

3-1-2008

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Recommended Citation

Morris, L., Loux, S., Ziller, E., & Hartley, D. (2008). Rural-urban differences in work patterns among adults with depressive symptoms. (Working Paper #38). Portland, ME: University of Southern Maine, Muskie School of Public Service, Maine Rural Health Research Center.

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**Rural-Urban Differences in
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With Depressive Symptoms**

March 2008



**RURAL-URBAN DIFFERENCES IN WORK PATTERNS
AMONG ADULTS WITH DEPRESSIVE SYMPTOMS**

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Maine Rural Health Research Center

Working Paper #38

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This study was funded by a cooperative agreement from the federal Office of Rural Health Policy, Health Resources and Services Administration, DHHS (CA#U1CRH03716). The conclusions and opinions expressed in the paper are the authors' and no endorsement by the University of Southern Maine or the funding source is intended or should be inferred.

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EXECUTIVE SUMMARY

Background

Mental illness can be a debilitating condition, making it difficult to fulfill many of life's roles, including that of wage earner. Whether resulting from job-related stress, social or environmental stressors, or other factors, sub-acute mental distress may pose temporary or long-term impairment to role functions, including the ability to earn a living. In rural areas, several factors may exacerbate the threat to normal role functioning posed by mental health problems. Small employers are less likely to have an Employee Assistance Program (EAP) that can respond to such sub-diagnostic problems, and are less likely to offer a mental health insurance benefit. With or without insurance, it is more difficult to find a mental health provider in rural areas, and there is some evidence that rural residents may be less likely to seek such services, due to stigma and fear that their privacy will not be protected. In addition, the job market in rural areas may further exacerbate the problem, with lower wages, fewer job alternatives, and reduced ability to accommodate the special needs of an employee in distress, due to having a smaller, less diversified job market.

Despite the importance to both workers and employers of understanding the impact of mental distress on work patterns, there are no studies to date that have examined this from a rural perspective. Using the National Longitudinal Survey of Youth (NLSY), a nationally representative survey of adults, this project addresses the issue of poor mental health among young to middle-career rural residents and how their employment may be affected. Specifically, we investigate how depressive symptoms affect employment patterns, and the extent to which such effects differ by rural and urban residence.

Findings

Our analysis follows a cohort sample from 1992 through 2004, although the specific findings presented in this paper are based on the 1992 survey data. The sixteen percent of our sample identified as rural differ from the urban sample in that they are more likely to be married, have less education, are less likely to be black or Hispanic, and less likely to have health insurance. For both urban and rural subjects, individuals with depressive symptoms work less than those who are not depressed as indicated by annual weeks worked (42.7 vs. 46.3, $p < .001$), annual hours worked (1781.6 vs. 1973.0, $p < .001$), and percent not working in the past year (19.6 vs. 10.5, $p < .001$). However, our multivariate analysis finds that depressed rural residents have no more difficulty maintaining employment than the urban depressed.

Discussion and Policy Implications

Certainly rural residents suffer no less than their urban counterparts from the multiple effects of depression on their ability to function in life's essential roles. That rural residents are as able as their urban counterparts to hold on to their jobs and bring home a paycheck says little about their productivity on the job, or, more importantly, about the suffering that may accompany such survival. Research has demonstrated that rural residents who are depressed have poorer access to mental health services and poorer outcomes when they receive such services (Rost et al., 2002). The results of these disparities, and suggested policy remedies have been discussed elsewhere in the literature of rural mental health. Questions remain, however, about access to employee assistance programs, productivity on the job, and the survival or coping strategies of rural workers with depressive symptoms.

INTRODUCTION

Mental illness can be a debilitating condition, making it difficult to fulfill many of life's roles, including that of wage earner (Lim, Sanderson & Andrews, 2000; Marcotte, Wilcox-Gok & Redmon, 1999). For those with serious and persistent mental illness, society has recognized this impairment with eligibility for supplemental security income (SSI) for those with certain diagnoses. However, we generally do not offer categorical benefits to those with less serious emotional disorders, although their ability to earn a living may be compromised. Whether resulting from job-related stress, social or environmental stressors, or other factors, sub-acute mental distress may pose temporary or long-term impairment to role functions. Employee assistance programs, mental health treatment, or informal support systems may help individuals return to normal functioning without permanent damage to career, family and social relationships; however, such resources may be unavailable or may not be used for a variety of reasons.

In rural areas, several factors may exacerbate the threat to normal role functioning posed by mental health problems. Small employers are less likely to have an Employee Assistance Program (EAP) that can respond to such sub-diagnostic problems, and are less likely to offer a mental health insurance benefit (Hartley, Quam and Lurie, 1994). With or without insurance, it is more difficult to find a mental health provider in rural areas, and there is some evidence that rural residents may be less likely to seek such services, due to stigma and fear that their privacy will not be protected (Hoyt, Conger, Valde, & Weihs, 1997). In addition, the job market in rural areas may further exacerbate the problem, with lower wages, fewer job alternatives, and reduced ability to accommodate the special needs of an employee in distress, due to having a smaller, less diversified job market (Marshall, 2001).

The health and economic well-being of individual workers matters not only to the worker and his or her family, but also to the well-being and viability of the local community and its economy. Greenberg et al. (1999) estimate that in the U.S. the cost of increased absenteeism and reduced work productivity attributable to anxiety disorders alone was \$4.1 billion in 1990, while the cost due to depression illness may be \$17 billion (Greenberg et al., 1993). Mental health problems lead to increased public assistance expenditures (O'Campo & Rojas-Smith, 1998) and a labor force that is less attractive to relocating businesses (Farquhar, Summers, & Sorkin, 2001). Unemployment and underemployment are higher and long-term poverty more common in rural areas (Mills, 2000) making economic development a key policy priority. In order to attract employers, rural communities need to offer a healthy and skilled labor pool (Marshall, 2001).

Despite the importance to both workers and employers of understanding the impact of mental distress on work patterns, there are no studies to date that have examined this from a rural perspective. Using the National Longitudinal Survey of Youth, a nationally representative survey of adults, this project addresses the issue of poor mental health among young to middle-career rural residents and how their employment may be affected. Specifically, we examine whether or not there is a differential impact of depressive symptoms on rural working-age adults compared to urban members of this population. In doing so, this project can identify if there is a particular need for policies to support rural workers to ensure that they are achieving the greatest possible productivity and earnings despite the mental stressors they may be facing in and out of the workplace.

BACKGROUND

Poor mental health can negatively impact an individual's employment status (Alexandre & French, 2001; Dooley et al., 2000; Marcotte, Wilcox-Gok & Redmon, 2000; Marcotte, Wilcox-Gok & Redmon, 1999). According to recent studies, depression is associated with a 5 to 19 percentage point lower likelihood of employment; among working-aged women, those with depression are 27 percentage points less likely than other women to be employed (Alexandre & French, 2001; Marcotte, Wilcox-Gok & Redmon, 2000; Marcotte, Wilcox-Gok & Redmon, 1999). For those workers able to maintain employment, mental and emotional problems often result in greater rates of absenteeism and presenteeism, i.e. poor productivity while at work (French & Zarkin, 1998). Recent studies show that workers with a mental health disorder averaged one less work day per month and depressed workers averaged seven to eight fewer weeks of work per year (Alexandre & French, 2001; Lim, Sanderson & Andrews, 2000).

Mental and emotional problems have also resulted in significant costs to employers and the economy as a whole. In 1990, the cost of increased absenteeism and reduced work productivity in the U.S. was estimated to be \$4.1 billion for anxiety disorders and \$17 billion for depression (Greenberg et al., 1999; Greenberg et al., 1993). In 2002, researchers estimate that absenteeism and presenteeism among depressed workers cost employers over \$8 billion and \$36 billion, respectively (Stewart et al., 2003). Mental health problems also lead to a less attractive labor force and therefore has the potential to further hurt the local economy by attracting fewer relocating businesses (Farquhar, Summers & Sorkin, 2001). In addition to poor worker productivity, employees with mental/emotional problems cost employers significantly more in medical care costs. Employees who reported being depressed cost employers 70% more in health care costs, while those who reported being highly stressed cost employers 46% more.

Employees with both depression and high stress were 147% more expensive to employers (Goetzel, Ozminkowski, Sederer & Mark, 2002).

Although previous research has not examined the relationships between mental illness and employment patterns in rural areas, several factors may significantly impact this relationship among rural workers. First, rural workers are typically less educated and have lower incomes than their urban counterparts, two factors which may make workers with mental illness more susceptible to unemployment and absenteeism (Alexandre & French, 2001). Second, the nature of the rural economy and labor market may make it more difficult for rural workers with mental health problems to maintain employment. The job market often offers lower wages, fewer job alternatives, and the reduced ability to accommodate the special needs of an employee in distress, due to having a smaller, less diversified job market (Marshall, 2001). Rural workers are more likely to become underemployed and have more difficulty transitioning back into adequate employment than their urban counterparts (Jensen, Findeis, Hsu & Schachter, 1999). Furthermore, in times of economic slowdown, rural labor markets are often the first to feel the effects, resulting in a disproportionate share of job loss in rural areas compared to urban areas (Hamrick, 1997). In this economic climate, rural residents with mental health problems may be more likely than those in urban areas to have difficulty finding and maintaining employment.

Receiving treatment for mental and emotional problems through health care providers and employee assistance programs (EAPs) can improve worker productivity, work and social relationships, and general health status (Smith et al., 2002; Selvik, Stephenson, Plaza & Sugden, 2004). However, rural workers may be less likely to have access to these services. Small employers, which make up approximately three-fourths of all rural firms in 1998, are significantly less likely to offer mental health benefits and EAPs to their employees (Masi et al.,

2004; Hartley, Quam & Lurie, 1994). Of the small employers offering EAPs, the majority use external vendors to provide these services and typically offer a fewer number of services (Masi et al., 2004). In addition, industries found most frequently in rural areas (e.g., mining, agriculture, forestry, fishing) are among the least likely to offer EAP services (Zarkin & Garfinkel, 1994). Furthermore, with or without insurance, rural residents have more difficulty finding a mental health provider and may be less likely to seek these services, due to stigma and fear that their privacy will not be protected (Hoyt, Conger, Valde & Weihs, 1997).

Although the above factors suggest that rural residents may suffer poorer employment outcomes if they have mental health problems than urban residents, this is a hypothesis that has not been tested by prior studies. To address this, we use the National Longitudinal Survey of Youth (NLSY), a nationally representative longitudinal survey conducted by the Bureau of Labor Statistics, to investigate how depressive symptoms affect employment patterns, and the extent to which such effects differ by rural and urban residence.

Knowledge of the extent to which depressive symptoms affect the workforce is important to employers, local development planners, and health service providers so that interventions can be targeted where they are most needed. This is especially important for rural areas because mental health and employment resources are scarcer, making it imperative that they be targeted to their most effective use. Our findings may also help to inform employers about how they may help their employees continue to function productively on the job.

RESEARCH QUESTIONS AND HYPOTHESIS

The purpose of this study is to determine whether or not rural individuals with depressive symptoms have a more difficult time maintaining employment than do urban residents with these symptoms. Specifically, we sought to address the following three research questions:

1. What is the prevalence of depressive symptoms (based on the CES-D 7-item scale) among labor force participants/non-participants and employed/unemployed individuals? What are the rural and urban differences in these prevalence rates?
2. Do depressive symptoms affect the likelihood that an individual will be employed over the course of a year? Are there rural and urban differences, and do these differences persist after controlling for key employment-relevant characteristics?
3. Among those with labor force participation during the year, to what extent do depressive symptoms affect employment levels and patterns (e.g. weeks and hours worked or length of time in current job)? Are there rural and urban differences, and do these differences persist after controlling for key employment-relevant characteristics?

Based on previous research and psychology, sociology and economic theory, we expect that workers with depressive symptoms will be more likely to be unemployed and have longer spells out of work. Given that rural residents have lower incomes, less education and less access to mental health services, we anticipate that rural residents with depressive symptoms will have a greater likelihood of being out of work than their urban and suburban counterparts. Similarly, we would expect rural residents suffering from depressive symptoms to spend fewer hours and weeks on the job over the course of a year. Our hypothesis then is that rural residents with depressive symptoms will have greater likelihood of non-work, and lower overall work levels, than will urban depressed.

METHODS

The National Longitudinal Survey of Youth 79 (NLSY79) is a nationally representative sample of 12,686 young men and women who were 14-22 years old when they were first surveyed in 1979. These individuals were interviewed annually through 1994 and are currently interviewed on a biennial basis.¹ The NLSY79 collects data on employment, education, family/household structure, income, insurance coverage, residence and health status, including measures of mental health. We analyzed data that were collected between 1992 and 2004, although the findings presented below are based on cross-sectional data from 1992. The 1992 survey had the advantage of being a larger sample and permitting more detailed analyses. However, preliminary analyses of later years of data and a pooled sample did not yield appreciably different findings, thus we did not complete the full longitudinal analyses we had originally planned.

The basic model specification will focus on the individual's mental health status and rural or urban residency and the impact on the individual's employment.

$$\text{EMPLOYMENT} = \beta_0 + \beta_1\text{DEP} + \beta_2\text{RURAL} + \beta_3\text{RURAL}*\text{DEP} + \mathbf{\beta X} + \mathbf{\beta Z} + \varepsilon$$

where

DEP = 1 if the person scores above a certain level on the CES-D

RURAL = 1 for rural residents and 0 otherwise

X = vector of control variables measuring individual and family-level characteristics, including sex, educational level, marital status, presence of a preschool aged child, health insurance status.

¹ The survey is sponsored by the Bureau of Labor Statistics at the U.S. Department of Labor and is conducted under contract with the Center for Human Resource Research at the Ohio State University and the National Opinion Research Center at the University of Chicago.

Z = a vector of regional dummy variables intended to control for regional labor market differences.

To investigate whether rural residents with depression or near depression have a more difficult time maintaining employment, interactions between mental health variables and the rural dummy variable (DEP*RURAL) are tested. Interaction effects arise when the relationship between the dependent variable (EMPLOYMENT) and an independent variable (DEP) is moderated by a third variable, in this case RURAL. The coefficient for the interaction term (β_3) estimates the extent to which the effect of being depressed differs for rural and non-rural residents.

For our hypothesis to be confirmed we would have to find significant negative relationships between EMPLOYMENT and DEP and EMPLOYMENT and DEP*RURAL. A negative relationship between the variable measuring depression and the dependent employment variables could be interpreted to mean that depression interferes with a person's ability to maintain employment and a negative relationship between the interaction term (DEP*RURAL) and EMPLOYMENT would suggest that rural residents who are depressed have an even harder time maintaining employment compared to urban residents who are also depressed.

However, a negative relationship between EMPLOYMENT and DEP could also reflect the presence of endogeneity caused by a reverse relationship between employment and depression. Rather than depression causing a decline in employment, a decline in employment is causing depression. In this case, the presence of endogeneity would inflate the estimated effect of depression on employment.² On the other hand, a positive relationship between employment and depression could also reflect an endogenous relationship, if high levels of work caused a person

² The effect of DEP is inflated because it is capturing both the negative effect that depression has on employment and the relationship between DEP and the error term caused by the reciprocal relationship between EMP and DEP.

to become depressed. This would cause the estimated effect of depression on employment to be biased downward.

Dependent Variables

Our specific measures of employment include: annual weeks worked, annual hours worked, annual weeks out of the labor force, job tenure (number of weeks with current employer), and whether a person was unemployed for the whole year.

The annual labor force status measures are summary variables created by the Bureau of Labor Statistics (BLS) based on arrays of weekly work participation in the prior calendar year. These summary variables include all jobs reported by a respondent in the prior year; thus, individuals working multiple part-time jobs will have the hours from each job included in their total hours worked for the year. These indicators provide us with the most comprehensive view of work activity across a year. For the job tenure indicator (the number of weeks continuously worked for the same employer, not necessarily in the same position) we again relied on a summary indicator created by the BLS for workers' current employers. When an individual has more than one employer, the one for whom s/he works most is used; when hours are the same, it is the employer for whom s/he has worked longest. To correct for likely coding error and skewing, we top-coded annual hours worked at 5000 and job tenure at 1000 weeks.

Explanatory Variables/Controls

The explanatory variables of primary interest in this paper are those that indicate whether a person is experiencing depressive symptoms and whether the person is an urban or rural resident. Variables measuring individual characteristics (education, race, sex, and age), marital status, presence of a preschool aged child, health insurance status, and region are included in multivariate models as controls.

Mental Health/Depression

The presence or absence of depressive symptoms is based on a short form (7-item) Center for Epidemiological Studies Depression Scale (CES-D). The full NLSY sample received the CES-D in 1992 and 1994 while in later years these questions were assigned only to respondents participating in the age 40 health module. While longer versions of the CES-D were administered in some of these years, we limited our analyses to the 7 items common across all years to ensure comparability.³ In the full CES-D (20 questions) a score of 16 is the cutoff for likely depression (accounting for about 20% of the NLSY population when measured). Because we are interested in both the likely clinically depressed, as well as those just below clinical levels, we classified those with CES-D scores in the upper quartile (CES-D scores of 6 or greater on the 7 question instrument) as having “depressive symptoms.” Throughout this paper we use the phrases “depressed” and “having depressive symptoms” somewhat interchangeably; although we recognize that the latter is more precise as we are talking about symptoms rather than clinical diagnoses.

Rural/Urban Residence

The NLSY-79 also contains information on each respondent’s state, county, and metropolitan area of residence for all rounds.⁴ Given the differences in health status, employment opportunities and provider supply for different levels of rurality, we had intended to use county-identifiers to link the NLSY to urban-influence codes and explore a more nuanced

³ The full CES-D instrument consists of 20 items asking about the person’s mental state over the past week on a four point likert scale. In 1992, the full 20-item scale was used; in years 1994, 1998 and 2000 a reduced set of 7 items from the 20 item CES-D instrument was used. As reported by Dooley, Prause, and Ham-Rowbottom (2000) the abbreviated 7-item scale has been widely used and the 1992 20-item measures correlate well ($r=0.90$) with 7-item scale used in subsequent years.

⁴ To access this “Geocode” data file, researchers must fill out a brief application explaining the nature of their proposed study and sign an affidavit to ensure data confidentiality.

view of rural depression and employment. However, the sample size of rural residents was too small to permit this more detailed analysis. Instead, we used the dichotomous Office of Management and Budget's designation of urban as those counties containing a Metropolitan Statistical Area (MSA), and rural as non-MSA counties. Although this is not ideal for understanding within rural differences, it is the only option given data limitations.

Individual and Family Characteristics

While the NLSY collects categorical information on family income (relative to the poverty line), we use instead education level as a proxy for family income because income and employment covariates will be too highly correlated. Level of education is generally a strong indicator of economic status but unlike income is unlikely to be affected by hours of work, at least in the short term (Moffitt and Cherlin, 2002). In the empirical analysis, the variables for education will be LOWEDUC, set equal to 1 if the individual has less than a high school diploma and zero otherwise, and COLLEGE, set equal to 1 if the individual has a four year college degree or more and 0 otherwise. Models will also include controls for the individual's marital status (MARRIED coded 1 if the person is married; 0 otherwise), and the presence of a child younger than 6 years (YOUNGKID).

Health Insurance Coverage

Whether a person has health insurance is likely to impact their ability to maintain employment in the face of depression. Those with insurance may be able to access mental health care more readily than those without. This may help them to maintain their employment. Rural residents are somewhat less likely to be covered by insurance. This variable is included as a control to see if there are additional rural effects beyond differences in health insurance coverage (i.e., are there fewer mental health care providers in rural areas).

Regional Controls

Regional dummy variables are included to control for differences in regional labor markets and the supply of mental health professionals, including safety net providers. We used the modified census region coding available in the NLSY geocoded data set to identify whether a respondent lived in a Northeast, North Central, South or West region of the country at the time of their depression screening.

ANALYSIS

Descriptive Results

We begin our analysis using a cross-sectional sample. Because the 1992 cross-section produces the largest overall sample and thus a larger rural sub-sample, we begin our analysis using data collected during that year. In 1992 the sample ranges in age from 27 to 35 years.

The characteristics of the rural and urban NLSY respondents in our final analytic sample differed in anticipated ways (see Table 1). For example, rural residents have lower levels of formal education, are more likely to be married, are less likely to belong to a racial or ethnic minority group, and are more likely to be uninsured.

As noted in our methods section, we categorize rural and urban residents' depression status based on the 7-question short form of the CES-D. Based on a 1992 cross-section, there are only minor differences in rates of depression (Table 2). There is no significant difference in the rate of depression when we use the more stringent measure (upper decile) and only small and marginally significant differences when we use the more expanded measure of depression (upper quartile). Using the more expanded definition of depression, we find that the rural sample is

slightly more likely to be depressed than the urban sample, 32 percent compared to 29 percent, respectively.

Table 1 Cross-Sectional (1992) Rural and Urban Sample Characteristics

CHARACTERISTIC	Total	Urban	Rural(All)
N =	8,696	7,292	1,404
Region***			
Northeast	17.1	19.4	5.1
North Central	23.5	21.9	32.2
South	38.7	35.7	54.1
West	20.7	23.0	8.6
Marital Status***			
Not married, no spouse	47.2	48.3	41.0
Married, spouse present	52.9	51.7	59.1
Has Preschool-aged Child?			
Yes	38.7	38.4	40.0
No	61.3	61.6	60.0
Education***			
Less than HS	15.3	14.5	19.2
HS / GED	43.4	41.7	52.3
College	41.3	43.8	28.6
Sex			
Male	49.0	48.7	50.4
Female	51.1	51.3	49.6
Race/Ethnicity***			
Hispanic	19.5	21.6	8.4
Black	29.9	30.5	26.8
Not Black, Not Hispanic	50.7	48.0	64.8
Insurance Status ***			
Insured	78.2	78.9	75.0
Uninsured	21.8	21.2	25.0
Age			
Mean Age at Depression Screen	30.9	30.9	30.9

NOTE: Data on sample characteristics measured at the 1992 interview. *Chi square test of independence between characteristic and rural-urban residence is significant at the $p < .05$ level. ** $p < .01$; *** $p < .001$ (NOTE: T-test used to compare difference in mean age)

Table 2 Rural-Urban Scores for Depression Based on CES-D (7-Item Short Form, 1992)

	Total	Urban	Rural(All)
N =	8,696	7,292	1,404
Mean CES-D Score	4.2	4.2	4.3
Upper Decile of Depressive Symptoms	13.8	13.6	15.0
Upper Quartile of Depressive Symptoms*	29.8	29.4	31.8

NOTE: Data on sample CES-D scores measured at the 1992 interview

*Chi square test of independence between characteristic and rural-urban residence is significant at the $p < .05$ level.

Bivariate Analysis

In order to test the hypothesis that rural residents face even greater difficulty maintaining employment in the face of poorer mental health compared to urban residents we begin by comparing work levels among four groups: urban residents who are not depressed, urban residents who are depressed, rural residents who are not depressed and rural residents who are depressed. To confirm our hypothesis we would need to find that the difference in employment levels for rural depressed groups versus rural non-depressed would be greater than the difference between urban depressed/non-depressed. Larger differences in employment levels between depressed and not depressed rural residents relative to differences in employment levels between depressed and not depressed urban residents may be evidence of aggravating effect of rural residency on employment among the depressed or near depressed above and beyond endogenous effects.⁵

Table 3 Bivariate Rural-Urban Differences in Employment History, by Depressive Symptoms (1992)

Employment Measure (Means)	Urban		Rural	
	Not Depressed (n = 5,148)	Depressed (n = 2,144)	Not Depressed (n = 958)	Depressed (n = 446)
Annual Weeks Worked in Past Year ^{a***}	46.3	42.7	45.7	42.3
Annual Hours Worked in Past Year ^{a***}	1973.0	1781.6	1955.9	1793.5
Annual Weeks OLF in Past Year ^{a***}	3.5	5.5	3.3	5.6
Weeks in Current Job ^{b***}	208.9	173.3	217.4	178.0
Percent Not Working in Past Year ^c	10.5	19.6	11.3	23.0

^aExcluding those with zero weeks worked. ^bExcluding those with zero weeks in a current main job. ***p ≤ .001 by ANOVA. ^cp. ≤ .001 based on chi-square test.

Table 3 shows that, as expected, individuals with depressive symptoms work less than individuals who are not depressed. As explained above, this finding is consistent with depression leading to lower levels of work as well as an endogenous relationship between the two variables

⁵ By comparing the difference in work levels between depressed and not depressed for urban and rural residents separately we are also indirectly controlling for differences in labor market conditions between rural and urban areas. If we simply compared differences in work between urban and rural depressed and urban and rural not depressed we would be confounding work declines related to depression with work declines related to differences in urban/rural labor market conditions.

whereby involuntary under-employment or unemployment leads to depression. We also see that among the non-depressed, rural residents work at slightly lower levels than urban residents but remain in their jobs longer. This probably reflects different local labor market conditions.

However, in terms of refuting or supporting the hypothesis that rural depressed will have a harder time maintaining employment compared to urban depressed, the bivariate results are mixed. The declines in work levels (as measured by the difference in work levels between the depressed and not depressed) are about the same for urban and rural residents when measured in terms of annual weeks worked (3.6 week difference for urban and 3.4 week difference for rural). In addition, among those who worked at all during the previous year (annual weeks worked > 0) there is little difference between urban and rural residents in the average number of weeks spent out of the labor force when comparing the depressed and non-depressed (2.0 week difference for urban and 2.3 week difference for rural). And when employment outcomes are measured in terms of job duration, the difference in the average number of weeks in current job between urban depressed and not depressed is 35.6 weeks (the non-depressed have been in their jobs an average of 208.9 weeks and the depressed have been in their jobs for an average of 173.3 weeks) compared to a difference of 39.4 weeks for rural residents (217.4 weeks minus 178.0 weeks). These results suggest that there is no additional difficulty faced by rural residents who are depressed.

Surprisingly, when employment is measured in terms of annual hours worked we find slightly smaller declines in employment among the rural depressed: there is a 191.4 hour difference (1973.0-1781.6) in the average number of hours worked when comparing depressed and non-depressed urban residents and a 162.4 hour difference (1955.9-1793.5) between rural

depressed and non-depressed. This suggests that rural residents who are depressed might be slightly less likely to reduce their hours compared to urban residents who are depressed.

When employment is measured in terms of percent not working at all during the previous year, the decline in work by depressed individuals is slightly greater for rural residents compared to urban residents. For example, there is a 9.1 percent difference in the likelihood of being out of the labor force completely for the whole year among urban depressed and non-depressed compared to an 11.7 percentage difference between rural depressed and non-depressed. While the difference is very small it is also consistent with the hypothesis that rural residents who are depressed have an even harder time maintaining employment than do the urban depressed, or may have a harder time re-entering the workforce if their depression has caused them to leave it.

Multivariate Analysis

We estimate regression models to test whether a rural effect is present after we control for other factors that affect employment levels. All multivariate analyses used weighted data to address for the NLSY sample design and clustering, along with question non-response. Test statistics were calculated using the Taylor series linearization approach in SAS to ensure that all standard errors were corrected for the NLSY complex sample design.⁶

Logistic regression was used to examine the effects of rural residency and depression on whether a person was in the workforce at all during the prior year. We use ordinary least squares to examine the effects of rural residency and depression on continuous measures of employment (annual weeks worked, annual hours worked, number of weeks in current job, number of weeks

⁶ The survey features now available in SAS, based on Taylor series linearization, have been compared to SUDAAN and found to produce identical parameter and test statistic estimates. See: <http://www2.sas.com/proceedings/forum2007/133-2007.pdf>

out of the labor force). The sample used in the OLS model included only those with non-zero weeks worked.⁷

Interaction terms between the rural dummy variable and mental health variables were included to test whether rural residents who are depressed have an even harder time maintaining employment. We also include controls for other factors known to affect employment outcomes including: marital status, presence of a preschool aged child in the household, race, gender, and education.⁸ We also include regional dummies as controls for labor market and other conditions and a variable flagging the person's health insurance status. Overall, the cross sectional regression results indicate that depressed rural residents are having no more difficulty maintaining employment than are the urban depressed.

Table 4 displays the results from logistic regression models. Tables 5, 6 and 7 display linear regression results using continuous employment outcomes measures annual weeks worked, annual hours worked and number of weeks in current job. In all cases the interaction term is not statistically significant.

⁷ Small rural samples did not permit us to simultaneously examine labor force participation and employment levels using two stage Heckman models.

⁸ We did not control for age explicitly in the cross-sectional analysis because there is very little variation in age in the NLSY because it is based on a cohort sample design with little variation in the age of the cohort.

Table 4: Logistic Regression Models Predicting Employment Status (Dependent variable NOWORK)

variables	Model 1				Model 2			
	estimate	Std error	Wald Chi Sq	Pr>Chi sq	estimate	Std error	Wald Chi Sq	Pr>Chi sq
Depressed	0.6366	0.0757	70.7280	0.0001	0.4073	0.0849	22.9999	0.0001
Rural	-0.00188	0.1601	0.0001	0.9906	0.0577	0.1776	0.1055	0.7453
Depressed*Rural	0.1688	0.2034	0.6891	0.4065	0.1252	0.2098	0.3561	0.5507
Youngkid					0.7624	0.0959	63.1730	0.0001
HS Diploma					-1.1444	0.0975	137.6929	0.0001
Married					-0.2196	0.1054	4.3435	0.0372
North Central					0.1514	0.1541	0.9652	0.3259
South					-0.1175	0.1327	0.7840	0.3759
West					0.1247	0.1469	0.7204	0.3960
Female					1.4145	0.0969	212.9069	0.0001
Minority					0.4874	0.0875	31.0278	0.0001
Insured					-0.3089	0.1022	9.1366	0.0025

Table 5: Linear Regression Models Predicting Employment Status (Dependent variable Annual Weeks Worked)

variables	Model 1				Model 2			
	estimate	Std error	T value	Pr>T	estimate	Std error	T value	Pr>T
Depressed	-5.0131323	0.55812170	-8.98	0.0001	-2.9755132	0.57080464	-5.21	0.0001
Rural	0.3026238	0.82314636	0.37	0.7135	0.1072564	0.79418315	0.14	0.8927
Depressed*Rural	-1.1717254	1.33941055	-0.87	0.3826	-0.9783864	1.24913682	-0.78	0.4343
Youngkid					-5.0909668	0.53944965	-9.44	0.0001
HS Diploma					7.9244606	0.78751078	10.06	0.0001
Married					2.0172261	0.54258336	3.72	0.0003
North Central					-0.0398660	0.84875938	-0.05	0.9626
South					1.3286170	0.73704096	1.80	0.0727
West					-0.1948839	0.85553903	-0.23	0.8200
Female					-6.9231375	0.45451693	-15.23	0.0001
Minority					-4.1323553	0.50945159	-8.11	0.0001
Insured					5.6682819	0.60454932	9.38	0.0001

Table 6: Linear Regression Models Predicting Employment Status (Dependent variable Annual Hours Worked)

variables	Model 1				Model 2			
	estimate	Std error	T value	Pr>T	estimate	Std error	T value	Pr>T
Depressed	-258.57720	29.9176922	-8.64	0.0001	-134.44323	30.5196266	-4.41	0.0001
Rural	-42.72628	47.0885159	0.91	0.3652	16.95522	44.1925856	0.38	0.7016
Depressed*Rural	-35.32334	66.1740925	-0.53	0.5940	-18.34589	61.4451718	-0.30	0.7655
Youngkid					-231.6690	26.7203763	-8.67	0.0001
HS Diploma					351.13041	37.9203823	9.26	0.0001
Married					71.96404	24.8130957	2.90	0.0041
North Central					38.61063	43.7882471	0.88	0.3788
South					102.27132	41.6655198	2.45	0.0148
West					2.49801	44.9609434	0.06	0.9557
Female					-579.89367	24.9339599	-23.26	0.0001
Minority					-204.18925	26.5892570	-7.68	0.0001
Insured					298.59002	32.1446448	9.29	0.0001

Table 7: Linear Regression Models Predicting Employment Status (Dependent variable Number of Consecutive Weeks in Current Job)

variables	Model 1				Model 2			
	estimate	Std error	T value	Pr>T	estimate	Std error	T value	Pr>T
Depressed	-32.204069	5.3990961	-5.96	0.0001	-13.596488	5.5376123	-2.46	0.0148
Rural	7.404007	11.0544940	0.67	0.5037	7.483752	10.0780212	0.74	0.4585
Depressed*Rural	13.309891	15.9786008	0.83	0.4057	15.727210	16.2487859	0.97	0.3341
Youngkid					9.133298	6.2828490	1.45	0.1474
HS Diploma					29.131338	6.6251489	4.40	0.0001
Married					30.922311	6.8664216	4.50	0.0001
North Central					-5.986600	11.1852467	-0.54	0.5930
South					-20.125184	8.628166	-2.33	0.0205
West					-30.513537	8.651567	-3.44	0.0007
Female					-29.714461	5.3668900	-5.54	0.0001
Minority					-12.968583	5.0901897	-2.55	0.0115
Insured					105.925343	6.5557098	16.16	0.0001

LIMITATIONS

While the bivariate analyses of the 1992 cross-sectional sample provides some (albeit weak) evidence that rural residents who are depressed may be having a harder time than urban depressed in maintaining employment (at least in terms of labor force participation rates), the

regression analysis of cross sectional samples provides no support for our hypothesis. This suggests that once other factors are controlled for, the rural depressed are, in fact, not having a more difficult time maintaining employment. While the analyses could be confounded by unobserved factors, small rural sub-samples, and endogeneity, our ability to control for such factors is limited by sample size and by our lack of a theoretical or empirical footing on which to base hypotheses about such factors. Moreover, since endogeneity would likely lead to exaggeration of the negative relationship between depression and employment, our lack of significant findings without controlling for endogeneity through an instrumental or lagged variable suggests that such an analysis would only confirm our non-significant findings. In addition, this study is limited by the fact that we were unable to compare the experiences of individuals from different gradations of rural residence (e.g. adjacent to or non-adjacent to rural areas or small rural versus big rural). Although this had been the original intent of the study, we found ourselves hampered by a small and potentially unrepresentative rural sample.

DISCUSSION AND POLICY IMPLICATIONS

While we did not find a significant rural effect in this analysis, the effect of depression on employment, whether measured as hours or weeks worked, or as simply being unemployed, is amply confirmed. Certainly rural residents suffer no less than their urban counterparts from the multiple effects of depression on their ability to function in life's essential roles. That rural residents are as able as their urban counterparts to hold on to their jobs and bring home a paycheck says little about their productivity on the job, or, more importantly, about the suffering that may accompany such survival. Research has demonstrated that rural residents who are depressed have poorer access to mental health services and poorer outcomes when they receive

such services. The results of these disparities, and suggested policy remedies have been discussed elsewhere in the literature of rural mental health (e.g. Hartley et al., 1999, Rost et al., 2002). Questions remain, however, about access to employee assistance programs, productivity on the job, and the survival or coping strategies of rural workers with depressive symptoms.

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