

Outcomes, Costs, and Utilization of Pregnancy-Related Care

Monique V. Chireau, MD, MPH, Talya Salz, BS,
Haywood Brown, MD, and Lori Bastian, MD, MPH

As the number of female veterans rises steadily, the need for the VA to track and monitor women's health services, such as pregnancy care, becomes more urgent. These VA researchers take an important first step in this direction.

Women comprise a rapidly growing percentage of the total veteran population. Of the estimated 24.4 million veterans in the United States in 2005, 1.7 million, or 7%, were women.¹ In years to come, this percentage is expected to rise steadily,^{2,3} with some estimates projecting a doubling to 14% by 2010.²

Female veterans have distinct health care needs from those of their male counterparts.³ The female veteran population, for instance, is relatively young. In 2004, roughly 46% of all female veterans were younger than 45, compared with only 19% of male veterans.⁴ And this age distribution is reflected in the population of female veterans who seek health care at VHA facilities.³ This means that a

substantial proportion of the women who use VA health care are of reproductive age. Many of these women are uninsured apart from their VA health care benefits because they do not qualify for Medicaid.

Recognition of these changing trends within the veteran population has resulted in expansion of health care coverage to accommodate the special needs of female veterans. The Veterans' Health Care Eligibility Reform Act of 1996 established a VHA maternity benefit program for female veterans.⁵ This program uses a fee-basis mechanism, by which veterans receive prenatal and obstetric care from non-VA providers in their communities—including hospitals, laboratories, radiologists, specialists, and obstetrics and gynecology physicians—who then bill the VA per visit and per procedure. The program covers the costs of all obstetric care, including those services associated with miscarriage. Legislation has been proposed that would add coverage of newborn care to the program.

In general, veterans appear to have poorer health and more intensive utilization of health services than age-matched civilians.⁶ Female veterans using VA care have been noted to have high rates of hypertension,

diabetes, dyslipidemia, smoking, and obesity, as well as a high prevalence of physical and sexual abuse, including military sexual trauma (MST).⁷⁻¹⁰ Nevertheless, no study has examined adverse pregnancy outcomes among female veterans. This may be due, in part, to the fact that the VA's focus on women's reproductive health is relatively recent. Additionally, while each VA medical center (VAMC) maintains records on women who have received prenatal and delivery care, no aggregated data or cost estimates are available for the total number of female veterans who utilize the VHA's maternity benefit program. Despite the potentially large costs associated with the program, streamlined mechanisms to track these services have not been developed.

To raise awareness of the lack of data and to begin to fill in some of the gaps, we performed a pilot study of female veterans at our facility whose prenatal care, delivery, and hospital charges were paid using the VA's fee-basis mechanism. We examined demographic and clinical characteristics of these veterans, their pregnancy outcomes, and the costs associated with their pregnancy care. We believe that the results of this study highlight the increasing

Dr. Chireau is an assistant professor in the department of obstetrics and gynecology at Duke University Medical Center (DUMC) and a research associate at the Center for Health Services Research in Primary Care, Durham VA Medical Center (DVAMC), both in Durham, NC. **Ms. Salz** is a PhD candidate in the department of health policy and administration at the School of Public Health, University of North Carolina, Chapel Hill. **Dr. Brown** is a professor and chair of the department of obstetrics and gynecology at DUMC. **Dr. Bastian** is an associate professor in the department of medicine at DUMC and a research associate at the Center for Health Services Research in Primary Care, DVAMC.

importance of the maternity benefit as a source of pregnancy-related care among female veterans and suggest directions for further research aimed at improving care for female veterans and their children.

STUDY METHODS

For our study, we included female veterans who applied for VA maternity benefits consecutively between calendar years 1999 and 2005 and who had received any care or referral for pregnancy care at the Durham VAMC. After obtaining approval from the VA Human Studies Committee, we identified these patients using the Durham VAMC's billing files and electronic medical record system, Veterans Health Information Systems and Technology Architecture (VistA).

Next, we created a de-identified Stata database (StataCorp LP, College Station, TX), which included information on pregnancy events and outcomes, concurrent medical and psychiatric conditions, and costs. We used International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) and Current Procedural Terminology (CPT) codes to identify pregnancy-associated outcomes and procedures. Adverse pregnancy events included hypertension in pregnancy (preeclampsia), gestational diabetes mellitus, preterm delivery, delivery of an infant that was small or large for the gestational age, postpartum hemorrhage, and fetal demise. We used data from VistA to identify concurrent medical and psychiatric conditions and assess rates of primary care enrollment. Finally, we used bills submitted by individual providers, laboratories, and hospitals to the Durham VAMC for reimbursement to estimate costs of obstetrical care.

Statistical analyses were performed using the Stata 8 (StataCorp LP) statistical software package.

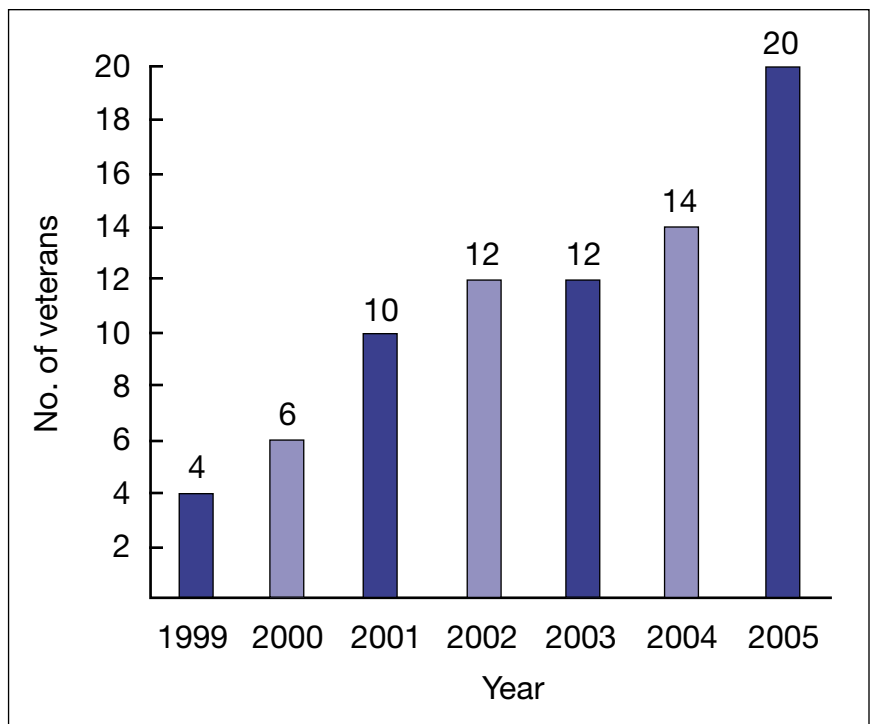


Figure. Number of veterans who both enrolled in the Durham VA Medical Center's fee-based maternity benefit program and delivered a baby during the study period, by year.

Student's *t* test was used to perform comparisons.

VETERANS WHO USED THE PROGRAM

We identified the records of 67 female veterans who had been approved to receive fee-based reimbursement for pregnancy-related care by the Durham VAMC during the specified study period. Notably, 22 of these veterans were using the program in 2005, more than twice as many as in the previous year (10). This pattern of use also was reflected in the numbers of veterans who were still enrolled in the program by the time they delivered their babies (Figure).

Of the 67 veterans identified, 33 had complete records—that is, we could ascertain that they had given birth after 20 weeks of gestation, and billing and delivery outcome data

were available. Among the 34 veterans with incomplete files, 19 were missing hospital billing data, 11 were still pregnant, three had miscarriages, and one had an abortion.

We included only the 33 veterans with complete records in our analysis. In the final sample, 61% of the patients were white and 39% were black (Table 1). The mean age was 28.5 years (range, 21 to 39 years).

CONCURRENT CONDITIONS AND OUTCOMES

Of the 33 veterans in our sample, 10 (32%) had at least one chronic medical condition and three (9%) had two or more conditions. Hypertension and asthma were the most common, affecting 21% and 9% of the veterans, respectively. Thirteen veterans (39%) had been diagnosed with at least one psychiatric condition, including

Continued on page 25

Continued from page 21

six (18%) with depression and two (6%) with posttraumatic stress disorder (PTSD). There were one case each (3%) of anxiety disorder, bipolar disorder, borderline personality disorder, MST, mood disorder, and schizophrenia. After pregnancy, 58% of the veterans were not enrolled in VA primary care.

Adverse pregnancy outcomes occurred in 12 (36%) of the veterans. Of these, five (15%) gave birth prematurely, two (6%) had gestational diabetes, two (6%) had an infant that was small for the gestational age, one (3%) had an abruption, one (3%) experienced a pregnancy ending in fetal demise in utero, and one (3%) had preeclampsia. Veterans with a psychiatric diagnosis were significantly more likely than those without such a diagnosis to have an adverse pregnancy event (Table 2). Neither psychiatric diagnoses nor chronic medical conditions, however, were associated with cesarean delivery.

The estimated mean total cost of pregnancy care for the entire sample was \$9,359 (range, \$5,078 to \$20,279). Not surprisingly, this cost differed with the type of delivery: \$7,447 (range, \$5,078 to \$9,899) for veterans who had vaginal deliveries versus \$11,654 (range, \$5,466 to \$20,279) for those who had cesarean deliveries. In addition, the mean total cost was significantly higher for veterans who had an adverse pregnancy event compared with those who had no adverse events.

OUR PATIENTS IN THE LARGER CONTEXT

Our study makes three contributions to medical literature. As the first published study of female veterans' use of pregnancy-related care, outcomes, and costs, it shows an increasing demand for the VA's fee-basis maternity benefit at the Durham VAMC in re-

Table 1. Demographics, concurrent conditions, and outcomes for pregnant veterans included in the study

Patient characteristics	Pregnant veterans with complete data (n = 33)
Age (in years) at delivery—mean (range)	28.3 (21–39)
Total hospital costs—mean (range)	\$9,358.92 (\$5,077.77–\$20,279.16)
Race—no. of patients (%)	
White	20 (60.6)
Black	13 (39.4)
Hispanic	0 (0.0)
Chronic medical condition—no. (%)	
Any	10 (32.3)
Hypertension	7 (21.2)
Asthma	3 (9.0)
Diabetes mellitus	0 (0.0)
Psychiatric condition—no. (%)*	
Any	13 (39.4)
Depression	6 (18.2)
Posttraumatic stress disorder	2 (6.1)
Anxiety disorder	1 (3.0)
Bipolar disorder	1 (3.0)
Borderline personality disorder	1 (3.0)
Military sexual trauma	1 (3.0)
Mood disorder	1 (3.0)
Schizophrenia	1 (3.0)
Any alcohol or drug abuse—no. (%)	2 (6.1)
Delivery outcomes—no. (%)	
Vaginal delivery	18 (54.5)
Cesarean delivery	15 (45.5)
Adverse pregnancy outcomes—no. (%)	
Any	12 (36.4)
Preterm infant/delivery	5 (15.2)
Gestational diabetes	2 (6.1)
Infant small for gestational age	2 (6.1)
Abruption	1 (3.0)
Fetal demise	1 (3.0)
Preeclampsia	1 (3.0)

*Some patients had more than one psychiatric diagnosis.

cent years. This trend supports the projection that cost-effective, high quality women's health care services will become a higher priority in the

VA in the near future. Adverse pregnancy events, such as premature birth, are by definition associated with far more infant than maternal

Continued on page 29

Continued from page 25

morbidity. Should VA benefits be expanded to include newborn care, as has been proposed in Congress, these issues will be of some concern.

Second, our study identifies pregnant veterans as a population at risk. In our study, 15% of the veterans had a preterm delivery. This is slightly higher than 2003 rates for the general population—both in our state of North Carolina (14%) and in the United States as a whole (12%).¹¹ In addition, the cesarean delivery rate of 45% among veterans in our study was substantially higher than the 2003 national average of 28% and the 2003 rate of 27% for North Carolina.¹¹ A similar cesarean delivery rate of 41%, however, was noted in a previous study of patient satisfaction among 123 female veteran users of maternity benefits—and this rate was deemed appropriate on medical review.¹²

What factors may have contributed to the pregnancy outcomes in our study? We found a significant relationship between psychiatric disorders and adverse pregnancy outcomes. This link is supported by other published studies.¹³⁻¹⁶ More than one third of the veterans in our sample had a psychiatric condition, a high rate of morbidity for young women. In a previous survey of female veterans of various ages that asked about psychiatric disorders and substance abuse, the rate of depression was 20%.¹⁰

Female veterans also may have unique risk factors for adverse pregnancy events, such as a higher prevalence of sexual and physical abuse, PTSD, and MST.^{9,17,18} A theoretical framework for the effects of PTSD and sexual trauma on adverse birth outcomes has been proposed.¹⁹ In addition, tobacco and substance abuse may be more common in female veterans.⁸

Chronic hypertension is frequently undiagnosed in young women and

Table 2. Outcomes and costs in subgroups of patients with concurrent psychiatric diagnoses, medical conditions, and adverse pregnancy outcomes

Subgroup	Mean	P value
Psychiatric diagnosis		
Adverse pregnancy outcomes	0.36	.007
Total charges	\$9,105	.623
Cesarean delivery	0.46	.475
Medical condition		
Adverse pregnancy outcomes	0.36	.392
Total charges	\$9,711	.362
Cesarean delivery	0.45	.127
Adverse pregnancy outcomes		
Total charges	\$11,406	.007
Cesarean delivery	0.46	.138

is associated with such adverse pregnancy outcomes as preeclampsia, small size for gestational age, and preterm birth. While the prevalence of chronic hypertension among postmenopausal female veterans has been shown to be as high as 94%,⁷ few data are available on the prevalence of hypertension in premenopausal veterans. In our study, 21% of female veterans had a diagnosis of hypertension.

More than half of the veterans in our sample were not enrolled in VA primary care after pregnancy. This indicates that many of the female veterans who use the VA fee-basis maternity benefit at the Durham VAMC are turning to the VA only for coverage of their pregnancy-related care, not for routine primary care. This fact is of concern, given the high rate of medical and psychiatric conditions in these women at baseline. Enrollment in VA primary care could help these women manage their chronic medical and psychiatric conditions, improving their overall health while also reducing their pregnancy risks. Furthermore, emerging evidence suggests that adverse pregnancy events are markers for maternal chronic dis-

ease.²⁰ This lends support to the need for primary care follow-up of female veterans who have experienced adverse pregnancy events.

Finally, there appears to be a need for augmented monitoring of female veterans' care, outcomes, and costs under the VHA's obstetric fee-basis program. Such a system could include case management and tracking of practice variation and patient risk factors. Further research is needed to define the relationship between patient and health services factors for pregnant veterans, with the goal of improving outcomes for these vulnerable women and their children.

STUDY LIMITATIONS

Because of variation among the population of female veterans seeking pregnancy care through the VA's fee-basis mechanism, findings from our small study may not be fully generalizable to the population of pregnant veterans at large. Differences in sampling frame, sampling methods, and denominators prevent direct comparisons with civilian populations.

Additionally, since our results were abstracted from administrative

and billing data, it is likely that we have missed some charges associated with the veterans' obstetric care and, thus, underestimated these costs. For the same reason, we were not able to determine the adequacy of prenatal care, nor can we be sure that prevalence rates of medical and psychiatric conditions were completely accurate.

About half of the 67 female veterans who were approved for the VA maternity benefit during our study period were excluded due to incomplete data. A possible explanation for this large proportion of missing data is that some VA patients become eligible for Medicaid after they have enrolled in VA fee-basis care. Others may use the VA maternity benefit program to cover residual costs from another insurance carrier. Overall, the small sample size of this study and its limited design make it best viewed as a pilot project to increase awareness of the need for further research on pregnant veterans' obstetric costs, outcomes, and utilization of health care.

REDUCING RISKS FOR PREGNANT VETERANS

We found that female veterans' pregnancy health and psychiatric status appear to contribute to an increased risk of adverse events during pregnancy. Despite their insured status and access to private obstetric care, the veterans in our study had higher rates of preterm and cesarean delivery than the general population. Female veterans may be a vulnerable population based on their medical, psychiatric, and obstetric risk. They may require care guidelines and special care settings. The latter of these might include case management; early screening protocols; consultation from mental health professionals; and outreach to minimize adverse outcomes, monitor quality, and control costs.^{21,22}

Dr. Chireau's work is supported by National Institutes of Health grant NICHD R-01-HD39373-02S1, Research Supplement for Underrepresented Minorities. In addition, the work of Drs. Chireau and Bastian is supported by the Women Veterans Comprehensive Health Center at the Durham VA Medical Center.

The opinions expressed herein are those of the authors and do not necessarily reflect those of Federal Practitioner, Quadrant HealthCom Inc., the U.S. government, or any of its agencies. This article may discuss unlabeled or investigational use of certain drugs. Please review complete prescribing information for specific drugs or drug combinations—including indications, contraindications, warnings, and adverse effects—before administering pharmacologic therapy to patients.

REFERENCES

1. Department of Veterans Affairs. *Women Veterans Population October 2005*. Women Veterans Health Program web site. Available at: www1.va.gov/womenvet/page.cfm?pg=53. Accessed August 9, 2006.
2. Department of Veterans Affairs. *VA Programs for Women Veterans*. VA Women Veterans Health Program web site. Available at: www1.va.gov/vwhp/page.cfm?pg=26. Accessed August 7, 2006.
3. Klein RE. *Women Veterans: Past, Present and Future*. Washington, DC: Department of Veterans Affairs, Office of the Actuary, Office of Policy, Planning, and Preparedness; May 2005 (update). Available at: www1.va.gov/vetdata/docs/WomenVeterans5-10-05.doc. Accessed August 17, 2006.
4. Table 1L: Veterans by state, age group, period, gender, 2000–2033. From: *VetPop2004*. Washington, DC: Department of Veterans Affairs, Office of the Actuary, Office of Policy, Planning, and Preparedness; November 2004. Available at: www1.va.gov/vetdata/docs/1L.xls. Accessed August 17, 2006.
5. §106(a), Pub L No. 102-585; 38 USC 8153; 38 USC 1703; 38 CFR §17.52; Veterans Affairs Memorandum LL 10-99-002: "Guidance on Maternity Benefits for Women Veterans."
6. Agha Z, Lofgren RP, VanRuiswyk JV, Layde PM. Are patients at Veterans Affairs medical centers sicker? A comparative analysis of health status and medical resource use. *Arch Intern Med*. 2000;160:3252–3257.
7. Friedlander AH, Altman L. Carotid artery atherosclerosis in postmenopausal women. Their prevalence on panoramic radiographs and their relationship to atherogenic risk factors. *J Am Dent Assoc*. 2001;132:1130–1136.
8. Coyle BS, Wolan DL, Van Horn AS. The prevalence of physical and sexual abuse in women veterans seeking care at a Veterans Affairs Medical Center. *Mil Med*. 1996;161:588–593.

9. DeRoma VM, Root LP, Smith BS Jr. Socioenvironmental context of sexual trauma and well-being of women veterans. *Mil Med*. 2003;168:399–403.
10. Davis TM, Bush KR, Kivlahan DR, Dobie DJ, Bradley KA. Screening for substance abuse and psychiatric disorders among women patients in a VA Health Care System. *Psychiatr Serv*. 2003;54:214–218.
11. Martin JA, Hamilton BE, Sutton PD, Ventura SJ, Menacker F, Munson ML. Births: Final data for 2003. *Natl Vital Stat Rep*. 2005;54(2):1–116.
12. Department of Veterans Affairs. *Women Veterans Health Program Newsletter*. 2004;40:14–16.
13. Curry MA, Perrin N, Wall E. Effects of abuse on maternal complications and birth weight in adult and adolescent women. *Obstet Gynecol*. 1998;92(4 pt 1):530–534.
14. Federenko IS, Wadhwa PD. Women's mental health during pregnancy influences fetal and infant developmental and health outcomes. *CNS Spectrum*. 2004;9(3):198–206.
15. Wadhwa PD, Culhane JF, Rauh V, Barve SS. Stress and preterm birth: Neuroendocrine, immune/inflammatory, and vascular mechanisms. *Matern Child Health J*. 2001;5(2):119–125.
16. Steer RA, Scholl TO, Hediger ML, Fischer RL. Self-reported depression and negative pregnancy outcomes. *J Clin Epidemiol*. 1992;45:1093–1099.
17. Sadler AG, Booth BM, Cook BL, Torner JC, Doebbeling BN. The military environment: Risk factors for women's non-fatal assaults. *J Occup Environ Med*. 2001;43:325–334.
18. Suffoletta-Maierle S, Grubaugh AL, Magruder K, Monnier J, Frueh BC. Trauma-related mental health needs and service utilization among female veterans. *J Psychiatr Pract*. 2003;9:367–375.
19. Seng JS. A conceptual framework for research on lifetime violence, posttraumatic stress, and childbearing. *J Midwifery Womens Health*. 2002;47:337–346.
20. Kaaja RJ, Greer IA. Manifestations of chronic disease during pregnancy. *JAMA*. 2005;294:2751–2757.
21. Alexander JW, Mackey MC. Cost effectiveness of a high-risk pregnancy program. *Care Manag J*. 1999;1(3):170–174.
22. Broton D, Youngblut JM, Brown L, Finkler SA, Neff DF, Madigan E. A randomized trial of nurse specialist home care for women with high-risk pregnancies: Outcomes and costs [published correction appears in *Am J Manag Care*. 2001;7:855]. *Am J Manag Care*. 2001;7:793–803.