

# Depressive Symptoms and Mental Health Service Utilization Among Persons With Limb Loss: Results of a National Survey

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**ABSTRACT.** Darnall BD, Ephraim P, Wegener ST, Dillingham T, Pezzin L, Rossbach P, MacKenzie EJ. Depressive symptoms and mental health service utilization among persons with limb loss: results of a national survey. *Arch Phys Med Rehabil* 2005;86:650-8.

**Objective:** To describe the prevalence of depressive symptoms, risk factors, and mental health service utilization in a national limb-loss sample.

**Design:** Cross-sectional survey.

**Setting:** Participants were interviewed by telephone.

**Participants:** A stratified sample by etiology of 914 persons with limb loss, derived from people who contacted the Amputee Coalition of America from 1998 to 2000.

**Interventions:** Not applicable.

**Main Outcome Measures:** Center for Epidemiologic Study Depression Scale (CES-D 10-item), pain bothersomeness, characteristics of the amputation, sociodemographics, and mental health service utilization.

**Results:** Prevalence for significant depressive symptoms (CES-D score,  $\geq 10$ ) was 28.7%. Risk factors included being divorced or separated, living at the near-poverty level, having comorbid conditions, being somewhat bothered or extremely bothered by back pain and phantom limb pain, and having residual limb pain for persons aged 18 to 54. Having higher education was a buffer against depressive symptoms. Almost 22% of the sample and 44.6% of persons with significant depressive symptoms received mental health service in the previous year. For persons with significant depressive symptoms, 32.9% reported needing mental health service but not receiving them, and 67.1% reported not needing mental health service.

**Conclusions:** Depressive symptoms are prevalent among persons with limb loss. Proper management of pain and medical comorbidity may mitigate depressive symptoms. Education about depressive symptoms and treatment options may

improve receipt of mental health service among persons with limb loss reporting significant levels of depressive symptoms.

**Key Words:** Amputees; Depression; Pain; Prevalence; Rehabilitation.

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APPROXIMATELY 1.2 MILLION people in the United States are currently living with limb loss. It is estimated that an additional 185,000 undergo amputation yearly, and that rate has increased over the past decade.<sup>1</sup> Vascular disease, trauma, and malignancy are the 3 major etiologies of acquired amputation.<sup>1</sup> Limb loss is associated with secondary conditions, including depressive symptomatology and clinical depression, which have been shown to adversely affect the rehabilitation process and outcomes in other chronic conditions.<sup>2,3</sup> Greater understanding of secondary conditions, such as pain and depression, may lead to better treatment and improved functional outcomes and quality of life (QOL) for persons with limb loss. To date, no study has examined mental health care service utilization among community-dwelling persons with limb loss. Understanding the mental health care needs, as well as barriers to treatment, among persons with limb loss may lead to improved education and interventions specified to shore up receipt of mental health care among this population.

The literature on the prevalence of clinical depression or depressive symptomatology in persons with limb loss is limited, and direct comparison between studies is problematic because of the heterogeneity of the measures used and variability in study samples. Some studies examine clinical depression, usually determined via a clinician-administered structured interview, whereas other studies examine depressive symptoms, assessed via standardized self-report measures, such as the Beck Depression Inventory<sup>4</sup> or the Center for Epidemiologic Study Depression Scale (CES-D).<sup>5</sup> Higher levels of depressive symptoms are a strong predictor of a subsequent diagnosis of depression and are associated with some similar health risks as clinical depression, such as increased risk for all-cause mortality.<sup>6</sup> In reviewing the studies of depression among persons with limb loss, a distinction must be made between those studies that document clinical depression and those that describe levels of depressive symptoms. Although persons reporting high levels of depressive symptoms on a self-report measure such as the CES-D may indeed be depressed, they cannot receive a diagnosis of clinical depression without a clinician-administered interview.

Using a structured clinical interview, 2 studies have examined rates of clinical depression in inpatients with limb loss (persons currently hospitalized for rehabilitation for their recent amputation). Kashani et al<sup>7</sup> reported a 35.0% prevalence rate of major depressive disorder in a prospective study of inpatients with various etiologies of limb loss. Cansever et al<sup>8</sup> reported a prevalence rate of 41.7% for limb-loss inpatients with major depression. They further examined prevalence by

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etiology, and found that 34.7% of persons with traumatic limb loss (accident or gunshot) and 51.4% of persons with surgical limb loss (due to diabetes mellitus, vascular diseases, or tumor) met criteria for the disorder<sup>8</sup>; however, these group differences did not reach statistical significance. Kashani et al<sup>7</sup> hypothesized that the trend toward higher rates of depression among persons with surgical limb loss was due to the burden of medical illness and associated comorbidity.

In contrast, the range for point prevalence for clinically diagnosed major depression in the general population is reported as 3.6% to 10.6%.<sup>9,10</sup> Chronically ill outpatients have a reported point prevalence of 11% for major depression,<sup>11</sup> and medical and surgical inpatients have a 6% to 14% point prevalence rate for the disorder.<sup>12,13</sup> These findings indicate a significantly increased prevalence of depression among inpatients with limb loss compared with the general population, as well as other inpatient populations.

Langer<sup>14</sup> reported a 29% point prevalence for significant depressive symptoms among inpatients with lower-extremity limb loss secondary to diabetes and peripheral vascular disease (PVD). For outpatients with limb loss (persons visiting an outpatient clinic for medical services), point prevalence rates of significant depressive symptoms are reported in the range of 21% to 35%,<sup>15-17</sup> and this range is comparable to nonamputee outpatient prevalence rates. A study of general population primary care outpatients across 5 countries reported a 25% prevalence rate for depressive symptoms.<sup>18</sup> One study examined outpatients at a diabetic clinic to compare rates of self-reported depressive symptomatology among diabetic controls with no amputation, mobile diabetics with amputation, and diabetics with chronic foot ulceration that would often lead to immobility. Although this study was limited by small sample size (N=52), results showed that while persons with limb loss had higher rates of depressive symptoms than did controls, diabetic patients with chronic foot ulceration reported the highest rates of depressive symptoms.<sup>19</sup> Overall, the literature suggests that the range for significant depressive symptoms among outpatient persons with limb loss is similar to that of the general outpatient population.

Although the current literature has described prevalence rates of depressive symptoms among both inpatient and outpatient persons with limb loss, research is lacking regarding depressive symptomatology among community-dwelling persons with limb loss (eg, persons with limb loss who are not seeking medical services of any kind). Persons with limb loss in a hospital or medical setting represent a distinct population and thus prevalence rates do not generalize to those in the community who do not seek services. Furthermore, without prevalence rates of depressive symptoms among community persons with limb loss, comparisons with large studies of the prevalence of depression in the general population cannot be made.

The rehabilitation literature indicates that levels of significant depressive symptoms after amputation are similar to those for other rehabilitation populations. In a study comparing inpatient rehabilitation groups with Parkinson's disease, right hemisphere stroke, or amputation, no differences were found for prevalence of depressive symptoms among the groups. Prevalence of significant levels of depressive symptoms among persons with limb loss appears to be relatively similar to persons with spinal cord injury (SCI) (25%–47%),<sup>20,21</sup> chronic pain (30%–54%),<sup>22</sup> and diabetes (18%–28%).<sup>23</sup>

Identified risk factors for depression in persons with limb loss include more recent amputation,<sup>8,16</sup> younger age,<sup>7,16,24</sup> and activity restriction.<sup>25</sup> Additionally, Rybarczyk et al<sup>15</sup> reported that adults who experienced social discomfort related to their

amputation were at greater risk for depressive symptoms. These findings are consistent with studies that have observed that limited social contact and unsatisfactory social support act as risk factors for depression in SCI<sup>26</sup> and mixed disability<sup>27</sup> samples. Evidence regarding the relationship between socioeconomic variables and depressive symptoms is inconsistent.<sup>7,15,24</sup>

Although pain has been identified as a significant predictor for depression in other populations,<sup>22,28</sup> the relationship between back pain, amputation-specific pain (phantom pain, residual limb pain), and depression is not well understood. However, amputation-specific pain is associated with decreased functioning and activity,<sup>15,29,30</sup> and restricted activity, in turn, has been associated with increased risk for depressive symptoms in persons with limb loss.<sup>15</sup>

Research on treatment for depression in persons with limb loss is sparse. To date, no study has examined the patterns of mental health care utilization and the extent to which mental health care needs remain unmet in limb-loss populations. This study was designed to describe both the prevalence of, and the risk factors for, depressive symptoms in a national sample of community-dwelling persons with limb loss. This study marks the first examination of depressive symptoms across the primary etiologies of limb loss: dysvascular disease, trauma, and malignancy. Finally, this study provides preliminary data on utilization of mental health services among community-dwelling persons with limb loss. We hypothesized that rates of depressive symptoms among this sample would be lower than those reported for outpatient and inpatient persons with limb loss. We further hypothesized that both back pain and amputation-related pain would be significant predictors for depressive symptoms in persons with limb loss.

## METHODS

The study was a cross-sectional survey design conducted as part of a larger project, the Limb Loss Research and Statistics Program, a partnership between the Johns Hopkins University Bloomberg School of Public Health (SPH) and the Amputee Coalition of America (ACA). Using an existing database containing information on persons who contacted the ACA from 1998 to 2000, we identified 6500 amputees. Information contained in the database included etiology and level of amputation, demographic information (date of birth, sex), mailing address, and telephone number.

## Participants

A stratified sample by etiology of 1538 persons with limb loss was identified. The sample was composed of persons with amputation secondary to PVD and/or diabetes mellitus (n=608), trauma (n=579), and malignancy of a limb or joint (n=351).

Eligibility criteria included English-speaking persons aged 18 to 84 years with amputation of either an upper- or lower-limb or bilateral amputation of upper or lower limbs. The study was reviewed and approved by the Committee on Human Research at the Johns Hopkins Bloomberg SPH.

Of the initial sample, 182 were ineligible because of age (5; 2.7%); type or level of amputation (12; 6.6%); lack of an amputation (29; 15.9%); non-English speaking (6; 3.3%); physically or mentally unable to respond (19; 10.4%); or death or institutionalization (111; 61.0%). Of the eligible 1356, 147 (11%) could not be located based on the information available in the database and 249 (18%) subjects declined to be interviewed. A total of 960 adults completed a 30-minute computer-assisted telephone interview, and of those, 21 required a proxy.

Eligibility criteria for a proxy were defined as family members 18 years of age or older who resided with the subject. The response rate was 71% of eligible participants and was similar across the 3 etiologic categories. Analysis was limited to a sample of 913 subjects. We omitted the responses of subjects with an amputation etiology of "other" or "unknown" (n=9), subjects with a minor amputation defined as amputation at the finger or toe level (n=10), partial interviews (n=7), and those who required a proxy (n=21).

### Survey Procedure

Subjects were mailed a letter from the ACA that outlined the purpose and objectives of the survey. A contact sheet and a stamped, addressed envelope were provided for persons to express interest or disinterest in participating in the study; 50% returned a contact sheet. If a contact sheet was not returned within 2 weeks, trained interviewers attempted to contact the subject by telephone. Tracing procedures were used for letters returned with no forwarding address and nonworking telephone numbers. Oral informed consent was obtained from the subjects before the interview. Telephone interviews were conducted between January and August 2001 using a computer-assisted telephone interview system. Trained interviewers telephoned respondents and used a computerized questionnaire to guide the interview and record responses.

### Measures

**Center for Epidemiologic Study Depression Scale.** The Center for Epidemiologic Study Depression Scale (10-item) (CES-D 10) is a shortened version of the original 20-item measure.<sup>5</sup> Subjects respond to the items by indicating how often they experienced each symptom in the past week (0, rarely or none of the time; 1, some of the time; 2, much of the time; 3, most or all of the time), with a possible total of 30 points. The CES-D 10 has been found to be both valid and reliable for the screening of depressive symptoms in a general population.<sup>31,32</sup> Cutpoints of 8 and 10 have been used with the CES-D 10 to classify subjects with significant depressive symptoms.<sup>33</sup> Our study used the more conservative cutpoint of 10, because it has been determined equivalent to a CES-D cutpoint of 20<sup>34</sup> and is more stringent than the commonly used cutpoint of 16.<sup>17,35</sup> The CES-D is particularly fitting for persons with chronic health conditions because this scale is not heavily weighted by somatic complaints that may lead to inflated ratings of depressive symptoms.<sup>36</sup>

**Pain.** The construct of pain bothersomeness has been used to assess back pain, stump pain, and phantom pain in persons with a lower-extremity amputation.<sup>37</sup> Pain bothersomeness of residual limb, phantom limb, and back pain was assessed on a Likert scale (0, no pain; 1, have pain but not bothered by it; 2, somewhat bothered by pain; 3, extremely bothered by pain) for the preceding 4 weeks. For the analyses, persons who reported having no pain were combined with persons who reported not being bothered by pain.

**Demographic and amputation-related characteristics.** Additional items included self-report of demographic information (sex, current age, race and ethnicity, marital status, educational level), amputation-specific questions (etiology, level and recency of amputation), and number of comorbid conditions. Information collected on household size and family income was used to generate household poverty status (poor, near poor, not poor) according to the year 2000 US Census definition of poverty thresholds. Persons whose total income was more than their respective poverty threshold ("not poor"), but below 125% of their threshold were

categorized as being "near poor." Further information on US Census poverty thresholds may be found online (<http://www.census.gov/hhes/poverty/threshld/thresh00.html>).

**Mental health service utilization.** Mental health service utilization was assessed by 3 yes or no questions. Participants were asked whether they had received mental health services in the past 12 months (yes, no). If no services were received, participants were asked to identify the reason or barrier (eg, cost, transportation, time).

For those who had received mental health services, an additional question was asked as to if there was a perceived need for additional services (yes, no). Those who had not received any mental health services were asked if they thought they needed services (yes, no). Persons who reported needing but not receiving additional services were asked to report the reason from the following choices (Didn't know where to go, Cost too much, Transportation issues, No time, No referral, Wanted to solve on own). Respondents were put into mutually exclusive categories based on perceived need and receipt of services.

### Statistical Analysis

Chi-square analysis was used to determine if there were significant differences among groups. Logistic regression was used for post hoc comparisons. To evaluate odds ratios (ORs) multiple logistic regression was used to control simultaneously for etiology, sex, age, race, recency and level of amputation, education level, household poverty status, marital status, number of comorbid conditions, and pain bothersomeness (phantom, residual limb, back). ORs with 95% confidence intervals (CIs) are reported. Analyses were performed using Stata, version 6.0.<sup>a</sup> Statistical significance was set at the *P* less than .05 level.

## RESULTS

The study sample was predominantly male (60.5%), was white (85.8%), had lower-limb amputation (88.0%), had at least 12 years of education (93.8%), was not poor (63.3%), was married or partnered (63.0%), and was comorbid for at least 2 conditions (65.2%) (table 1). The mean age of the sample was 50.3±13.3 years and mean time since amputation was 4 years.

Tests of normality indicated the total score for the CES-D 10 was skewed, and therefore, subsequent analyses treated depressive symptoms as a dichotomous variable (≥10 classified as significant depressive symptoms). The median CES-D 10 score for the full sample was 5.0, and 28.7% (n=262) reported significant depressive symptoms (≥10 on CES-D 10). Median CES-D 10 scores were 7.31 for dysvascular, 7.37 for trauma, and 5.10 for cancer.

Table 2 presents the data for subjects (n=262) who met criteria for significant depressive symptoms. Because no significant differences for depressive symptoms were found among the levels of amputation ( $\chi^2$  test=.59, *P*=.43), and due to the small numbers in the cells, groups were collapsed into upper limb and lower limb for subsequent analyses. Differences in the number of persons with significant depressive symptomatology were found by etiology ( $\chi^2$  test=15.4, *P*=.001), age ( $\chi^2$  test=19.6, *P*<.001), education ( $\chi^2$  test=25.8, *P*<.001), poverty status ( $\chi^2$  test=38.1, *P*<.001), marital status ( $\chi^2$  test=21.5, *P*<.001), comorbidity ( $\chi^2$  test=9.3, *P*=.009), phantom pain bothersomeness ( $\chi^2$  test=59.0, *P*<.001), residual limb pain bothersomeness ( $\chi^2$  test=72.4, *P*<.001), and back pain bothersomeness ( $\chi^2$  test=96.3, *P*<.001).

However, on further investigation in the multivariate model controlling for other factors, etiology and age were no longer

Table 1: Characteristics of Study Population

Characteristic	All Etiologies (N=913)	Dysvascular (n=340; 37.2%)	Trauma (n=357; 39.1%)	Cancer (n=216; 23.6%)
Sex				
Male	552 (60.5)	198 (58.2)	276 (77.3)	78 (36.1)
Female	361 (39.5)	142 (41.8)	81 (22.7)	138 (63.9)
Age (y)				
18-44	317 (33.9)	57 (16.1)	167 (46.1)	93 (42.5)
45-54	262 (28.0)	105 (9.7)	100 (27.6)	57 (26.0)
55-64	196 (21.0)	99 (28.0)	60 (16.6)	37 (16.9)
65+	160 (17.1)	93 (26.3)	35 (9.7)	32 (14.6)
Mean age $\pm$ SD (y)	50.3 $\pm$ 13.3	55.6 $\pm$ 10.9	46.9 $\pm$ 13.2	47.4 $\pm$ 14.1
Race/ethnicity				
White, non-Hispanic	783 (85.8)	279 (82.0)	312 (87.4)	193 (89.0)
Black, non-Hispanic	66 (7.2)	39 (11.5)	15 (4.2)	12 (5.5)
Other	64 (7.0)	22 (6.5)	30 (8.4)	12 (5.5)
Time since amputation (y)				
<2	117 (12.9)	62 (18.4)	41 (11.6)	14 (6.5)
2-5	407 (44.8)	205 (60.8)	148 (41.7)	54 (25.0)
6-9	92 (10.1)	34 (10.1)	30 (8.4)	28 (13.0)
10+	292 (32.2)	36 (10.7)	136 (38.3)	120 (55.5)
Amputation level				
Upper limb	100 (11.0)			
Below elbow	45 (4.9)	1 (0.3)	40 (11.2)	4 (1.9)
Above elbow	47 (5.2)	2 (0.6)	33 (9.2)	12 (5.6)
Bilateral	8 (0.9)	2 (0.6)	6 (1.7)	0 (0.0)
Lower limb	811 (88.0)			
Below knee	372 (40.8)	178 (52.4)	156 (43.7)	38 (17.8)
Above knee	351 (38.5)	93 (27.4)	98 (27.5)	160 (74.8)
Bilateral	88 (9.7)	64 (18.8)	24 (6.7)	0 (0.0)
Education level				
<12y	57 (6.24)	26 (7.7)	21 (5.9)	10 (4.6)
High school graduate/GED	242 (26.5)	99 (29.1)	111 (31.1)	32 (14.8)
>12y	614 (67.3)	215 (63.2)	225 (63.0)	174 (80.6)
Poverty status				
Not poor	578 (63.3)	197 (34.1)	216 (37.4)	165 (28.6)
Near poor	238 (26.1)	99 (41.6)	100 (42.0)	39 (16.4)
Poor	97 (10.6)	44 (45.4)	41 (42.3)	12 (12.4)
Marital status				
Married/coupled	575 (63.0)	188 (55.3)	249 (69.7)	138 (63.9)
Divorced/separated	166 (18.2)	80 (23.5)	57 (16.0)	29 (13.4)
Widowed	47 (5.2)	28 (8.2)	8 (2.2)	11 (5.1)
Never married	125 (13.7)	44 (12.9)	43 (12.0)	38 (17.6)
Comorbidities				
None	111 (12.2)	10 (2.9)	92 (25.8)	9 (4.2)
1	207 (22.7)	17 (5.0)	100 (28.0)	90 (41.7)
2+	595 (65.2)	313 (92.1)	165 (46.2)	117 (54.1)
Pain bothersomeness				
Phantom				
None, not bothered	322 (35.2)	109 (32.1)	121 (40.0)	92 (42.9)
Somewhat	392 (42.8)	155 (45.7)	152 (42.7)	85 (39.7)
Extremely	195 (21.3)	75 (22.1)	83 (23.3)	37 (17.2)
Residual limb				
None, not bothered	379 (41.6)	149 (44.0)	124 (34.7)	106 (49.3)
Somewhat	368 (40.4)	124 (36.7)	162 (45.4)	82 (38.1)
Extremely	163 (17.9)	65 (19.2)	71 (19.9)	27 (12.6)
Back				
None, not bothered	385 (42.2)	153 (45.0)	144 (40.3)	88 (41.1)
Somewhat	392 (43.0)	137 (40.29)	147 (41.2)	108 (50.5)
Extremely	134 (14.7)	50 (14.7)	66 (18.5)	18 (8.4)

NOTE. Values are n (%) unless otherwise indicated.

Abbreviations: GED, General Educational Development diploma; SD, standard deviation.

**Table 2: Percentage With Significant Depressive Symptoms by Selected Characteristics**

CES-D 10 Score $\geq 10$ (n=262)	% (n)	$\chi^2$ , P Value
<b>Etiology</b>		
Dysvascular	38.2 (100)	15.4, $P=.001$
Trauma	46.2 (121)	
Cancer	15.6 (41)	
<b>Sex</b>		
Male	28.3 (156)	0.12, $P=.72$
Female	29.4 (106)	
<b>Age category (y)</b>		
18–44	31.9 (100)	19.6, $P<.001$
45–54	35.5 (92)	
55–64	23.0 (44)	
65+	17.4 (26)	
<b>Race/ethnicity</b>		
White, non-Hispanic	27.7 (217)	3.1, $P=.21$
Black, non-Hispanic	31.8 (21)	
Other	37.5 (24)	
<b>Time since amputation (y)</b>		
<2	31.6 (37)	2.7, $P=.44$
2–5	30.5 (124)	
6–9	23.9 (22)	
10+	26.7 (78)	
<b>Amputation level</b>		
Upper limb	32.0 (32)	0.59, $P=.43$
Above elbow	29.8 (14)	
Below elbow	31.1 (14)	
Bilateral upper	50.0 (4)	
Lower limb	28.3 (230)	
Above knee	27.1 (95)	
Below knee	28.8 (107)	
Bilateral lower	31.8 (28)	
<b>Education level</b>		
<12y	43.9 (25)	25.8, $P<.001$
High school graduate/GED	38.4 (93)	
>12y	23.5 (144)	
<b>Poverty status</b>		
Not poor	21.8 (126)	38.1, $P<.001$
Near poor	38.6 (92)	
Poor	45.4 (44)	
<b>Marital status</b>		
Married/partnered	25.0 (144)	21.5, $P<.001$
Divorced/separated	43.4 (72)	
Widowed	26.7 (13)	
Never married	26.4 (33)	
<b>Comorbidity</b>		
None	18.0 (20)	9.3, $P=.009$
1	26.1 (54)	
2+	31.6 (188)	
<b>Pain bothersomeness</b>		
<b>Phantom</b>		
None, not bothered	14.9 (48)	59.0, $P<.001$
Somewhat	31.9 (125)	
Extremely	45.6 (89)	
<b>Residual limb</b>		
None, not bothered	16.1 (61)	72.4, $P<.001$
Somewhat	31.5 (116)	
Extremely	51.5 (84)	
<b>Back</b>		
None, not bothered	15.6 (60)	96.3, $P<.001$
Somewhat	31.1 (122)	
Extremely	59.7 (80)	

significant risk factors for depressive symptoms (table 3). Persons with more than 12 years of education appeared to be buffered from depressive symptoms (OR=.47; 95% CI, .24–.92;  $P=.028$ ) relative to those with less education. Significant risk factors included living in a near-poverty household (OR=1.49; 95% CI, 1.01–2.20;  $P=.043$ ) and being divorced or separated (OR=1.89; 95% CI, 1.22–2.93;  $P=.004$ ). There was a consistent pattern for comorbidity and risk for depression; having 1 comorbidity significantly increased one's chance for depressive symptoms (OR=2.55; 95% CI, 1.30–5.03;  $P=.007$ ), and being comorbid for 2 or more conditions posed an even greater risk (OR=3.28; 95% CI, 1.74–6.21;  $P\leq.001$ ). Persons who reported being extremely bothered by phantom pain were 2.92 times more likely to have depressive symptoms than those with no phantom pain or those who had some pain that did not bother them (95% CI, 1.66–5.11;  $P<.001$ ).

Persons bothered by residual limb pain were more likely to report depressive symptoms ( $\chi^2$  test=72.4,  $P<.001$ ) (table 3), and additional analysis indicated that age appeared to modify the effect of residual limb pain on depression. For persons in the 18 to 54 age category, being somewhat bothered by residual limb pain significantly increased one's odds for depressed mood (OR=2.23; 95% CI, 1.35–3.67;  $P=.002$ ), and those who were extremely bothered by residual limb pain were at even greater risk for depressed mood (OR=4.78; 95% CI, 2.64–8.64;  $P<.001$ ) compared with persons with no residual limb pain or who were not bothered by residual limb pain (table 4). For persons aged 55 to 64, however, residual limb pain bothersomeness was not a significant predictor for depressive symptoms. Greater back pain bothersomeness was associated with higher risk for depressive symptoms for all ages (somewhat bothered OR=2.19; 95% CI, 1.46–3.29; extremely bothered OR=3.31; 95% CI, 2.02–5.42).

Regarding mental health service utilization, 21.8% of the entire sample and 44.6% of persons with significant depressive symptoms reported receiving mental health services in the previous 12 months (table 5). For persons with significant depressive symptoms who received mental health services, more than half (55.3%) reported needing additional mental health services. Almost a third of those with significant depressive symptoms (32.9%) reported they needed mental health services but had not received them in the previous year. For those who said they needed mental help but had not received mental health services, the primary reasons given included "not knowing where to go" (19.2%), "cost" (27.7%), and wanting to "solve on own" (15.9%). However, 67.1% of persons with significant depressive symptoms reported they had not received mental health services and did not feel that they needed any help.

Persons with significant depressive symptoms were almost 5 times as likely to have utilized mental health services (OR=4.77; 95% CI, 3.22–7.05;  $P<.001$ ) than persons without high levels of symptoms. Only 1 significant difference regarding age and service utilization was found; persons aged 55 to 64 were less likely to seek mental health care services than persons aged 18 to 44 (OR=.43; 95% CI, .24–.78;  $P<.01$ ). There was a linear trend for mental health services in that those with less recent amputations were less likely to seek services than persons whose limb loss occurred within the past 2 years (age 45–54y: OR=.60; 95% CI, .36–1.0;  $P=.052$ ) (age 55–64y: OR=.38; 95% CI, .17–.82;  $P=.014$ ) (age 65y+: OR=.42; 95% CI, .23–.76;  $P<.005$ ). Regarding sex differences, there was a trend for men to be less likely than women to seek mental health services (OR=.68; 95% CI, .46–1.0;  $P=.053$ ), although it should be noted that the statistical significance of this finding is marginal. Finally, persons with back pain were more likely

**Table 3: ORs of Depressive Symptoms Using Logistic Regression to Predict Depressive Symptomatology (n=900)**

Characteristic	OR	95% CI	P
<b>Etiology</b>			
Dysvascular (ref)	1.00		
Trauma	1.50	(.94–2.35)	.085
Cancer	.87	(.50–1.48)	.608
<b>Sex</b>			
Male (ref)	1.00		
Female	.84	(.58–1.21)	.355
<b>Age category (y)</b>			
18–54 (ref)	1.00		
55–64	.89	(.41–1.90)	.765
65+	1.17	(.54–2.54)	.687
<b>Race/ethnicity</b>			
White, non-Hispanic (ref)	1.00		
Black, non-Hispanic	1.10	(.58–2.10)	.756
Other	1.75	(.95–3.20)	.071
<b>Time since amputation (y)</b>			
<2 (ref)	1.00		
2–5	.98	(.58–1.64)	.942
6–9	.56	(.27–1.16)	.121
10+	.87	(.49–1.54)	.643
<b>Amputation level</b>			
Upper limb (ref)	1.00		
Lower limb	.97	(.55–1.71)	.938
<b>Education level</b>			
<12y (ref)	1.00		
High school graduate/GED	.80	(.40–1.59)	.532
>12y	<b>.47</b>	<b>(.24–.92)</b>	<b>.028</b>
<b>Poverty status</b>			
Not poor (ref)	1.00		
Near poor	<b>1.49</b>	<b>(1.01–2.20)</b>	<b>.043</b>
Poor	1.43	(.81–2.50)	.207
<b>Marital status</b>			
Married/partnered (ref)	1.00		
Divorced/separated	<b>1.89</b>	<b>(1.22–2.93)</b>	<b>.004</b>
Widowed	1.18	(.52–2.68)	.689
Never married	1.06	(.622–1.83)	.809
<b>Comorbidity</b>			
None (ref)	1.00		
1	<b>2.55</b>	<b>(1.30–5.03)</b>	<b>.007</b>
2+	<b>3.28</b>	<b>(1.74–6.21)</b>	<b>&lt;.001</b>
<b>Pain bothersomeness</b>			
<b>Phantom</b>			
None, not bothered (ref)	1.00		
Somewhat	1.37	(.83–2.28)	.216
Extremely	<b>2.92</b>	<b>(1.66–5.11)</b>	<b>&lt;.001</b>
<b>Residual limb</b>			
<b>18–54</b>			
None, not bothered (ref)	1.00		
Somewhat	<b>2.23</b>	<b>(1.35–3.67)</b>	<b>.002</b>
Extremely	<b>4.78</b>	<b>(2.64–8.64)</b>	<b>&lt;.001</b>
<b>55–64</b>			
None, not bothered (ref)	1.00		
Somewhat	.55	(.20–1.48)	.237
Extremely	.40	(.12–1.30)	.127
<b>65+</b>			
None, not bothered (ref)	1.00		
Somewhat	<b>0.3</b>	<b>(.10–0.96)</b>	<b>.044</b>
Extremely	<b>0.1</b>	<b>(.03–0.62)</b>	<b>.010</b>
<b>Back</b>			
None, not bothered (ref)	1.00		
Somewhat	<b>2.19</b>	<b>(1.46–3.29)</b>	<b>&lt;.001</b>
Extremely	<b>3.31</b>	<b>(2.02–5.42)</b>	<b>&lt;.001</b>

NOTE. Boldface indicates significant depressive symptoms. Abbreviation: ref, referent.

to access mental health service utilization than those without back pain (OR=1.54; 95% CI, 1.01–2.33;  $P<.05$ ).

For persons with significant depressive symptoms, having Veteran's Association or workers' compensation insurance and having a trauma etiology of limb loss were the strongest predictors for mental health care utilization. Those with Veteran's Association or workers' compensation insurance were more than 5 times as likely to have received mental health services than persons with private insurance (OR=5.39; 95% CI, 1.19–24.4;  $P<.05$ ), and persons with a trauma etiology of limb loss were more than twice as likely as persons with dysvascular etiology to have received services (OR=2.21; 95% CI, 1.03–4.74;  $P<.05$ ). A sex difference was found, in that men were less likely than women to have received mental health services (OR=.53; 95% CI, .28–1.0;  $P<.05$ ). Persons age 55 to 64 were less likely than persons 18 to 44 to have received services (OR=.39; 95% CI, .16–.99;  $P<.05$ ), and persons whose amputation occurred 6 to 9 years ago were less likely than persons with the most recent amputations to have received mental health services (OR=.24; 95% CI, .06–.89;  $P<.05$ ).

Finally, persons with phantom limb pain were less likely to have received mental health services than persons without phantom limb pain (OR=.36; 95% CI, .13–.95;  $P<.05$ ).

## DISCUSSION

Our study provides the first reported prevalence data on risk factors for depressive symptoms across the 3 primary etiologies of limb loss in community-dwelling persons. Consistent with previous literature on limb-loss populations, the prevalence of depressive symptomatology for the full sample (28.7%) was 2 to 4 times greater than rates for the general population,<sup>9,10</sup> and was similar to rates reported for outpatient persons with limb loss.<sup>15–17</sup> These findings confirm that the risk for depression among community-dwelling persons with limb loss is comparable to rates reported for outpatient persons with other chronic conditions.

Persons with a trauma-related amputation reported the highest levels of depressive symptoms. This subset of amputees was also the youngest of the 3 groups, and younger age has been associated with higher rates of depressive symptoms in prior research<sup>7,16</sup>; however, these studies did not control for other variables. Although our initial findings supported the previous work, which showed young age and etiology to be risk factors for depressive symptoms, when we controlled for factors such as level of education, marital status, and one's experience of pain, neither age nor etiology were found to be significant predictors of depressive symptoms.

Although recency of amputation has been reported as a significant risk factor for depressive symptoms in previous research,<sup>7,16</sup> these findings were not confirmed. It may be that the better utilization of mental health services among persons with the most recent amputations (discussed later) served to mitigate depressive symptoms. However, several risk factors for depressive symptoms were identified, including living in a near-poor household. Although lower socioeconomic status has been described as a risk factor for depression elsewhere,<sup>38</sup> it is unclear why near-poor households emerged as a risk factor and poor households did not. It is possible that this anomaly may be attributable to the relatively small number of persons in this cell.

Being divorced or separated increased one's risk for depressive symptoms almost 2-fold above persons who were married or partnered. The risks associated with divorce and separation found in this limb-loss sample has been similarly documented in other chronic conditions.<sup>18,38,39</sup> Interestingly, Kashani et al<sup>7</sup>

Table 4: ORs for Depressive Symptoms for Residual Limb Pain Bothersomeness

Age (y)	No Pain/Not Bothered	Somewhat Bothered	Extremely Bothered
18-54	1.0	2.23 (1.35-3.67) <i>P</i> =.002	4.78 (2.64-8.64) <i>P</i> <.001
55-64	1.0	0.5 (0.2-1.5) <i>P</i> =.237	0.4 (0.1-1.3) <i>P</i> =.127
65+	1.0	0.3 (0.1-0.9) <i>P</i> =.044	0.1 (0.0-0.6) <i>P</i> =.010

NOTE. Values are OR, 95% CI, and *P* value.

did not find socioeconomic variables (marital and economic status) to be significant predictors of depression among inpatient amputees, but other factors were not controlled for in the Kashani et al<sup>7</sup> study. Livneh et al<sup>24</sup> reported that among a sample of 61 community-dwelling, limb-loss support group members, socioeconomic variables (sex, marital status, education level) and disability-related factors combined into a group of variables with younger age and more recent amputation and were predictive of scores on the depression subscale of the COPE Inventory.<sup>40</sup> Our results showed the significance of certain sociodemographic variables (marital status, household poverty level) above and beyond other variables, and these findings support the importance of emphasizing social support in psychologic interventions.

The adjusted ORs for having significant depressive symptoms increased linearly with medical comorbidity, thus replicating previous research that documented a linear association between depressive symptoms and medical comorbidity in other populations.<sup>39,41</sup> With 87.9% of the sample being comorbid for at least 1 medical condition, and 65.2% having 2 or more comorbidities, the phenomenon of limb loss is underscored as one that is rarely seen without concurrent medical complications. Thus, for amputees, the burden of managing illness and associated secondary conditions is likely to be substantial and significantly increases the risk for clinical depression.

Level of education offered a significant buffering effect against depressive symptoms. Controlling for all other study variables, persons with more than 12 years of education were less at risk for depressive symptoms. However, results in the literature regarding the relationship between education and depression are somewhat conflicting. Some studies have noted a similar inverse relationship between depression and level of education,<sup>10,42,43</sup> whereas others have not.<sup>39</sup> One study<sup>44</sup> reported that level of education was significantly and positively related to lifetime prevalences of minor depression and moderate depression, but not to severe depression. Kessler et al<sup>45</sup> found that persons with less than 12 years of education were more likely to report being depressed in the past year; however, this finding was not confirmed for lifetime prevalence of the disorder. The buffering effect of higher education was not related to mental health service utilization. However, it may be

that persons with more education are more likely to both be aware of, and utilize, existing resources, including social support.

In this study, pain bothersomeness in all 3 types of pain measured emerged as a risk factor for depressive symptoms. For residual limb pain bothersomeness, differences by age category were found. Being somewhat or extremely bothered by residual limb pain was a risk factor only for persons younger than 55 years. The level of residual pain bothersomeness does not appear to increase the risk for depressive symptoms in persons age 55 to 64. It is possible that residual limb pain in younger persons is more attributable to activity, whereas for older persons the residual limb pain is more attributable to underlying disease. Younger persons may find this unexpected form of pain more bothersome and disabling, whereas older persons may be more conditioned to cope positively. It must also be noted that these findings may be an artifact of small cell numbers. Regardless, this interesting age discrepancy for the relationship of pain bothersomeness and depressive symptoms merits further examination.

Being bothered by either phantom limb pain or back pain represented a significant risk factor for depressive symptoms for all age groups. The results confirm the need for thorough pain assessment in this population. It is estimated that as many as 85% of persons with acquired amputation experience phantom limb pain,<sup>46,47</sup> and more than 70% of persons experience residual limb pain and back pain 3 years or more post amputation.<sup>37</sup> Chronic pain has been shown to be a strong predictor for depressive morbidity in the general population.<sup>48</sup> However, for persons with limb loss, the utility of pain management interventions is highlighted, because efficacious pain management may mitigate depressive symptoms. Additionally, because the relationship between pain and depression is correlational, not causal, proper treatment for depressive symptoms may facilitate amelioration of pain.

Nearly 45% (44.6%) of persons with depressive symptoms reported receiving mental health services in the past year. However, it is not known whether receipt of services was related to these depressive symptoms or other issues. Persons with significant depressive symptoms were more likely to have received mental health services if the etiology of the amputation was traumatic or if they had Veteran's Association or

Table 5: Utilization of Mental Health Services for Previous 12 Months

Mental Health Services	Total Sample (N=913)	No Significant Depressive Symptoms (n=651)	Significant Depressive Symptoms (n=262)
Received MHS	21.8 (199)	12.6 (82)	44.6 (117)
Need for additional services not met	46.2 (90)	33.3 (27)	55.3 (63)
Need met	53.9 (109)	66.7 (55)	44.7 (54)
Did not receive MHS	78.2 (715)	87.0 (569)	55.3 (145)
Need for services not met	8.9 (63)	2.8 (16)	32.9 (47)
Need met	91.1 (647)	97.2 (551)	67.1 (96)

NOTE. Values are % (n).

Abbreviation: MHS, mental health service.

workers' compensation insurance. Although trauma as an etiology did not emerge as a risk factor for depressive symptoms, the greater tendency among persons in this group to use mental health services in the previous year may have attenuated the expression of depressive symptoms. Better mental health utilization among persons with Veteran's Association or workers' compensation insurance suggests that insurance plans with generous mental health care provisions may stimulate pursuit and receipt of services, which, in turn, may lessen the impact of depressive symptoms and/or help prevent a depressive episode from occurring.

The most current epidemiologic data estimated that 57.3% of clinically depressed persons in the general population received some type of care (medical, psychological, or alternative treatment) for their clinical depression.<sup>45</sup> Direct comparison to rates observed in that study cannot be made, however, because our study is an investigation of significant depressive symptoms only. An epidemiologic study of depression among 9090 persons in the general US population (National Comorbidity Survey Replication study) found that 51.6% of persons who reported being depressed in the previous 12 months received mental health services.<sup>45</sup> However, this study found that only 21.7% were treated adequately, having received sufficient medication and psychotherapy for significant amelioration of symptoms.<sup>45</sup>

Overall, results showed that persons older than age 45 and persons with less recent amputations (>2y since amputation) were less likely to have received mental health services than younger persons with the most recent amputations. The increased likelihood among persons with recent limb loss to receive mental health services may have offset the higher levels of depressive symptoms found in previous studies.<sup>8,16</sup> Similarly, although other research has shown female sex to be a predictor for depression,<sup>44,45</sup> we did not find a sex effect for significant depressive symptoms. However, men were significantly less likely than women to seek mental health services, regardless of level of depressive symptoms. Thus, for women, the greater tendency to utilize mental health services may have served to mitigate their level of depressive symptoms.

Of persons with significant depressive symptoms who had not received mental health services within the year, 67.1% reported that they did not need services, despite their self-reported distress. Thus, a large percentage of people are in need of education regarding the symptoms of depression and treatment options. Depressive symptoms are a risk factor for both poor outcome and for clinical depression. Interventions that capture symptomatic persons earlier and provide education may facilitate improved outcome and better QOL for persons with limb loss.

Treatment for clinical depression is effective but appears to be underutilized in this population. In addition, self-management interventions targeted toward increasing both self-efficacy and coping skills may help prevent or reduce depressive symptoms. This class of interventions has demonstrated efficaciousness in other populations for decreasing depressive symptoms and health care costs, and improving well-being.<sup>49-51</sup> Limb-loss populations may benefit from a self-management intervention tailored to address secondary conditions. Such interventions may increase ability to manage disease, ameliorate the impact of secondary conditions, decrease depression, and increase QOL for persons with limb loss. The development and empirical testing of such interventions is recommended as an area for future research.

Interpretation of the results must involve consideration of several methodologic limitations. First, as previously discussed, the CES-D 10 is a screening tool for depression, and,

although it is related to clinical diagnosis, it is not a diagnostic measure. Second, causal inferences cannot be made, because the study is cross-sectional and provides correlational data only. Third, although our response rate (71%) is regarded as scientifically acceptable, the other 29% who did not participate in the study may introduce error into the results. Fourth, although we report on utilization of mental health services, it is not known whether receipt of services was linked to depressive symptoms. Finally, the convenience sample of study participants identified from a national database of persons who had contacted the ACA may not be representative of the larger population of persons with limb loss. A person having contacted the ACA for information at least once from 1998 to 2000 is potentially a more motivated, proactive individual than those who did not seek information during this timeframe.

## CONCLUSIONS

Prevalence of significant depressive symptoms among community-dwelling persons with limb loss is high (28.7%). Age and diagnostic category were not related to level of depressive symptoms when a multivariate analysis was used. Education, poverty, marital status, and pain remained predictors of depressive symptoms after controlling for confounders. The greatest risk factors for depressive symptomatology were higher levels of pain and comorbidity, both of which are prevalent in persons with limb loss. Additionally, 42% of persons with significant depressive symptoms reported having an unmet need for mental health services. Interventions that target depressive symptoms and pain management, and that bolster self-management skills appear particularly suitable to the needs of this population and may help ameliorate depressive symptoms.

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