 years tertiary education	1.00 [0.87-1.15]		0.07	6.98	0.99 [0.88-1.14]		0.07	6.57
>= 3 years tertiary education	1(ref)		-		1(ref)		-	
No professional activity during pregnancy	1.00 [0.85-1.16]	0.955	0.08	7.76	1.03 [0.89-1.19]	0.636	0.07	7.20
Health literacy[f]	**1.22 [1.12-1.33]**	**0.000**	0.04	4.54	**1.23 [1.14-1.35]**	**0.000**	0.03	4.30
Medical history / History of mental health care since adolescence								
History of medical termination of pregnancy (MTP)	1.31 [0.91-1.88]	0.146	0.24	18.49	1.29 [0.91-1.83]	0.144	0.23	17.81
Mental health care history since adolescence[g]		**0.000**				**0.000**		
None	1(ref)		-		1(ref)		-	
Psychological care (for at least 3 months)	**1.39 [1.19-1.64]**		0.11	8.17	**1.45 [1.24-1.69]**		0.11	7.87
Psychiatric care (for at least 3 months) and/or hospitalisation for a psychiatric problem	**1.49 [1.22-1.81]**		0.15	10.05	**1.52 [1.23-1.88]**		0.16	10.84
Pregnancy								
Multiparous	0.94 [0.82-1.08]	0.386	0.07	6.99	0.95 [0.83-1.07]	0.414	0.06	6.60
BMI (kg/m^2) before pregnancy	1.00 [0.98-1.01]	0.784	0.01	0.62	1.00 [0.99-1.01]	0.864	0.01	0.61
Weight change during pregnancy (in kg)		**0.016**				0.133		
<=0	**1.35 [1.01-1.80]**		0.20	14.73	1.22 [0.91-1.64]		0.18	15.03
1 to 8	1.15 [0.98-1.35]		0.09	8.13	1.09 [0.93-1.28]		0.09	7.99
9 to 15	1(ref)				1(ref)		-	
16 to 22	0.93 [0.79-1.08]		0.07	8.08	0.95 [0.82-1.10]		0.07	7.66
>=23	**1.32 [1.02-1.70]**		0.17	13.07	1.27 [1.00-1.62]		0.16	12.37
Pregnancy-related emergency or walk-in consultation(s)	1.02 [0.90-1.15]	0.711	0.06	6.08	1.03 [0.92-1.15]	0.636	0.06	5.72
Self-perceived social support from loved ones		**0.000**				**0.000**		
Little or None	**1.84 [1.54-2.19]**		0.16	8.89	**1.80** [**1.52-2.14**]		0.16	8.76
Good	**1.29 [1.12-1.48]**		0.09	7.01	**1.30** [**1.15-1.48**]		0.09	6.56
Very good	1(ref)		-		1(ref)		-	

Not having a pregnancy at low obstetrical risk[h]	1.09 [0.95-1.25]	0.203	0.07	6.86	1.08 [0.95-1.23]	0.232	0.07	6.56
Feelings for at least two week during the pregnancy		**0.000**				**0.000**		
Sadness, despair, hopelessness	**1.88** [**1.60-2.22**]		0.16	8.34	**1.92** [**1.65-2.25**]		0.15	7.94
Anhedonia	**1.75** [**1.39-2.19**]		0.20	11.55	**1.69** [**1.36-2.11**]		0.19	11.09
Both	**2.70** [**2.31-3.13**]		0.21	7.67	**2.61** [**2.26-3.01**]		0.19	7.37
None	1(ref)		-		1(ref)		-	
Childbirth								
Mode of delivery		0.079				0.133		
Spontaneous vaginal	1(ref)		-		1(ref)		-	
Instrumental vaginal	**1.24 [1.05-1.47]**		0.11	8.59	**1.18 [1.01-1.38]**		0.09	8.01
Scheduled caesarean	1.14 [0.91-1.44]		0.13	11.59	1.10 [0.88-1.38]		0.13	11.34
Emergency caesarean before labour	1.15 [0.83-1.60]		0.19	16.74	1.19 [0.89-1.59]		0.17	14.66
Emergency caesarean during labour	0.98 [0.81-1.19]		0.10	9.84	0.95 [0.79-1.15]		0.09	9.46
Child health								
Weight for gestational age[i]		0.366				0.069		
Small for gestational age (SGA) infant	1.09 [0.90-1.30]		0.10	9.18	1.17 [0.98-1.39]		0.10	8.96
Appropriate for gestational age (AGA) infant	1(ref)		-		1(ref)			
Large for gestational age (LGA) infant	0.90 [0.74-1.11]		0.09	10.31	0.87 [0.71-1.07]		0.09	10.34
Child re-hospitalization(s) during the two first months after leaving maternity ward[g]	1.17 [0.95-1.43]	0.134	0.12	10.27	1.19 [0.98-1.45]	0.080	0.12	10.01

a An EPDS score >= 13 identified PPD
b Significant associations ($p<0.05$) are in bold
c See Methods section; Mechanism of non-response was missing at random or missing non at random which justified the use of multiple imputation; auxiliary variables used to perform multiple imputation by chain reaction were as follows: Monthly household income (in euros), social security healthcare insurance, and premature birth
d Adjusted Prevalence Ratio (aPR) of PPD at two months, related 95%CI, standard deviation (SE), variation coefficient ((SE/PR)*100) and global p-value (Poisson regression with robust error variance, weighted and non-imputed (complete case) or imputed data).
e At childbirth. The reference corresponds to the age group with the lowest prevalence and a sufficient number of women.
f Domain 6 of the Health Literacy Questionnaire (HLQ) (Ability to actively engage with healthcare providers). It comprises 5 questions which generate a mean score ranging from 1 to 5. The higher the mean score the lower the level of health literacy
g Self-declared at two months postpartum (see questions asked in Methods section)
h Based on consensual French and international recommendations from the French National Authority for Health
i Small (>10^{th} percentile), Appropriate ([10^{th} -90^{th} percentile]) and Large (>90^{th} percentile) defined according to EPOPé curves adjusted for gestational age and sex

Abbreviations: EPDS=Edinburgh Postpartum Depression Scale, PPD=Postpartum depression, PR=Prevalence Ratio, SE= standard deviation, 95%CI=95% Confidence Interval

Supplementary Table 5: PPD prevalence according to different EPDS thresholds. The 2021 ENP, France (n=7,133).

EPDS threshold	**PPD prevalence** (% [95%CI])[a]	**Variation coefficient**[b]
>=9	34.2 [33.0-35.4]	1.8
>=10	29.3 [28.1-30.5]	2.1
>=11	24.8 [23.7-26.0]	2.3
>=12	20.8 [19.7-21.9]	2.6
>=13	16.7 [15.7-17.7]	3.0
>=14	13.4 [12.5-14.3]	3.5

a Percentage and related 95% confidence interval (95% CI) for PPD prevalence obtained after weighting
b Standard deviation/prevalence *100
Abbreviations: EPDS=Edinburgh Postpartum Depression Scale, PPD=Postpartum depression

Supplementary Table 6: Sensitivity analyses excluding the three covariates[a] which were potential early markers of antenatal depression[b], The 2021 ENP, France (n=7,133).

	Postpartum depression[b] at two months (Multivariate analysis)[c]					
	All women (n=7,133)			Women with no history of psychological/psychiatric care since adolescence (n=5,564)		
	Adjusted PR[d] [95% CI] [d]		p-value[d]	Adjusted PR[d] [95% CI] [d]		p-value[d]
Socio-eco-demographic characteristics						
Age (in years)[e]			**0.011**			**0.021**
15-24	**1.42**	**[1.12-1.79]**		**1.38**	**[1.03-1.84]**	
25-29	**1.32**	**[1.10-1.60]**		**1.35**	**[1.08-1.68]**	
30-34	1.16	[0.99-1.38]		1.18	[0.97-1.44]	
35-39	1(ref)			1(ref)		
>=40	**1.34**	**[1.05-1.71]**		**1.51**	**[1.13-2.03]**	
Country of birth			**0.003**			**0.028**
France	1(ref)			1(ref)		
Other European country	1.00	[0.71-1.41]		0.89	[0.58-1.36]	
North Africa	**1.49**	**[1.18-1.90]**		**1.44**	**[1.11-1.87]**	
Other African country	**1.31**	**[1.05-1.62]**		1.19	[0.92-1.54]	
Other country	1.35	[0.93-1.95]		1.37	[0.93-2.04]	
Not living with a partner	1.21	[0.96-1.52]	0.105	1.25	[0.94-1.66]	0.127
Educational level			0.879			
< Secondary school diploma	0.98	[0.81-1.18]		0.94	[0.75-1.16]	
Secondary school diploma and 1 or 2 years tertiary education	1.02	[0.89-1.16]		1.03	[0.89-1.20]	
>= 3years tertiary education	1(ref)			1(ref)		0.613
No professional activity during pregnancy	**1.16**	**[1.00-1.34]**	**0.037**	1.18	[0.99-1.39]	0.056
Mean score of health literacy[f]	**1.41**	**[1.30-1.54]**	**0.000**	**1.45**	**[1.32-1.53]**	**0.000**
Medical history / History of mental health care since adolescence						
History of medical termination of pregnancy (MTP)	1.41	[0.99-2.01]	0.057	1.17	[0.71-1.91]	0.542
Mental health care history since adolescence[g]			**0.000**	-	- -	
None	1(ref)			-	- -	
Psychological care (for at least 3 months)	**1.61**	**[1.37-1.88]**		-	- -	
Psychiatric care (for at least 3 months) and/or hospitalisation for a psychiatric problem	**1.80**	**[1.49-2.19]**		-	- -	
Pregnancy						
Multiparous	1.04	[0.91-1.18]	0.595	0.98	[0.84-1.14]	0.818
BMI (kg/m2) before pregnancy	0.99	[0.98-1.01]	0.992	1.00	[0.99-1.02]	0.759
Weight change during pregnancy (in kg)			**0.029**			0.170
<=0	1.32	[0.99-1.77]		1.31	[0.92-1.86]	
1 to 8	1.13	[0.96-1.33]		1.10	[0.91-1.33]	
9 to 15	1(ref)			1(ref)		
16 to 22	0.99	[0.85-1.16]		1.05	[0.87-1.26]	
>=23	**1.40**	**[1.08-1.80]**		**1.38**	**[1.03-1.86]**	
Not having a pregnancy at low obstetrical risk[h]	1.14	[0.99-1.30]	0.055	**1.22**	**[1.04-1.43]**	**0.014**
Childbirth						
Mode of delivery			0.068			**0.042**
Spontaneous vaginal	1(ref)			1(ref)		

Instrumental vaginal	**1.22**	**[1.04-1.43]**		**1.23**	**[1.06-1.53]**	
Scheduled caesarean	1.08	[0.84-1.38]		1.08	[0.79-1.45]	
Emergency caesarean before labour	1.23	[0.92-1.65]		1.16	[0.82-1.63]	
Emergency caesarean during labour	0.94	[0.77-1.15]		0.88	[0.69-1.13]	
Child health						
Weight for gestational age[i]			0.166			0.190
Small for gestational age (SGA) infant	1.13	[0.95-1.35]		1.19	[0.97-1.46]	
Appropriate for gestational age (AGA) infant	1(ref)			1(ref)		
Large for gestational age (LGA) infant	0.88	[0.72-1.09]		0.96	[0.75-1.22]	
Child re-hospitalization(s) during the two first months after leaving maternity ward[g]	1.21	[0.98-1.49]	0.070	**1.30**	**[1.03-1.64]**	**0.029**

a "Feeling of sadness, despair, hopelessness and/or anhedonia for at least two weeks during the pregnancy"; "Self-perceived support from loved ones during pregnancy"; "Emergency or walk-in declared consultation related to the pregnancy"

b An EPDS score >= 13 indicated postpartum depression

c Significant associations ($p<0.05$) are in bold

d Adjusted Prevalence Ratio (aPR) of PPD at two months, related 95%CI and global p-value (Poisson regression with robust error variance, weighted and imputed data).

e At childbirth. The reference corresponds to the age group with the lowest prevalence and a sufficient number of women.

f Domain 6 of the Health Literacy Questionnaire (HLQ) (Ability to actively engage with healthcare providers). It comprises 5 questions which generate a mean score ranging from 1 to 5. The higher the mean score, the lower the level of health literacy

g Self-declared at two months postpartum (see questions asked in Methods section)

h Based on consensual French and international recommendations from the French National Authority for Health

i Small (>10^{th} percentile), Appropriate ([10^{th} -90^{th} percentile]) and Large (>90^{th} percentile) defined according to EPOPé curves adjusted for gestational age and sex