

Psychiatric Disorders in Pregnant and Postpartum Women in the United States

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Context: Psychiatric disorders and substance use during pregnancy are associated with adverse outcomes for mothers and their offspring. Information about the epidemiology of these conditions in this population is lacking.

Objective: To examine sociodemographic correlates, rates of DSM-IV Axis I psychiatric disorders, substance use, and treatment seeking among past-year pregnant and postpartum women in the United States.

Design: National survey.

Setting: Face-to-face interviews conducted in the 2001-2002 National Epidemiologic Survey on Alcohol and Related Conditions.

Participants: A total of 43 093 respondents were interviewed, of whom 14 549 were women 18 to 50 years old with known past-year pregnancy status.

Main Outcome Measures: Prevalence of 12-month DSM-IV Axis I psychiatric disorders, substance use, and treatment seeking.

Results: Past-year pregnant and postpartum women had significantly lower rates of alcohol use disorders and any substance use, except illicit drug use, than nonpregnant

women. In addition, currently pregnant women had a lower risk of having any mood disorder than nonpregnant women. The only exception was the significantly higher prevalence of major depressive disorder in postpartum than in nonpregnant women. Age, marital status, health status, stressful life events, and history of traumatic experiences were all significantly associated with higher risk of psychiatric disorders in pregnant and postpartum women. Lifetime and past-year treatment-seeking rates for any psychiatric disorder were significantly lower among past-year pregnant than nonpregnant women with psychiatric disorders. Most women with a current psychiatric disorder did not receive any mental health care in the 12 months prior to the survey regardless of pregnancy status.

Conclusions: Pregnancy per se is not associated with increased risk of the most prevalent mental disorders, although the risk of major depressive disorder may be increased during the postpartum period. Groups of pregnant women with particularly high prevalence of psychiatric disorders were identified. Low rates of maternal mental health care underscore the need to improve recognition and delivery of treatment for mental disorders occurring during pregnancy and the postpartum period.

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PREGNANCY AND THE POSTPARTUM period are widely considered to be periods of increased vulnerability to psychiatric disorders.¹⁻¹² Psychiatric disorders during pregnancy are associated with poor maternal health¹³⁻¹⁹ and inadequate prenatal care.²⁰⁻²² Maternal psychiatric disorders during pregnancy and the postpartum period are also associated with numerous adverse outcomes for the offspring, including maladaptive fetal growth and development,²²⁻³⁶ poor cognitive development and behavior during childhood and adolescence,²³⁻³² and negative nutritional and health effects.^{13,33-38} For these reasons, accurate information about the mental health status of women during pregnancy and the postpartum period is urgently needed.

Most of what is known about psychiatric problems among pregnant women

comes from findings among clinical samples, often without nonpregnant control groups. Furthermore, most research in this area has focused on anxiety and depressive symptoms,²⁷ rather than anxiety and mood disorders, and thus has not adequately addressed the relationship between mental disorder diagnoses and perinatal outcomes. In these samples, the prevalence of psychiatric disorders ranged from 15% to 29%.^{15,20-22,39-47} Risk factors identified in these studies include lack of a romantic partner, previous history of psychiatric disorder, and lifetime exposure to traumatic events.^{22,41,42,45,48-50} Only 5% to 14% of women received treatment of their psychiatric disorders.^{15,40,41} However, to our knowledge, no previous study used sampling methods permitting accurate estimation of the prevalence of psychiatric disorders among pregnant women in the

United States. Furthermore, we know of no previous study that included nonpregnant women of comparable age drawn from the general population to identify the specific contribution of pregnancy or the postpartum period to the risk of psychiatric disorders. Many studies were limited by use of screening scales rather than diagnostic measures for *DSM-IV* criteria. Finally, previous studies assessed only mood and anxiety disorders rather than a broader range of psychiatric disorders.

As the result of these gaps in research on mental disorders during pregnancy and the postpartum period, accurate national information on the mental health of pregnant women is lacking. Such information is needed for focused planning at the national and local level, and to inform the development of prevention and intervention programs. The current study addresses these critical gaps in knowledge. In a nationally representative sample of pregnant women, we present 12-month prevalence of *DSM-IV* psychiatric disorders, compare these with the prevalence of psychiatric disorders in nonpregnant women of childbearing age, identify risk factors for such disorders, and provide estimates of lifetime and 12-month rates of treatment seeking among pregnant and nonpregnant women with *DSM-IV* psychiatric disorders.

METHODS

SAMPLE

The 2001-2002 National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) is a nationally representative sample of the adult population of the United States conducted by the US Census Bureau, which administered face-to-face interviews under the direction of the National Institute on Alcohol Abuse and Alcoholism, as described in detail elsewhere.⁵¹ The NESARC target population was the civilian, noninstitutionalized population, 18 years or older, residing in households in the 50 states and the District of Columbia. This included persons living in households and the following noninstitutional group quarters: boarding houses, rooming houses, nontransient hotels and motels, shelters, facilities for housing workers, college quarters, and group homes. The final sample included 43 093 respondents drawn from individual households and group quarters. Blacks, Hispanics, and young adults (aged 18 to 24 years) were oversampled. Data were adjusted to account for oversampling and respondent and household nonresponse.

The overall survey response rate consists of 3 parts. The household response rate was 89%. Household nonresponse occurred when no interview was obtained from the household and a sample person was never selected. The person response rate was 93%. Person nonresponse occurred when a sample person was selected but was not interviewed. The NESARC estimates were adjusted at the household and person level to account for nonresponse from refusals, absences, and unlocated housing units. The sample frame response rate was 99%. The overall response rate in the NESARC (81%) is derived by multiplying the NESARC household response rate (89%) by the NESARC person response rate (93%) and the sample frame response rate (99%). The weighted data were then adjusted using the 2000 Decennial Census, to be representative of the US civilian population for a variety of sociodemographic variables.

Women in the NESARC were asked whether they were pregnant at the time of the interview and whether they had been pregnant at any point in the preceding 12 months.⁵¹ There were

14 895 women of childbearing age (18 to 50 years) in the NESARC sample. Of these, 346 did not know their past-year pregnancy status and were removed from the analysis. Another 1524 women were pregnant at the time of the survey or had been pregnant in the preceding 12 months (referred to as "past-year pregnant women"). Of these, 453 were pregnant at the time of the survey ("currently pregnant"), 5 did not know their current pregnancy status (but had been pregnant in the past year), and 1066 had been pregnant during the preceding 12 months but were not pregnant at the time of the interview. Of these 1066 women, 72 reported currently having no children. For analyses of postpartum women, these 72 were removed, leaving a total sample of 994 "postpartum women." All remaining women in the NESARC aged 18 to 50 years were included in the "nonpregnant women" group ($n=13\ 025$).

All potential NESARC respondents were informed in writing about the nature of the survey, the statistical uses of the survey data, the voluntary aspect of their participation, and the federal laws that rigorously provided for the strict confidentiality of the identifiable survey information. Respondents consenting to participate after receiving this information were interviewed. The research protocol, including informed consent procedures, received full ethical review and approval from the US Census Bureau and the US Office of Management and Budget.

INTERVIEWER TRAINING

Interviews were conducted by approximately 1800 professional lay interviewers from the US Census Bureau. On average, the interviewers had 5 years of experience in the administration of census and other health-related national surveys. Training was standardized under the direction of the National Institute on Alcohol Abuse and Alcoholism. All interviewers completed a 5-day self-study course followed by a 5-day in-person training session at one of the US Census Bureau's regional offices. For quality control purposes and to assess the accuracy of the interviewers' performance, 2657 respondents were readministered 1 to 3 sections of the NESARC interview to verify answers. These interviews also formed the basis of a test-retest reliability study of Wave 1 NESARC measures.⁵²

DIAGNOSTIC ASSESSMENT

Sociodemographic measures included age, sex, race/ethnicity, nativity, marital status, urbanicity of residence, and region of the country. Socioeconomic measures included education, personal annual income, and insurance type. To be consistent with previous research, women were categorized as being older than 25 years or 25 years or younger.

All diagnoses, except psychotic disorder, were made according to the *DSM-IV* criteria using the National Institute on Alcohol Abuse and Alcoholism's Alcohol Use Disorder and Associated Disabilities Interview Schedule—*DSM-IV* Version (AUDADIS-IV),⁵³ a valid and reliable fully structured diagnostic interview designed for use by professional interviewers who are not clinicians. Axis I diagnoses included in the AUDADIS-IV can be separated into 3 groups: (1) substance use disorders (including alcohol abuse or dependence, any drug abuse or dependence, and nicotine dependence); (2) mood disorders (including major depressive disorder, dysthymia, and bipolar disorder); and (3) anxiety disorders (including panic disorder, social anxiety disorder, specific phobia, and generalized anxiety disorder). The test-retest reliability and validity of AUDADIS-IV measures of *DSM-IV* disorders have been reported elsewhere.^{52,54-58} Owing to concerns about the validity of psychotic diagnoses in general population surveys as well as the length of the interview, possible psychotic disorders were

Table 1. Twelve-Month Percentage Distributions and ORs of Sociodemographic Characteristics by Pregnancy Status

Characteristic	% (SE)		OR (95% CI)	Postpartum Women, ^b % (SE) (n=994)	OR (95% CI)
	Nonpregnant Women (n=13 025)	Past-Year Pregnant Women ^a (n=1524)			
Race/ethnicity					
White	67.0 (1.9)	57.2 (2.4)	1 [Reference]	55.5 (2.8)	1 [Reference]
Black	13.2 (0.8)	14.2 (1.2)	1.25 (1.04-1.51)	14.4 (1.4)	1.32 (1.08-1.61)
Native American	2.1 (0.2)	2.8 (0.6)	1.57 (0.96-2.57)	2.8 (0.7)	1.63 (0.94-2.82)
Asian	4.9 (0.6)	6.1 (1.0)	1.47 (1.06-2.02)	5.5 (0.9)	1.35 (0.92-1.97)
Hispanic	12.9 (1.4)	19.7 (2.5)	1.80 (1.48-2.18)	21.8 (3.0)	2.05 (1.61-2.60)
Nativity					
US born	84.8 (1.5)	80.0 (2.2)	1 [Reference]	78.4 (2.6)	1 [Reference]
Foreign born	15.2 (1.5)	20.0 (2.2)	1.39 (1.19-1.62)	21.6 (2.6)	1.54 (1.27-1.86)
Age, y					
18-25	21.0 (0.5)	38.0 (1.8)	2.30 (1.96-2.69)	36.1 (2.2)	2.13 (1.75-2.59)
26-50	79.0 (0.5)	62.1 (1.8)	1 [Reference]	63.9 (2.2)	1 [Reference]
Marital status					
Married or cohabiting	59.6 (0.7)	76.2 (1.5)	1 [Reference]	75.4 (1.9)	1 [Reference]
Widowed, separated, or divorced	13.4 (0.4)	4.7 (0.6)	0.27 (0.21-0.36)	5.9 (0.9)	0.35 (0.25-0.49)
Never married	27.0 (0.7)	19.2 (1.4)	0.55 (0.45-0.68)	18.7 (1.8)	0.55 (0.42-0.71)
Education					
< High school	11.2 (0.7)	17.1 (1.3)	1 [Reference]	18.6 (1.7)	1 [Reference]
High school	27.0 (0.6)	26.3 (1.3)	0.64 (0.53-0.77)	24.9 (1.6)	0.55 (0.44-0.71)
College or higher	61.9 (0.8)	56.6 (1.7)	0.60 (0.51-0.70)	56.5 (2.1)	0.55 (0.44-0.68)
Personal annual income, \$					
0-19 999	56.1 (0.8)	69.8 (1.5)	1 [Reference]	72.9 (1.6)	1 [Reference]
20 000-34 999	22.6 (0.5)	16.9 (1.2)	0.60 (0.51-0.72)	15.5 (1.4)	0.53 (0.43-0.66)
35 000-69 999	17.5 (0.6)	10.3 (1.0)	0.47 (0.39-0.58)	8.7 (1.0)	0.38 (0.30-0.50)
≥ 70 000	3.7 (0.3)	3.0 (0.5)	0.63 (0.44-0.91)	2.9 (0.6)	0.59 (0.38-0.93)
Urbanicity					
Rural	62.7 (2.6)	58.5 (3.3)	1.19 (1.00-1.42)	40.1 (3.4)	1.13 (0.92-1.39)
Urban	37.3 (2.6)	41.5 (3.3)	1 [Reference]	59.9 (3.4)	1 [Reference]
Region					
Northeast	19.6 (3.5)	18.5 (3.9)	0.87 (0.69-1.11)	17.1 (3.9)	0.83 (0.61-1.13)
Midwest	22.9 (3.4)	23.1 (3.7)	0.93 (0.75-1.15)	24.1 (3.8)	1.00 (0.77-1.30)
South	35.2 (3.5)	34.3 (3.8)	0.89 (0.74-1.09)	35.3 (4.1)	0.95 (0.76-1.19)
West	22.3 (3.7)	24.1 (4.4)	1 [Reference]	23.5 (4.5)	1 [Reference]
Parity					
Nullipara	32.9 (0.7)	17.8 (1.3)	0.44 (0.36-0.53)	100 (0.0)	NA
Multipara ^c	67.1 (0.7)	82.3 (1.3)	1 [Reference]	0 (0.0)	NA
Insurance					
Private	68.8 (1.0)	57.2 (1.9)	0.89 (0.74-1.07)	55.4 (2.3)	0.80 (0.64-1.01)
Public	8.5 (0.4)	21.6 (1.5)	2.72 (2.20-3.37)	21.9 (1.7)	2.58 (1.99-3.33)
None	22.8 (0.8)	21.3 (1.5)	1 [Reference]	22.8 (2.0)	1 [Reference]
Overall health (good, very good, or excellent) ^d	89.6 (0.4)	94.3 (0.7)	1.92 (1.49-2.46)	94.3 (0.9)	1.93 (1.39-2.69)
Stressful life events					
Mean No. of stressful life events ^e	1.8 (0.0)	2.0 (0.1)	1.08 (1.04-1.12)	2.1 (0.1)	1.11 (1.06-1.17)
Breakup of romantic relationship, separation, or divorce in past 12 mo	8.2 (0.3)	8.8 (0.8)	1.08 (0.87-1.35)	9.6 (1.1)	1.19 (0.91-1.55)
History of trauma or victimization in past 12 mo ^f	4.6 (0.2)	5.3 (0.6)	1.18 (0.92-1.53)	4.7 (0.7)	1.04 (0.75-1.44)

Abbreviations: CI, confidence interval; NA, not applicable; OR, odds ratio.

^aPast-year pregnant women includes both currently pregnant and postpartum women.

^bPostpartum women includes women who were not currently pregnant but had been pregnant in the past 12 months.

^cOne or more children.

^dOverall health status assessed self-reported perception of the respondents' health. Respondents were asked, "In general, would you say your health is excellent, very good, good, fair, or poor?"

^eOdds of having a psychiatric disorder with each additional stressful life event in the past 12 months.

^fHistory of trauma and victimization in the past 12 months was defined as being personally the victim of a crime or attempted crime, such as being beaten up, mugged or attacked by a stranger or someone they knew, hit, threatened, or forced to have sex.

indicated by asking the respondents whether they had ever been told by a doctor or other health professional that they had schizophrenia or a psychotic disorder.

We also included variables measuring any substance use, any alcohol use, and any tobacco use in the past 12 months.

The reliability of the alcohol consumption and drug use measures have been documented elsewhere.⁵² The number of stressful life events was measured with 12 items from the Social Readjustment Rating Scale,⁵⁹ eg, fired from a job or forced to move. Additional questions queried pregnancy complications (eg, "Did

you experience/have you experienced any complications with your pregnancy?"), parity, and overall health status (eg, "In general, would you say your health is excellent, very good, good, fair, or poor?"). Also, respondents were classified as having a history of trauma and victimization in the past 12 months if they had personally been the victim of a crime or attempted crime, such as having been beaten up, mugged, or attacked by a stranger or someone they knew; hit; threatened; or forced to have sex.

To estimate rates of mental health service utilization, respondents with psychiatric disorders were classified as receiving treatment if they sought help from a counselor, therapist, physician, or psychologist, or from an emergency department; if they were hospitalized for psychiatric reasons at least 1 night; or if they were prescribed medications. Treatment utilization questions were disorder-specific. Analyses were conducted on those who were diagnosed as having the disorder of interest in the time frame under consideration. For instance, prevalence of past-year treatment seeking for a mood disorder was calculated among those with a past-year diagnosis of a mood disorder by means of treatment utilization questions specifically asked about treatment for a mood disorder.

STATISTICAL ANALYSES

Weighted cross-tabulations were used to calculate prevalence rates for each study group. A series of logistic regression analyses yielded odds ratios, indicating associations between pregnancy status and (1) sociodemographic characteristics, (2) each specific 12-month psychiatric disorder, and (3) 12-month and lifetime mental health service utilization. In these 3 sets of analyses, nonpregnant women served as the reference group. The logistic regression analyses of the associations between pregnancy status and each 12-month psychiatric disorder are presented without adjustment, and also adjusted for sociodemographic characteristics, previous history of that disorder (occurring prior to the past 12 months), overall health, and number of stressful life events. Finally, a series of logistic regression analyses yielded odds ratios indicating associations between sociodemographic characteristics and any 12-month psychiatric disorder among pregnant women, using pregnant women without any 12-month psychiatric disorder as the reference group. Standard errors and 95% confidence limits for all analyses were estimated with SUDAAN,⁶⁰ which is statistical software that adjusts for the design characteristics of the survey.

To guard against the possibility of variations in the results due to different definitions of the sample of interest, identical analyses were conducted separately for the 3 different samples, past-year pregnant women, currently pregnant women, and postpartum women (using the same nonpregnant group as the reference group in all analyses for the 3 samples). We present herein the analyses conducted on the largest group (past-year pregnant women) and indicate the main differences with the analyses of the other 2 samples (currently pregnant women and postpartum women). Full results of the analysis of the sample of currently pregnant women are available as supplementary material (eTables 1, 2, 3, and 4 [<http://www.archgenpsychiatry.com>]).

RESULTS

SOCIODEMOGRAPHIC CHARACTERISTICS

The distributions of sociodemographic characteristics by pregnancy status are shown in **Table 1**. Compared with nonpregnant women, past-year pregnant women were

more likely to be Hispanic, black, or Asian; to be foreign born; to be between the ages of 18 and 25 years; and to have public insurance. In addition, past-year pregnant women were more likely than nonpregnant women to have a higher number of stressful life events and to report good to excellent overall health. Conversely, past-year pregnant women were significantly less likely than nonpregnant women to be widowed, separated, divorced, or never married; to have more than a high school education; to have earned \$20 000 or more in the past year; and to be nulliparous.

RATES OF DSM-IV AXIS I DISORDERS

Twelve-month rates of specific *DSM-IV* psychiatric disorders by pregnancy status are shown in **Table 2**. Twelve-month prevalence of psychiatric disorders ranged from 0.4% (any psychotic disorders) to 14.6% (any substance use disorder) in past-year pregnant women and from 0.3% to 19.9% for the same diagnoses in nonpregnant women. Adjusted odds ratios revealed that past-year pregnant women were significantly less likely than nonpregnant women to have been diagnosed as having any substance use disorder, including alcohol and other drug use disorders and nicotine dependence, and any psychiatric disorder. Past-year pregnant women also had lower rates of any alcohol use and any tobacco use, but not any illicit drug use.

SOCIODEMOGRAPHIC PREDICTORS OF PSYCHIATRIC DISORDERS AMONG PAST-YEAR PREGNANT WOMEN

Table 3 shows percentage distributions and odds ratios for sociodemographic characteristics for past-year pregnant women with and without any 12-month *DSM-IV* psychiatric disorders. Being 18 to 25 years old; never being married or being widowed, separated, or divorced; and reporting pregnancy complications, current stressful life events, breakup of a romantic relationship, and history of trauma or victimization within the past 12 months were associated with higher rates of psychiatric disorders in past-year pregnant women. Furthermore, compared with past-year pregnant women without psychiatric disorders, past-year pregnant women with psychiatric disorders were significantly less likely to report good to excellent overall health.

MENTAL HEALTH SERVICE UTILIZATION AMONG PAST-YEAR PREGNANT AND NONPREGNANT WOMEN

The odds of past-year treatment seeking for mood disorders among women with a past-year diagnosis of a mood disorder were significantly lower in past-year pregnant women than in nonpregnant women (**Table 4**).

ANALYSES OF CURRENTLY PREGNANT WOMEN AND POSTPARTUM WOMEN

Although there were some minor differences between identical analyses of past-year pregnant women and those

Table 2. Twelve-Month Prevalence and ORs of DSM-IV Axis I Psychiatric Disorders by Pregnancy Status

Disorder	% (SE)		OR (95% CI)	AOR ^b (95% CI)	Postpartum Women, ^c % (SE)	OR (95% CI)	AOR ^b (95% CI)
	Nonpregnant Women (n=13 025)	Past-Year Pregnant Women ^a (n=1524)					
Any psychiatric disorder	30.1 (0.8)	25.3 (1.3)	0.78 (0.69-0.90)	0.75 (0.62-0.90)	25.7 (1.8)	0.80 (0.68-0.95)	0.81 (0.65-1.02)
Any new-onset psychiatric disorder (current but not before past 12 mo)	7.0 (0.3)	8.0 (0.8)	1.16 (0.92-1.46)	0.97 (0.75-1.25)	8.3 (1.1)	1.20 (0.89-1.61)	0.96 (0.69-1.33)
Any substance use disorder	19.9 (0.7)	14.6 (1.2)	0.68 (0.57-0.82)	0.56 (0.44-0.71)	12.0 (1.3)	0.55 (0.43-0.69)	0.44 (0.33-0.59)
Any alcohol use disorder	7.6 (0.4)	3.6 (0.5)	0.45 (0.34-0.60)	0.49 (0.36-0.67)	2.9 (0.6)	0.36 (0.23-0.54)	0.41 (0.27-0.64)
Any drug use disorder	2.0 (0.2)	1.6 (0.4)	0.82 (0.49-1.37)	0.52 (0.29-0.94)	1.3 (0.5)	0.63 (0.30-1.34)	0.50 (0.23-1.08)
Nicotine dependence	14.6 (0.6)	12.5 (1.1)	0.84 (0.68-1.02)	0.79 (0.64-0.97)	10.7 (1.2)	0.70 (0.55-0.89)	0.60 (0.47-0.76)
Any mood disorder	13.7 (0.5)	13.3 (1.1)	0.96 (0.80-1.16)	1.04 (0.83-1.32)	15.2 (1.5)	1.13 (0.90-1.40)	1.28 (0.97-1.69)
MDD	8.1 (0.9)	8.4 (0.4)	0.95 (0.75-1.20)	1.24 (0.94-1.64)	9.3 (1.1)	1.11 (0.84-1.46)	1.52 (1.07-2.15)
Dysthymia	2.0 (0.2)	0.9 (0.4)	0.46 (0.21-1.00)	0.51 (0.22-1.18)	1.0 (0.5)	0.49 (0.18-1.33)	0.74 (0.26-2.07)
Bipolar disorder	2.3 (0.2)	2.8 (0.5)	1.26 (0.86-1.84)	1.09 (0.70-1.70)	2.9 (0.6)	1.31 (0.86-2.00)	1.08 (0.66-1.78)
Any anxiety disorder	14.9 (0.6)	13.0 (1.1)	0.85 (0.70-1.03)	0.99 (0.68-1.43)	12.3 (1.3)	0.81 (0.65-1.00)	0.89 (0.57-1.38)
Panic disorder	3.0 (0.2)	2.2 (0.5)	0.73 (0.46-1.15)	0.91 (0.53-1.56)	2.5 (0.6)	0.83 (0.50-1.39)	0.92 (0.48-1.73)
Social anxiety disorder	2.8 (0.2)	1.8 (0.4)	0.65 (0.41-1.02)	0.66 (0.33-1.31)	1.0 (0.4)	0.34 (0.15-0.75)	0.36 (0.14-0.92)
Specific phobia	10.2 (0.5)	9.2 (0.9)	0.89 (0.72-1.11)	0.93 (0.53-1.61)	8.7 (1.0)	0.84 (0.66-1.08)	0.97 (0.49-1.91)
Generalized anxiety	1.8 (0.2)	1.3 (0.4)	0.73 (0.42-1.29)	1.57 (0.82-3.02)	1.5 (0.5)	0.81 (0.41-1.60)	1.78 (0.81-3.94)
Any psychotic disorder	0.3 (0.1)	0.4 (0.2)	1.14 (0.44-2.94)	1.50 (0.54-4.18)	0.5 (0.2)	1.60 (0.58-4.45)	1.98 (0.61-6.46)
Any substance use	73.8 (1.0)	63.0 (1.8)	0.60 (0.53-0.69)	0.66 (0.57-0.77)	62.1 (2.1)	0.58 (0.49-0.69)	0.63 (0.52-0.77)
Any alcohol use	68.5 (0.9)	59.0 (1.7)	0.66 (0.58-0.75)	0.71 (0.61-0.81)	58.1 (2.1)	0.64 (0.54-0.75)	0.69 (0.57-0.83)
Any tobacco use	26.6 (0.8)	21.9 (1.5)	0.77 (0.66-0.91)	0.76 (0.64-0.89)	21.5 (1.8)	0.75 (0.62-0.92)	0.69 (0.56-0.83)
Any illicit drug use	6.8 (0.3)	6.2 (0.7)	0.91 (0.72-1.17)	0.87 (0.66-1.15)	6.1 (0.8)	0.89 (0.66-1.20)	0.93 (0.67-1.28)
Mean No. of cigarettes a day in past 12 mo (only among smokers)	15.9 (0.3)	16.6 (1.4)	$t=0.52$ $P=.60$	$\beta=0.05$ $SE=0.04$ $P=.29^d$	16.3 (1.6)	$t=0.23$ $P=.82$	$\beta=0.04$ $SE=0.04$ $P=.28^d$

Abbreviations: AOR, adjusted odds ratio; CI, confidence interval; MDD, major depressive disorder; OR, odds ratio.

^aPast-year pregnant women includes both currently pregnant and postpartum women.

^bOdds ratios adjusted for race/ethnicity, nativity, age, marital status, education, parity, lifetime history of row-defined disorder (disorder occurring prior to the past 12 months), overall health, and number of stressful life events.

^cPostpartum women includes women who were not currently pregnant but had been pregnant in the past 12 months.

^dLinear regression controlled for race/ethnicity, nativity, age, marital status, education, parity, overall health, and stressful life events.

conducted when the sample was restricted to postpartum women (see Tables 1, 2, 3, and 4) or currently pregnant women (see eTables 1, 2, 3, and 4), the overall pattern of results remained the same. Most differences involved changes in the level of significance of the findings. Important exceptions were as follows: (1) the prevalence of major depressive disorder, which was not different between past-year pregnant and nonpregnant women, was significantly higher in postpartum women when the adjusted odds ratios were considered; (2) in contrast to past-year pregnant women, currently pregnant women had a significantly decreased likelihood of having any mood disorder compared with nonpregnant women; and (3) the prevalence of social anxiety disorder, which was not significantly different between past-year pregnant and nonpregnant women, was significantly lower in postpartum women compared with nonpregnant women.

COMMENT

This is, to our knowledge, the first study to examine the prevalence and correlates of mental disorders and mental health treatment seeking in a nationally representative sample of pregnant and postpartum women. We

highlight 4 major results: (1) although rates of Axis I psychiatric disorders, including substance use, mood, and anxiety disorders, are high in women of childbearing age regardless of pregnancy status, pregnancy per se is not associated with an increased risk of new onset or recurrence of the most prevalent mental disorders, and is associated with lower rates of substance use, except illicit drug use, and substance use disorders; (2) the risk of major depressive disorder may be increased during the postpartum period, whereas the risk of any mood disorder appears to be decreased in currently pregnant women; (3) younger age, not being married, exposure to traumatic or stressful life events in the past 12 months, pregnancy complications, and overall poor health increase the risk of mental disorders in past-year pregnant women; and (4) psychiatric treatment rates among pregnant women with psychiatric disorders are very low.

Although high rates of psychiatric disorders have been reported in clinical samples of pregnant and postpartum women,^{40,41,61-64} the specific contribution of pregnancy to the prevalence of psychiatric disorders in women of childbearing age had not been previously examined. In our study, the overall 12-month rate of psychiatric disorders in pregnant and postpartum women was high, but no differences were found in the overall prevalence of

Table 3. Twelve-Month Percentage Distributions and ORs of Sociodemographic Characteristics by Pregnancy and Psychiatric Status

Characteristic	Past-Year Pregnant Women, ^a % (SE)			Postpartum Women, ^b % (SE)		
	With Any Psychiatric Disorder ^c (n=389)	Without Any Psychiatric Disorder (n=1135)	AOR ^d (95% CI)	With Any Psychiatric Disorder ^c (n=254)	Without Any Psychiatric Disorder (n=740)	AOR ^d (95% CI)
Race/ethnicity						
White	60.7 (3.1)	56.0 (2.7)	1 [Reference]	59.5 (3.8)	54.1 (3.2)	1 [Reference]
Black	16.7 (2.2)	13.3 (1.5)	0.91 (0.58-1.41)	17.0 (2.7)	13.5 (1.6)	1.02 (0.59-1.76)
Native American	4.4 (1.3)	2.2 (0.7)	1.48 (0.54-4.07)	6.4 (2.0)	1.5 (0.6)	3.36 (1.08-10.40)
Asian	4.8 (1.3)	6.6 (1.2)	1.24 (0.60-2.58)	5.4 (1.8)	5.5 (1.1)	1.95 (0.70-5.44)
Hispanic	13.4 (2.2)	21.9 (2.8)	0.66 (0.41-1.06)	11.7 (2.1)	25.4 (3.5)	0.53 (0.31-0.92)
Age, y						
18-25	47.7 (3.1)	34.7 (2.0)	1.49 (1.05-2.10)	42.8 (3.6)	33.8 (2.6)	1.34 (0.89-2.03)
26-50	52.4 (3.1)	65.3 (2.0)	1 [Reference]	57.2 (3.6)	66.2 (2.6)	1 [Reference]
Marital status						
Married or cohabiting	65.0 (2.9)	79.9 (1.6)	1 [Reference]	65.5 (3.5)	78.8 (2.2)	1 [Reference]
Widowed, separated, or divorced	8.7 (1.8)	3.3 (0.6)	3.12 (1.83-5.31)	12.3 (2.7)	3.7 (0.8)	3.28 (1.75-6.17)
Never married	26.3 (2.6)	16.7 (1.5)	1.53 (1.03-2.28)	22.3 (2.8)	17.5 (2.2)	1.18 (0.75-1.87)
Education						
< High school	19.0 (2.5)	16.4 (1.5)	1 [Reference]	21.6 (3.3)	17.6 (1.8)	1 [Reference]
High school	29.0 (2.7)	25.4 (1.4)	0.87 (0.57-1.34)	25.8 (3.1)	24.6 (1.8)	0.67 (0.39-1.15)
College or higher	52.0 (3.0)	58.2 (2.0)	0.78 (0.50-1.22)	52.7 (3.8)	57.9 (2.4)	0.61 (0.36-1.04)
Personal annual income, \$						
0-19 999	72.0 (2.7)	69.0 (1.9)	1 [Reference]	75.5 (3.2)	72.0 (2.1)	1 [Reference]
20 000-34 999	17.4 (2.2)	16.8 (1.4)	1.05 (0.70-1.60)	16.1 (2.7)	15.3 (1.6)	0.95 (0.55-1.64)
35 000-69 999	8.2 (1.7)	11.1 (1.2)	0.84 (0.47-1.51)	5.6 (1.6)	9.8 (1.3)	0.55 (0.26-1.16)
≥ 70 000	2.4 (1.0)	3.1 (0.6)	0.92 (0.34-2.51)	2.8 (1.3)	2.9 (0.7)	0.94 (0.25-3.48)
Urbanicity						
Rural	45.4 (3.8)	40.2 (3.6)	1.27 (0.92-1.75)	44.8 (4.4)	38.7 (3.9)	1.30 (0.83-2.03)
Urban	54.6 (3.8)	59.8 (3.6)	1 [Reference]	55.2 (4.4)	61.3 (3.9)	1 [Reference]
Region						
Northeast	13.3 (2.9)	20.3 (4.4)	0.67 (0.45-1.01)	12.1 (2.9)	18.9 (4.6)	0.61 (0.33-1.12)
Midwest	28.1 (3.8)	21.4 (3.9)	1.12 (0.73-1.71)	27.9 (4.3)	22.8 (4.1)	0.98 (0.57-1.67)
South	35.6 (3.9)	33.8 (4.1)	0.96 (0.67-1.37)	38.6 (4.3)	34.1 (4.6)	1.02 (0.65-1.61)
West	22.9 (3.7)	24.4 (4.8)	1 [Reference]	21.4 (3.7)	24.2 (5.2)	1 [Reference]
Parity						
Nullipara	20.8 (2.6)	16.7 (1.5)	1.25 (0.86-1.81)	13.7 (2.6)	0 (0.0)	NA
Multipara ^e	79.2 (2.6)	83.3 (1.5)	1.0	86.3 (2.6)	100.0 (0.0)	NA
Pregnancy complications	40.1 (2.8)	25.2 (1.7)	1.90 (1.42-2.54)	47.3 (3.2)	42.9 (3.4)	1.70 (1.23-2.35)
Breakup of romantic relationship, separation, or divorce in past 12 mo	18.3 (2.3)	5.6 (0.8)	2.54 (1.59-4.07)	20.0 (3.0)	6.1 (1.0)	2.49 (1.36-4.57)
Mean No. of stressful life events in past 12 mo ^f	3.1 (0.1)	1.6 (0.1)	1.41 (1.30-1.52)	3.2 (0.2)	1.7 (0.1)	1.44 (1.30-1.60)
Overall health (good, very good, or excellent) ^g	87.7 (1.9)	96.5 (0.6)	0.30 (0.18-0.50)	88.9 (2.4)	96.1 (0.8)	0.38 (0.20-0.74)
History of trauma or victimization in past 12 mo ^h	9.4 (1.6)	4.0 (0.6)	2.23 (1.33-3.74)	9.4 (1.9)	3.1 (0.7)	3.31 (1.69-6.48)

Abbreviations: AOR, adjusted odds ratio; CI, confidence interval; NA, not applicable; OR, odds ratio.

^aPast-year pregnant women includes both currently pregnant and postpartum women.

^bPostpartum women includes women who were not currently pregnant but had been pregnant in the past 12 months.

^cPsychiatric disorders include a past-year diagnosis of any alcohol use disorder, any drug use disorder, nicotine dependence, major depressive disorder, dysthymia, bipolar disorder, panic disorder, social anxiety disorder, specific phobia, or generalized anxiety disorder.

^dOdds ratios adjusted for race/ethnicity, nativity, age, marital status, education, and parity.

^eOne or more children.

^fOdds of having a psychiatric disorder with each additional stressful life event in the past 12 months.

^gOverall health status assessed self-reported perception of the respondents' health. Respondents were asked, "In general, would you say your health is excellent, very good, good, fair, or poor?"

^hHistory of trauma and victimization in the past 12 months was defined as being personally the victim of a crime or attempted crime, such as being beaten up, mugged or attacked by a stranger or someone they knew, hit, threatened, or forced to have sex.

specific psychiatric disorders between past-year pregnant and postpartum and nonpregnant women, except for the prevalence of substance use disorders, which was lower in past-year pregnant and postpartum women than in nonpregnant women of childbearing age. Our results are in accord with most,^{3,5,7,8,44,65} although not all,⁴⁷ stud-

ies derived from clinical samples, but are important because they extend these findings to the general population. Clinical studies have suggested that trimester of pregnancy affects the rates of psychiatric symptoms, with some studies suggesting an exacerbation of psychiatric disorders in the first 2 trimesters of pregnancy,⁶⁵ while

Table 4. Prevalence and ORs of Mental Health Service Utilization Among Nonpregnant, Past-Year Pregnant, and Postpartum Women With 12-Month and Lifetime DSM-IV Disorders

	% (SE)		OR (95% CI)	AOR ^b (95% CI)	Postpartum Women, ^c % (SE) (n=994)	OR (95% CI)	AOR ^b (95% CI)
	Nonpregnant Women (n=13 025)	Past-Year Pregnant Women ^a (n=1524)					
Treatment seeking for any disorder ^d							
Past 12 mo	16.5 (0.8)	10.5 (1.8)	0.59 (0.40-0.88)	0.68 (0.44-1.04)	11.1 (2.3)	0.63 (0.39-1.02)	0.64 (0.39-1.05)
Lifetime	41.0 (0.8)	35.8 (2.3)	0.80 (0.65-0.98)	0.88 (0.70-1.09)	40.7 (2.9)	0.99 (0.78-1.25)	1.03 (0.80-1.33)
Treatment seeking for alcohol use disorder							
Past 12 mo	6.0 (0.9)	9.9 (4.6)	1.70 (0.54-5.37)	1.79 (0.44-7.29)	8.3 (5.9)	1.40 (0.28-7.09)	1.06 (0.15-7.41)
Lifetime	41.0 (0.8)	7.6 (1.6)	0.67 (0.43-1.05)	0.69 (0.43-1.13)	9.1 (2.1)	0.81 (0.49-1.35)	0.75 (0.43-1.33)
Treatment seeking for drug use disorder							
Past 12 mo	17.0 (3.0)	30.3 (11.0)	2.13 (0.68-6.67)	2.56 (0.59-11.09)	34.6 (16.2)	2.59 (0.59-11.40)	2.43 (0.46-12.95)
Lifetime	15.3 (1.2)	18.0 (3.4)	1.22 (0.74-1.99)	1.18 (0.71-1.95)	21.0 (4.5)	1.46 (0.85-2.03)	1.36 (0.79-2.36)
Treatment seeking for mood disorder							
Past 12 mo	25.5 (1.4)	14.3 (2.7)	0.49 (0.31-0.77)	0.57 (0.34-0.93)	15.0 (3.3)	0.52 (0.30-0.88)	0.55 (0.31-0.96)
Lifetime	61.1 (1.1)	56.1 (3.2)	0.76 (0.53-1.07)	0.86 (0.58-1.27)	58.6 (3.7)	0.73 (0.48-1.10)	0.76 (0.48-1.19)
Treatment seeking for anxiety disorder							
Past 12 mo	11.6 (1.0)	6.1 (1.9)	0.50 (0.25-0.97)	0.62 (0.31-1.24)	7.5 (2.6)	0.62 (0.29-1.32)	0.72 (0.33-1.57)
Lifetime	29.0 (1.1)	23.2 (2.9)	0.74 (0.52-1.05)	0.92 (0.65-1.30)	27.9 (4.3)	0.95 (0.61-1.47)	1.10 (0.71-1.73)

Abbreviations: AOR, adjusted odds ratio; CI, confidence interval; OR, odds ratio.

^aPast-year pregnant women includes both currently pregnant and postpartum women.

^bOdds ratios adjusted for race/ethnicity, nativity, age, marital status, education, and parity.

^cPostpartum women includes women who were not currently pregnant but had been pregnant in the past 12 months.

^dMental health service utilization among respondents with the specific 12-month or lifetime disorder (disorder occurring before the past 12 months).

others have reported greater rates of depressive disorders during the second and third trimesters of pregnancy.^{18,64} The NESARC did not collect data on month of pregnancy at interview. Including only women during their first, second, or third trimester of pregnancy might have resulted in higher or lower estimates, according to trimester, of the prevalence of mental disorders among pregnant women than the ones reported herein. Our results on all pregnant women, regardless of trimester, provide a more accurate overall estimate of the prevalence of psychiatric disorders during this entire critical period. Nevertheless, the high prevalence of psychiatric disorders in pregnant women stresses the need for continued work to identify the causes and develop effective treatments for mental disorders among pregnant and postpartum women.

Past-year pregnant and postpartum women were significantly less likely than nonpregnant women to use any substance, except illicit drugs. Use of illicit drugs was slightly but not significantly less likely among past-year pregnant and postpartum women. The 2006 National Survey on Drug Use and Health (NSDUH) reports significantly lower rates of substance use, including illicit drugs, among pregnant women than among nonpregnant women.⁶⁶ However, rates of substance use by pregnant women overall in the NSDUH were lower than the rates reported in our sample. This discrepancy may be due to differences between the NSDUH and our study in the alcohol consumption and substance use measures and the time frame for reporting use of these substances (30 days in the NSDUH and past 12 months in the NESARC). Moreover, the test-retest reliability and validity of the NSDUH alcohol consumption and drug use measures have

not been reported, so differences in psychometric properties of the measures in the 2 surveys could also contribute to a difference in results. Nonetheless, substance use by pregnant women is a leading preventable cause of mental, physical, and psychological problems in infants and children.^{13,14,37-39} Priority should be given to development of effective screening and intervention efforts to assist pregnant and postpartum women in reducing substance abuse, evaluation of the effectiveness of current treatment programs, and investigation of barriers to treatment of pregnant substance users.

Although the overall prevalence of psychiatric disorders appears to be similar among currently pregnant, postpartum, and nonpregnant women, 2 important exceptions were the elevated risk of major depressive disorder during the postpartum period and the decreased likelihood of having any mood disorder in currently pregnant women. Biological (eg, hormonal) as well as psychological and social role changes associated with childbirth may increase the risk of major depressive disorder during the postpartum period. Furthermore, women with psychiatric illness who become pregnant may discontinue their psychiatric medication for fear of prenatal exposure of offspring to these agents, thereby increasing the risk of depressive relapse during pregnancy or the puerperium.⁶⁴ Our finding is consistent with most previous studies,^{2-5,9} although a lack of increase in prevalence of major depressive disorder during this period has also been reported.^{7,8} Past negative results may have been due to differences in the diagnostic criteria, the timing of the assessments, limited sample sizes, or use of convenience samples rather than population-based samples. Our findings underscore the need for systematic screen-

ing and treatment of postpartum women to ensure their health and the health of their offspring.

Our novel finding that currently pregnant women are significantly less likely than nonpregnant women to have a mood disorder suggests either a protective effect of pregnancy or an effect of pregnancy selection on rates of any mood disorder. The cross-sectional design of the NESARC does not permit differentiation of the effects of pregnancy selection from pregnancy itself on rates of psychiatric disorder and treatment. In other words, if women without histories of psychiatric disorders were more likely to become pregnant than those with psychopathologic symptoms, selection bias could mask an effect of pregnancy on increased rates of psychiatric disorders in pregnant women. However, by controlling for previous psychiatric disorders, our analyses should have minimized this possibility. Prospective studies that compare pregnant women with women who attempt but fail to become pregnant may also be biased by potential psychiatric disorders related to pregnancy failure.

Risk factors for psychiatric disorders and substance use among pregnant women are consistent with those identified in the general population⁶⁷⁻⁷⁴ and clinical samples of pregnant women.^{22,41,42,45,49,50,66,75} The odds of psychiatric morbidity were greater among women who were younger (aged 18-25 years); who were widowed, separated, or divorced; who reported recent loss of a romantic relationship, trauma, or victimization; who had more stressful life events; and who had poor or fair overall health. Our study extends previous findings by documenting that pregnancy complications are also associated with significantly higher risk of psychiatric morbidity in pregnant women. Identification of these groups at increased risk of psychiatric disorders should help alert all clinicians who treat pregnant and postpartum women (and their children) and aid in focusing targeted prevention and early treatment interventions in these populations.

Pregnant women with psychiatric disorders seldom reported having sought mental health treatment. Consistent with previous community surveys, most women with a current psychiatric disorder did not receive any mental health care in the 12 months before the survey.^{76,77} We found that this result held regardless of pregnancy status, even when we adjusted for sociodemographic factors. Furthermore, past-year pregnant women with past-year mood disorders had lower treatment rates than nonpregnant women. This observation is consistent with a recent report that pregnant women are less likely than nonpregnant women to receive inpatient or outpatient psychiatric treatment⁹ and that mental health symptoms and diagnoses are significantly undetected and underrecorded in pregnant women who receive prenatal care in obstetrics clinics.⁴⁶ Our analyses suggest that differences in service use are unlikely to be due to lower need (ie, lower prevalence) but rather may reflect a decreased ability to obtain care. This important, previously undetected health care disparity is even more striking because most women of childbearing age access the health care system during their pregnancies or postpartum periods.⁷⁸ Their failure to receive psychiatric treatment suggests the existence of important barriers to mental health care for this population.⁷⁹

Patients and health care providers may view psychiatric symptoms as a normative response to the physiologic and psychosocial changes during this period. On the basis of our results, such reactions may be mistaken and may interfere with recognition and treatment of psychiatric disorders among pregnant and postpartum women.^{21,46} Educational campaigns targeting women, their caretakers, and primary care physicians may be needed to increase recognition of psychiatric disorders among pregnant women. Mental health screening during routine prenatal and obstetric care may improve the detection of psychiatric disorders.⁴⁶ Dilemmas about the treatment of psychiatric disorders during pregnancy and puerperium may discourage women from seeking psychiatric treatment during this period.⁸⁰ Development and testing of empirically validated treatments of pregnant women that are safe for fetuses may increase rates of treatment seeking.⁸¹⁻⁸⁴ Competing medical demands (such as those directly related to pregnancy, postpartum, and pediatric care; other family, social, and work obligations; or simply fatigue) may interfere with patients' ability to attend appointments. Treatment models that are more patient centered may be needed to facilitate mental health treatment of this population.⁸⁵ Those models may include modifications already in place for the treatment of other populations, such as delivery of psychotherapy over the telephone or extended clinic hours.⁸⁶

Our results should be interpreted in the context of the following limitations. First, information on pregnancy status was based on self-report and not confirmed by pregnancy test. Second, because the NESARC sample included only individuals 18 years or older, information was unavailable on adolescents, who may be at increased risk of developing psychiatric disorders during pregnancy, although rates of adolescent pregnancy have recently declined.⁸⁷ Third, although NESARC is the largest US psychiatric epidemiologic survey ever conducted, our power to detect subgroup differences in the prevalence of rare mental disorders, eg, psychotic disorders, is limited. Other recent studies⁹ may be better powered to examine the occurrence of these disorders owing to their larger sample sizes, although they are limited by the risk of Berkson bias. Our study, on the other hand, counterbalances this limitation by its ability to examine the occurrence of disorders that have not resulted in admission or treatment and direct interview of pregnant, postpartum, and nonpregnant women. Fourth, the assessment of 12-month symptoms in currently pregnant women may have included women who were early in pregnancy, and therefore reporting symptoms largely or entirely from months prior to pregnancy. This would reduce the apparent differences in prevalence between the nonpregnant and the pregnant subgroups. However, most of the findings held when those 2 groups were analyzed separately. Fifth, the NESARC did not specifically assess the amount of obstetric care received by pregnant and recently postpartum women, information that would be helpful to add to future large-scale epidemiologic studies. Sixth, the NESARC did not collect data on month of pregnancy, time elapsed since delivery, use of psychotropic medication during pregnancy or puerperium, pregnancy outcomes, or specific complications. It is possible that some of the women included in

the postpartum group may have had a miscarriage or abortion. However, our data suggest that women with pregnancy complications have a greater prevalence of psychiatric disorders than other pregnant women. Exclusion of women with a miscarriage or abortion from the analyses would have resulted in lower estimates of mental disorders than the ones reported herein, suggesting that our analyses do not underestimate the prevalence of psychiatric disorders among pregnant women. Seventh, information on substance use and substance use disorders was based on self-report and not confirmed by objective methods. Some discrepancies have been found between self-reported and objectively measured rates of drug use in pregnant women in antenatal care.⁸⁸ Finally, our results rely on *DSM-IV* Axis I categories, a dichotomous model of psychiatric disorders. Continuous models of psychiatric disorders, currently being considered for *DSM-V*, may have provided different results.

Despite these limitations, the NESARC constitutes the largest nationally representative survey to date to include information on psychiatric disorders in pregnant women. Pregnancy is traditionally viewed as a stressful period that may provoke mental illness.⁸⁹ However, with the exception of major depressive disorder among postpartum women, rates of the most prevalent psychiatric disorders are not significantly higher and, in some cases, are even lower in pregnant and postpartum women than in nonpregnant women of childbearing age. It is possible that the clinical impression of elevated rates of mental disorders among pregnant women is explained by the higher contact of pregnant women with some aspects of the health care system, in this age group, compared with their nonpregnant counterparts, whose disorders are therefore underestimated. In this study, groups of pregnant women with particularly high prevalence of psychiatric disorders were identified (ie, pregnant women aged 18-25 years who were living without a partner, widowed, separated, divorced, and never married; pregnant women who experienced pregnancy complications, stressful life events, and trauma or victimization; and pregnant women with overall poor health). These more vulnerable groups should be targeted for prevention, assessment, and intervention efforts. Low rates of mental health service use were identified in this study regardless of pregnancy status. However, past-year treatment seeking for any 12-month mood disorder in past-year pregnant and postpartum women, and for any 12-month anxiety disorder in past-year pregnant women, was significantly lower than in nonpregnant women of childbearing age. Given the critical importance of this life period for mothers and their offspring, urgent action is needed to increase detection and treatment of psychiatric disorders among pregnant and postpartum women in the United States.

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Additional Information: The eTables are available at <http://www.archgenpsychiatry.com>.

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