



Economic Impact of Vasomotor Symptoms and Depression on Healthcare Expenditures Among U.S. Women

Ganguli M.¹, Epane J.P.², McCleary K.², Ribadu N.³

¹ DrPH Doctoral student, Loma Linda University School of Public Health, Loma Linda, CA, USA

² Loma Linda University School of Public Health, Loma Linda, CA, USA

³ Loma Linda University School of Behavioral Health, Loma Linda, CA, USA

Background

- Vasomotor symptoms (VMS), including hot flashes and night sweats, affect nearly 80% of midlife women and are commonly accompanied by depression (El Khoudary et al., 2019).
- Both conditions are linked to increased healthcare utilization; however, few nationally representative studies have quantified the additional economic burden of co-occurring VMS and depression using nationally representative U.S. data. (Gibson et al., 2025).

Objective

To examine the association between VMS, depression, and healthcare expenditures among U.S. women using pooled 2017–2022 Medical Expenditure Panel Survey (MEPS) data.

Methodology

- Retrospective cross-sectional study using pooled 2017–2022 MEPS data. Women were categorized as VMS with depression (n=529), VMS without depression (n=268), or no VMS/no depression (n=21,245) based on ICD-10 codes and self-reported depression
- Outcomes included outpatient visits, inpatient admissions, and ED visits. Survey-weighted regression models adjusted for demographic, socioeconomic, insurance, regional, and comorbidity factors.
- Survey-weighted generalized linear models with a gamma distribution and a log link were used for expenditures adjusted for Consumer Price Index (2022).

Results

Model 1: Overall annual cost

Compared with women with no VMS/no depression, total healthcare costs were 90% higher among women with VMS and depression ($\beta = 0.64$; \$11,404 vs. \$6,002) and 55% higher among women with VMS without depression ($\beta = 0.44$; \$9,303 vs. \$6,002).

Model 2: Outpatient annual cost

Compared with women with no VMS/no depression, outpatient costs were 36% higher among women with VMS and depression ($\beta = 0.31$; \$2,354 vs. \$1,730) and 38% higher among women with VMS without depression ($\beta = 0.32$; \$2,387 vs. \$1,730).

Table 1: Adjusted Multivariable Model for Healthcare Annual Expenditure

Variable	Total Cost β (SE)	Outpatient Cost β (SE)	ED Cost β (SE)	Rx Cost β (SE)
Independent variables – Ref: With no VMS & no depression (N=21,245)				
VMS with Depression (N=529)	0.64*** (0.08)	0.31*** (0.05)	0.03 (0.10)	0.96*** (0.13)
VMS without Depression (N=268)	0.44*** (0.10)	0.32*** (0.07)	0.10 (0.15)	0.74*** (0.17)
Covariates				
Age (Years) – Ref: <44yrs				
Greater than 55 years (Menopause)	0.31*** (0.04)	0.03 (0.02)	-0.19** (0.06)	0.28*** (0.07)
44 to 55 (Peri-Menopause)	-0.26*** (0.04)	-0.20*** (0.02)	-0.16* (0.07)	-0.51*** (0.07)
Race – Ref: Whites				
African American	-0.26*** (0.04)	-0.31*** (0.03)	-0.13* (0.05)	-0.09 (0.07)
Others/Unknown	-0.39*** (0.04)	-0.37*** (0.03)	-0.00 (0.07)	-0.21* (0.09)
Ethnicity- Ref: Hispanic				
Non-Hispanic	0.34*** (0.04)	-0.14*** (0.03)	-0.16* (0.06)	0.27** (0.08)
Education – Ref: Bachelor degree				
High school/GED	-0.11** (0.03)	0.05* (0.02)	-0.04 (0.06)	0.04 (0.07)
Higher than a bachelor's degree	0.09* (0.04)	0.14*** (0.02)	-0.02 (0.06)	0.07 (0.07)
Less than high school	-0.44*** (0.05)	-0.41*** (0.45)	-0.19* (0.08)	-0.06 (0.11)
Poverty level – Ref: High income (>=400% FPL)				
Low income (<200% FPL)	-0.18*** (0.04)	-0.04 (0.02)	-0.14* (0.06)	-0.15* (0.08)
Middle income (200–399% FPL)	-0.14*** (0.03)	-0.14*** (0.02)	-0.10 (0.06)	-0.09 (0.06)
Marital Status – Ref: Married				
Not married/Other	0.04 (0.02)	0.03 (0.02)	-0.00 (0.04)	0.19** (0.05)
Insurance Status – Ref: Private				
Public	-0.10*** (0.03)	-0.18*** (0.02)	-0.59*** (0.05)	0.05 (0.07)
Uninsured	-0.89*** (0.07)	-0.48*** (0.05)	0.06 (0.13)	-0.92*** (0.15)
Region – Ref: Midwest				
Northeast	-0.06 (0.04)	0.08* (0.04)	0.06 (0.07)	0.02 (0.08)
South	-0.18*** (0.03)	0.04 (0.02)	-0.02 (0.05)	0.07 (0.06)
West	-0.22*** (0.04)	0.17*** (0.02)	0.04 (0.06)	-0.24* (0.07)
Employment Status – Ref: Employed				
Unemployed	0.27*** (0.03)	0.11*** (0.02)	0.00 (0.05)	0.40*** (0.05)
Years – Ref: 2017				
2018	0.11* (0.04)	0.16*** (0.24)	0.06 (0.06)	0.06 (0.07)
2019	0.12* (0.04)	0.20*** (0.03)	0.09 (0.06)	-0.16* (0.07)
2020	0.10* (0.04)	0.27*** (0.03)	0.06 (0.07)	-0.021 (0.09)
2021	0.30*** (0.04)	0.45*** (0.03)	0.22* (0.07)	-0.17 (0.09)
2022	0.44*** (0.04)	0.67*** (0.03)	0.30*** (0.08)	-0.05 (0.09)
Health Severity Status				
CCI Score (continuous)	0.17*** (0.00)	0.11*** (0.00)	0.03*** (0.01)	0.21*** (0.01)

Note: SE=standard error. Significant p values: *p<0.05, **p<0.001, ***p<0.0001.

Results-Contd.

Model 3: Emergency Department annual cost

Compared with women with no VMS/no depression, Emergency department costs showed no significant difference, indicating no substantial change compared to the reference group in both VMS with depression and without depression.

Model 4: Prescription Drug annual cost

Compared with women with no VMS/no depression, prescription drug spending was 169% higher among women with VMS and depression ($\beta = 0.99$; \$3,452 vs. \$1,323) and 110% higher among women with VMS without depression ($\beta = 0.74$; \$2,778 vs. \$1,323).

Policy Implications

- Policies should support comprehensive menopause care that includes access to symptom management, mental health services, and prescription treatment for women with VMS, particularly among underserved and racial/ethnic minority populations.
- Expanding insurance coverage, improving access to care, and addressing racial disparities in menopause diagnosis and treatment may reduce long-term healthcare spending and improve quality of life for midlife women.

Conclusion

The study found that women with VMS and depression experience substantial incremental healthcare expenditures, thus highlighting the need for integrated, value-based menopause and mental health care.