

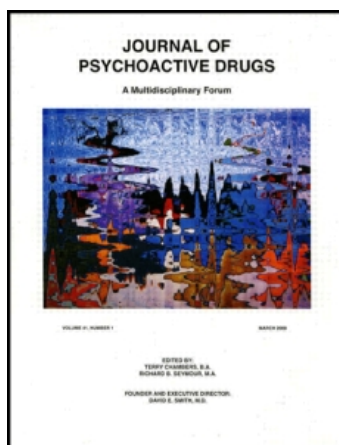
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### Service Use and Treatment Barriers Among Inhalant Users

Brian E. Perron<sup>a</sup>; Orion Mowbray<sup>b</sup>; Sarah Bier<sup>c</sup>; Michael G. Vaughn<sup>d</sup>; Amy Krentzman<sup>e</sup>; Matthew O. Howard<sup>f</sup>

<sup>a</sup> University of Michigan, School of Social Work, Ann Arbor, MI <sup>b</sup> University of Michigan Joint Program in Social Work and Psychology, Ann Arbor, MI <sup>c</sup> University of Michigan School of Social Work, Ann Arbor, MI <sup>d</sup> School of Social Work and Public Policy and Epidemiology at Saint Louis University, St. Louis, MO <sup>e</sup> Department of Psychiatry, University of Michigan Addiction Research Center in the, School of Medicine, Ann Arbor, MI <sup>f</sup> University of North Carolina at Chapel Hill,

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## Short Communication

### SERVICE USE AND TREATMENT BARRIERS AMONG INHALANT USERS<sup>†</sup>

**Brian E. Perron, Ph.D.\***  
**Orion Mowbray, M.S.W.\*\***  
**Sarah Bier, M.S.W.\*\*\***  
**Michael G. Vaughn, Ph.D.\*\*\*\***  
**Amy Krentzman, Ph.D.\*\*\*\*\***  
**Matthew O. Howard, Ph.D.\*\*\*\*\***

**Abstract**—Inhalant use is a serious global problem with consequences equal to or surpassing those of other drugs. Regrettably, few prior studies have examined inhalant users' patterns of service and treatment utilization. The purpose of this study is to identify factors associated with service use and barriers to treatment among a nationally representative sample of inhalant users. Data from the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) reveal that among inhalant users problem severity and substance use disorder comorbidity were associated with substance abuse treatment barriers and service usage. These findings can help improve the service delivery system to provide effective treatments and reduce the risk of emergency department usage, which is among the most expensive and least effective ways to deal with substance abuse.

**Keywords**—inhalant misuse, service utilization, treatment barriers, substance abuse treatment

Inhalant use refers to the intentional inhalation of chemical vapors for the purpose of producing psychoactive effects.

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\*Assistant Professor, University of Michigan, School of Social Work, Ann Arbor, MI.

\*\*Doctoral student, University of Michigan Joint Program in Social Work and Psychology, Ann Arbor, MI.

\*\*\*Graduate student and research assistant, University of Michigan School of Social Work, Ann Arbor, MI.

Results from national surveys show they are among the most widely used of all psychoactive substances. For example, results from the 2006 Monitoring the Future Survey indicated that approximately 16.1% of eighth graders reported lifetime use of inhalants, a figure that was higher than that for marijuana (15.7%) and cocaine (3.4%) use (Johnston et al. 2007). Inhalant use is a serious problem, as the consequences of such use can rival or exceed the consequences of other drug use (Esmail et al. 1992).

Recent research has identified factors associated with inhalant use among adolescents and adults (Perron & Howard 2009; Wu & Howard 2007). These studies, as well as those related to improving the diagnosis of inhalant abuse and dependence (Perron et al. 2010, 2009a), are needed to help inform the development of empirically-supported prevention and treatment programs. However, the development of such programs is not possible without a greater understanding of the service use patterns among this at-risk population. While a recent report showed that inhalant dependence was significantly associated with odds of emergency department service use (second only to heroin dependence), the broader patterns and correlates of service utilization among inhalant users are virtually unknown (Perron et al. In press).

The purpose of this study is to identify factors associated with service use and perceived barriers to treatment among a nationally representative sample of inhalant users. This is the first analysis to document this information, which can be used to more effectively and efficiently plan, develop and target services for this at-risk population.

### METHODS

The present analysis used data from the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), which is a nationally representative survey of

\*\*\*\*Assistant Professor, School of Social Work and Public Policy and Epidemiology at Saint Louis University, St. Louis, MO.

\*\*\*\*\*National Institute on Alcohol Abuse and Alcoholism postdoctoral research fellow at the University of Michigan Addiction Research Center in the Department of Psychiatry, School of Medicine, Ann Arbor, MI.

\*\*\*\*\*Frank A. Daniels Distinguished Professor for Human Services Policy Information, University of North Carolina at Chapel Hill.

Please address correspondence and reprint requests to Brian E. Perron, University of Michigan, School of Social Work, 1080 S. University Avenue, Ann Arbor, MI 48103. Email: beperron@umich.edu

**TABLE 1**  
**Summary Characteristics of Inhalant Users and Percentages Reporting Service Use or Barriers**

Variable	Overall (N= 664) % (SE)	Service Utilization % (SE)	Services $\chi^2$	Service Barriers % (SE)	Barriers $\chi^2$
Race					
White	82.2 (1.74)	23.6 (2.23)		13.9 (1.61)	
Black	3.8 (0.73)	30.2 (8.58)	0.35	18.9 (6.80)	0.98
Hispanic	13.9 (1.71)	25.3 (5.45)		20.3 (4.57)	
Urbanicity					
Urban	35.6 (2.86)	22.6 (3.04)	0.29	13.4 (2.27)	0.64
Rural	64.4 (2.86)	24.9 (2.84)		15.9 (1.98)	
Gender					
Male	74.2 (2.02)	24.8 (2.35)	0.38	15.3 (1.74)	0.09
Female	25.8 (2.02)	22.2 (3.62)		14.2 (3.17)	
Marital Status					
Married	43.7 (2.30)	22.9 (2.72)		13.9 (2.38)	
Separated/Divorced	17.4 (1.73)	27.7 (4.58)	0.41	20.2 (3.94)	0.96
Never Married	38.9 (2.26)	23.9 (3.74)		14.0 (2.57)	
Personal Income <sup>1</sup>					
\$0 to \$19,999	28.4 (2.21)	37.2 (4.83)		22.8 (3.63)	
\$20,000 to \$34,999	18.9(1.64)	19.5 (3.58)	3.54*	11.9 (2.87)	2.30
\$35,000 to \$69,999	31.8 (2.15)	19.6 (3.09)		12.5 (2.55)	
\$70,000 and Over	20.9 (2.01)	17.4 (3.74)		11.2 (3.01)	
Age					
18 to 34	50.7 (2.25)	22.9 (3.13)		13.3 (2.31)	
35 to 54	45.1 (2.24)	25.9 (2.81)	0.58	17.9 (2.14)	3.67*
55 and over	4.2 (0.80)	19.0 (6.67)		5.4 (2.91)	
Lifetime Inhalant Grouping					
No Disorder	80.6 (1.96)	19.8 (2.29)		12.7 (1.53)	
Abuse	17.2 (1.85)	38.7 (5.04)	7.28**	22.8 (4.42)	3.96*
Dependence	2.3 (0.69)	66.2 (16.29)		41.6 (14.82)	
Lifetime Alcohol Use Disorder	83.5 (1.66)	26.1 (2.30)	7.34**	16.1 (1.63)	3.99*
Other Lifetime Substance Use Disorder <sup>2</sup>	78.7 (1.86)	28.9 (2.41)	28.31**	18.2 (1.74)	18.91**

Note: Overall column values are reported as column percentages. Service utilization and service barriers are presented as row percentages.

<sup>1</sup>Measured in dollars per year.

<sup>2</sup>Noninhalant and non-nicotine drug use disorder. \*  $p < .05$ , \*\* $p < .01$

43,093 noninstitutionalized U.S. residents aged 18 years and older (Grant et al. 2004a, b). The NESARC was based on a multistage sampling design that oversampled young adults, Hispanics, and African-Americans to obtain reliable statistical estimation in these subpopulations and to ensure appropriate representation of racial/ethnic groups.

In the administration of this survey, U.S. Census Bureau workers, trained by National Institute on Alcohol Abuse and Alcoholism (NIAAA) staff, administered the Alcohol Use Disorders and Associated Disabilities Interview Schedule—DSM-IV version (AUDADIS-IV). AUDADIS-IV is a structured interview designed for administration by trained lay interviewers. AUDADIS-IV assesses 10 DSM-IV substance use disorders and evidences good-to-excellent reliability for the assessment of substance use disorders (Grant et al. 2003, 1995). The NESARC survey, sampling protocol, and related publications are described in detail in prior studies (Stinson et al. 2008; Grant et al. 2003, 1995).

### Measurement

**Inhalant use.** This study included all survey respondents who reported using inhalants at any time in their lives. DSM-IV criteria were used to classify subjects based on whether they met lifetime criteria for inhalant abuse (without dependence) or dependence (with or without abuse). Thus, study respondents fell into one of three mutually exclusive categories: inhalant dependent, inhalant abusers, or inhalant users without abuse or dependence.

**Substance use disorders.** Participants were classified as having a lifetime alcohol use disorder if they met lifetime DSM-IV criteria for abuse of or dependence on alcohol. Participants were classified as having a lifetime other substance use disorder (that is, a substance use disorder other than an inhalant use disorder or alcohol use disorder) if they met lifetime DSM-IV criteria for abuse or dependence for marijuana, cocaine or crack, tranquilizers, stimulants, painkillers, other prescription drugs, hallucinogens, and sedatives.

**TABLE 2**  
**Service Utilization and Treatment Barriers Most Frequently Endorsed Among Inhalant Users**

	Overall	No Inhalant Disorder	Inhalant Abuse	Inhalant Dependence	$\chi^2$
	% (SE)	% (SE)	% (SE)	% (SE)	
<b>Service Utilization</b>	<b>N = 160</b>	<b>N = 101</b>	<b>N = 44</b>	<b>N = 15</b>	
Narcotics/Alcoholics/Cocaine Anonymous	68.5 (5.06)	67.5 (6.28)	67.8 (9.86)	82.0 (12.42)	0.50
Drug or Alcohol Rehabilitation Program	61.2 (4.82)	57.9 (6.18)	64.9 (9.23)	80.2 (12.09)	1.16
Private Physician/Psychiatrist/Social Worker	55.6 (4.84)	55.8 (6.03)	52.3 (9.51)	67.5 (16.37)	0.31
Drug/Alcohol Detox Ward Or Clinic	52.3 (4.99)	55.3 (6.17)	51.5 (8.98)	45.2(16.10)	0.11
Outpatient Clinic/Outreach or Day Program	44.0 (5.15)	42.9 (6.81)	42.2 (8.59)	62.2(17.11)	0.64
<b>Treatment Barriers</b>	<b>N = 112</b>	<b>N = 75</b>	<b>N = 25</b>	<b>N = 12</b>	
Strong Enough to Handle it Alone	43.9 (5.53)	46.6 (7.14)	37.5 (9.68)	43.2 (18.76)	0.27
Thought it Would get Better by Itself	31.1 (6.07)	25.3 (7.02)	44.4 (12.68)	41.1 (18.75)	0.95
Too Embarrassed to Discuss with Anyone	28.8 (5.47)	28.7 (6.83)	32.9 (9.41)	12.5 (9.76)	0.82
Didn't Want to Go	25.8 (5.41)	25.4 (6.10)	22.7 (12.79)	42.2 (18.86)	0.38
Couldn't Afford to Pay the Bill	21.3 (4.84)	14.8 (5.39)	38.3 (9.94)	23.1 (16.76)	1.86

**Sociodemographic variables.** Several sociodemographic variables were assessed in this study: racial/ethnic groups including Caucasians (non-Hispanic), African Americans, and Hispanics; urbanicity (urban or rural); gender (male, female); marital status (married, separated, never married); personal income (in dollars per year); and age (in years).

**Service utilization.** Participants were asked to reply "yes" or "no" to the questions: "Have you ever gone anywhere or seen anyone for a reason that was related in any way to your use of medicines or drugs—a physician, counselor, Narcotics Anonymous, or any other community agency or professional?" "Did you ever in your life talk to a medical doctor or other professional about your use of drugs?" This question was directed towards service utilization that resulted from the use of any substance, not necessarily inhalant use. Participants who endorsed this question affirmatively were then asked whether they used each of 14 different substance abuse-related services, such as 12-Step meetings, private practitioner, drug rehabilitation, and drug detoxification (see Appendix 1 for complete listing of services).

**Drug treatment barriers.** Participants were asked: "Was there ever a time when you thought you should see a doctor, counselor, or other health professional or seek any other help for your drug use, but you didn't go?" Participants who endorsed this question were then asked whether they were impeded from going to treatment for any of 27 possible barriers to getting help, such as "I didn't think treatment would help," "I could not afford it," or "I didn't know where to go for help" (see Appendix 1 for complete listing).

**Analysis.** Analyses were computed using SUDAAN Version 9.0 (SAS Institute 2004). This system implements a Taylor series linearization to adjust standard errors of estimates for complex survey sampling design effects including clustered data. Chi-square tests were used to make bivariate comparisons between each categorical variable

and dichotomous outcomes: (1) presence/absence of service utilization and (2) presence/absence of barriers to treatment. Multivariable logistic regression analyses were used to examine service utilization and barriers to treatment while adjusting for sociodemographic and other clinical variables. Full models with all independent variables were examined first, followed by trimmed models of only key variables for purposes of parsimony.

## RESULTS

### Overall Sample Characteristics

Within the NESARC sample, 664 persons reported having used inhalants at any point during their lives. Characteristics of this sample of inhalant users are presented in Table 1. The sample was predominately White (82.2%), aged 18 to 34 (50.7%), and male (74.2%). Over half of the sample reported living in a rural area (64.4%). Regarding clinical characteristics, 19.5% of the total sample met criteria for DSM-IV inhalant use disorder (abuse or dependence), 78.7% met lifetime DSM-IV criteria for another substance use disorder, and 83.5% reported a lifetime alcohol use disorder.

### Service Utilization

Of the total sample of inhalant users, 24.1% reported receiving at least one type of substance abuse-related services. As described in Table 1, respondents with an income of less than \$20,000 annually reported receiving services more often (37.2%) compared to persons at higher income levels. The majority of persons with inhalant dependence used some form of service (66.2%). This was a substantially higher prevalence of service use compared to those with inhalant abuse (38.7%) or no disorder (19.9%). Having a lifetime alcohol use disorder was also associated with a

**TABLE 3**  
**Multivariable Logistic Regression Results Predicting Service Use and Treatment Barriers Among Lifetime Inhalant Users**

Variable	Service Utilization OR (95% CI)	Service Barriers OR (95% CI)
Race		
White	-	-
Black	1.63 (0.65-4.08)	1.74 (0.75-4.02)
Hispanic	1.02 (0.52-2.01)	1.66 (0.86-3.20)
Urbanicity		
Urban	0.77 (0.45-1.32)	0.74 (0.43-1.27)
Rural	-	-
Gender		
Male	0.89 (0.51-1.52)	0.99 (0.49-2.00)
Female	-	-
Marital Status		
Married	1.23 (0.67-2.24)	1.12 (0.57-2.20)
Separated/Divorced	1.19 (0.57-2.49)	1.40 (0.59-3.29)
Never Married	-	-
Personal Income <sup>1</sup>		
\$0 to \$19,999	<b>2.72 (1.26-5.87)</b>	2.10 (0.88-4.99)
\$20,000 to \$34,999	1.01 (0.47-2.14)	0.88 (0.37-2.09)
\$35,000 to \$69,999	1.12 (0.54-2.32)	1.14 (0.51-2.55)
\$70,000 and Over	-	-
Age		
18 to 34	-	-
35 to 54	.23 (0.73-2.09)	1.41 (0.73-2.72)
55 and over	11.39 (0.40-4.84)	0.45 (0.12-1.70)
Lifetime Inhalant Grouping		
No Disorder	-	-
Abuse	<b>1.88 (1.08-3.27)</b>	1.47 (0.82-2.66)
Dependence	4.31 (0.64-28.85)	2.56 (0.54-12.15)
Lifetime Alcohol Use Disorder	1.98 (0.70-5.64)	1.60 (0.54-4.73)
Lifetime Drug Use Disorder <sup>2</sup>	<b>5.52 (1.98-15.44)</b>	<b>5.27 (1.14-24.30)</b>

Note: OR = odds ratio. CI = Confidence interval. Items in bold are statistically significant based on an odds ratio that does not bound the value 1.0.

<sup>1</sup>Measured in dollars per year.

<sup>2</sup> Noninhalant, non-alcohol drug use disorder.

high prevalence of service use (26.1%), as was having a noninhalant substance use disorder (28.9%).

Table 2 provides a summary of the five most common types of services utilized among persons with a lifetime history of inhalant use. The most common type was a 12-Step program (Narcotics, Alcoholics or Cocaine Anonymous; 68.5%), followed by an alcohol or other drug rehabilitation program (61.2%) and seeing a private physician, psychiatrist, or social worker (55.6%). There were no significant differences observed among levels of inhalant abuse within the five most common services.

Multivariable logistic regression was used to identify factors associated with any type of lifetime service use among inhalant users while controlling for confounding variables. We assessed a full model, which included all variables in Table 1, as well as a trimmed model that included only race/ethnicity, marital status, income, lifetime drug use disorder status, and lifetime inhalant disorder status. The first model was statistically significant ( $\chi^2 = 83.13, p < .01$ ), with a pseudo R-square value of .12. This model showed

that persons with an income of \$19,000 or less had odds of service utilization 2.72 times greater than those from the highest income group, \$70,000 and over (95% CI = 1.26-5.87). Furthermore, persons with inhalant abuse had 1.88 times greater odds of service utilization compared to those without an inhalant use disorder (95% CI = 1.08-3.27). No significant differences were observed between those with dependence and those without an inhalant use disorder. Finally, persons with a lifetime drug use disorder had 5.52 times greater odds of service utilization (95% CI = 1.98-15.44). None of the other independent variables showed statistical significance. These findings were nearly identical to those in a model that excluded other sociodemographic variables; although the effect size of the income variable was slightly diminished (OR = 2.60, 95% CI = 1.22-5.56), the odds associated with service utilization for inhalant use disorder variable remained constant (OR = 1.89, 95% CI = 1.09-3.29), and the lifetime substance use disorder variable was slightly attenuated (OR = 5.71, 95% CI = 1.96-16.58).

### Treatment Barriers

Of the total sample of inhalant users, 15% reported at least one barrier to receiving services. As described in Table 1, respondents with an income of less than \$20,000 annually reported the highest percentage of barriers to treatment (22.8%) compared to persons at higher income levels, but no significant differences emerged among income groups. Less than half of persons with inhalant dependence reported at least one barrier to treatment (41.6%), following those with inhalant abuse (22.8%) and those with no disorder (12.7%). Having a lifetime alcohol use disorder was also associated with a high prevalence of service use (16.1%), as was having another substance use disorder (18.2%).

Table 2 provides a summary of the most common treatment barriers among persons with a lifetime history of inhalant use. The most common treatment barrier reported was the misguided belief that the individual should be strong enough to handle it alone (43.9%), followed by thinking the problem would get better by itself (31.1%), and feeling too embarrassed to discuss it with anyone (28.8%). There were no significant differences in treatment barriers by inhalant use disorder groups.

Multivariable logistic regression was used to identify factors associated with experiencing a treatment barrier while controlling for confounding variables. We assessed a full model, which included all variables in Table 1, as well as a trimmed model that included only race/ethnicity, marital status, income, lifetime drug use disorder status, and lifetime inhalant disorder status. The first model was statistically significant ( $\chi^2 = 45.45, p < .01$ ), with a pseudo R-square value of .07. This model showed that persons with a lifetime other substance use disorder had odds of encountering a barrier to treatment that was 5.27 times greater than those without (95% CI = 1.14–24.30). None of the other independent variables achieved statistical significance. The findings were nearly identical in the trimmed model, although the effect size of the lifetime other drug use disorder variable changed slightly (OR = 5.58, 95% CI = 1.20–25.97).

### DISCUSSION

This is the first study to present findings concerning treatment utilization and barriers to care among a nationally representative sample of service users. These data are needed to provide information necessary for developing services and structuring treatment. As prior studies have revealed, inhalant users have a high level of substance and psychiatric use comorbidities (Perron et al. 2009a; Wu & Howard 2007), which underscores the importance of understanding their patterns of service use given the severity

of their substance use. This can help improve the service system that will provide effective treatments and reduce the risk of emergency department usage (Perron et al. 2009a), which is among the most expensive and least effective forms of substance abuse intervention.

As expected, this study found that persons who met DSM-IV criteria for inhalant dependence had the highest levels of service use and barriers to treatment. However, it is notable that a significant number of persons with less severe involvement with inhalants—that is, those classified as having abuse or not meeting criteria for a disorder—were also frequent service users. The patterns of service use for inhalant users were remarkably similar to the most frequently used services among persons seeking services for other drug-related problems (Perron et al. 2009b). This could be explained by the fact that the NESARC survey instrument did not query individuals about service use related to specific drug use. Thus, it may be other substance use among inhalant users that explains these patterns of service use, which is an important issue that future research needs to clarify.

Other than a lifetime history of another drug use disorder, no other factors emerged as correlates of service use or barriers to treatment among inhalant users in the multivariable models. A likely possibility is the heterogeneity that is involved with inhalant use. More specifically, it is important to consider that inhalants are the only substance classified by their mode of administration rather than chemical composition (Perron et al. 2009a). Thus, there may be subtypes of inhalant users that are seeking or experiencing different types of mechanisms of inhalant delivery. These different types of mechanisms of inhalant use delivery may be further complicated by complex interactions with different types of other drug use and psychiatric comorbidities.

Despite the measurement limitations of this survey, these results represent an important first step in understanding services-related issues among inhalant users and are suggestive of implications for practice. Most notably, because inhalant users most frequently use 12-Step related services compared to all other types of services, a combination of treatment and 12-Step participation may be more helpful for this population. Sensitivity to the use of inhalants is particularly needed within the medical and substance abuse treatment community to help reduce the stigma associated with inhalants, as this was also found to be a frequent barrier to treatment among inhalant users who sought but did not receive services. Finally, professional service providers should pay greater attention to assessing for inhalant use, as inhalant users may present for services in all major forms of substance use disorder treatment.

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## APPENDIX 1

### Complete Listing of NESARC Service Use and Perceived Treatment Barrier Items

#### Service Usage

1. Ever went to Narcotics/Cocaine/Alcoholics Anonymous or any 12-Step meeting?
2. Ever went to family services or other social service agency?
3. Ever went to drug/alcohol detoxification ward/clinic?
4. Ever went to inpatient ward of psychiatric/general hospital or community mental health program?
5. Ever went to outpatient clinic, including outreach and day/partial patient program?
6. Ever went to drug/alcohol rehabilitation program?
7. Ever went to methadone maintenance program?
8. Ever went to emergency room because of medicine/drug use?
9. Ever went to halfway house because of medicine/drug use?
10. Ever went to crisis center because of medicine/drug use?
11. Ever went to employment assistance program (EAP)?
12. Ever went to clergyman, priest, or rabbi because of medicine/drug use?
13. Ever went to private physician, psychiatrist, psychologist, social worker, or other professional?
14. Ever went to any other agency or professional?

#### Treatment Barriers

1. I did not seek help because I wanted to go, but health insurance didn't cover it.
2. I did not seek help because I didn't think anyone could help.
3. I did not seek help because I didn't know any place to go for help.
4. I did not seek help because I couldn't afford to pay the bill.
5. I did not seek help because I didn't have any way to get there.
6. I did not seek help because I didn't have the time.
7. I did not seek help because I thought the problem would get better by itself.
8. I did not seek help because I was too embarrassed to discuss it with anyone.
9. I did not seek help because I was afraid of what my boss, family, friends or others might think.
10. I did not seek help because I thought I should be strong enough to handle it alone.
11. I did not seek help because I was afraid they would put me in the hospital.
12. I did not seek help because I was afraid of the treatment they would give me.
13. I did not seek help because I hated answering personal questions.
14. I did not seek help because the hours were inconvenient.
15. I did not seek help because a member of my family objected.
16. I did not seek help because my family thought I should go, but didn't think it was necessary.
17. I did not seek help because I can't speak English very well.
18. I did not seek help because I was afraid I would lose my job.
19. I did not seek help because I couldn't arrange for childcare.
20. I did not seek help because I had to wait too long to get into the program.
21. I did not seek help because I wanted to keep using the medicine or drug.
22. I did not seek help because I didn't think the medicine or drug problem was serious enough.
23. I did not seek help because I didn't want to go.
24. I did not seek help because I stopped using a drug or medicine on my own.
25. I did not seek help because friends or family helped me stop using a medicine or drug.
26. I did not seek help because I tried getting help before and it didn't work.
27. I did not seek help because of some other reason.