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EXAMINING THE EFFECTS OF A USUAL SOURCE OF CARE ON DISPARITIES AMONG EMPLOYED U.S. ADULTS WHO MISS WORK DUE TO ILLNESS

TIANA LUKAS
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Reviewed and approved* by the following:

Patricia Miranda
Assistant Professor of Health Policy and Administration and Demography
Thesis Supervisor

Rhonda BeLue
Associate Professor of Health Policy and Administration
Honors Adviser

* Signatures are on file in the Schreyer Honors College.

ABSTRACT

The role of a usual source of care (USC) in the understanding of health disparities is important because approximately 18.5% of U.S. adults from 2006-2007 did not rely on a USC, which is more than a 2% increase within five years. The purpose of this study is to examine the relationship between a USC and the outcome of interest, missed workdays. Employed U.S. adults age 18-85 from the 2008 Medical Expenditures Panel Survey were examined. The outcome variable is specified as the number of missed workdays due to illness. The main effect was a USC, defined as whether someone has a healthcare facility to visit for health issues. A zero-inflated negative binomial regression model was used to account for the large number of zero responses for missed workdays. Approximately 73% of the 9,101 respondents had a USC. The average number of missed workdays among those with a USC was 4.6 days compared to 3.9 days for the overall sample. Those with a USC have 60% lower odds of never missing work ($P < 0.01$) and 1.41 times the expected number of missed workdays ($P < 0.01$) compared to those without a USC. Those with a USC have lower odds of being someone who never misses work, as well as an increased expected number of missed workdays, compared to those without a USC. A USC is a main component of a medical home model, and focusing efforts on a USC for those who can benefit most from health reform or need preventive services can build on the successes of a medical home. As health reform provisions increase access to care and preventive services, the increased expected number of missed workdays shown in the findings could balance in the future with effective prevention efforts to reduce illness.

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INTRODUCTION

One of the factors that can explain health disparities in America is a "usual source of care," which is commonly used in national health surveys (Viera, Pathman, & Garret, 2006). In terms of access, a usual source of care can be defined as "a particular doctor's office, clinic, health center, or other place one goes to if one is sick or needs advice about health" (Viera et al., 2006, p. 360). Focusing on a usual source of care to understand health disparities is important because, according to the Centers for Disease Control and Prevention [CDC], approximately 18.5% of U.S. adults did not rely on a usual source of care from 2006 to 2007, which is more than a 2% increase within five years (CDC, 2009). Furthermore, a primary or usual source of health care's goal is to increase patient care "effectiveness, efficiency, and equitability" (Starfield & Shi, 2004, p. 1493). Those with a usual source of care are more likely to receive preventive services and be able to access care, unlike those without a usual source of care who face many barriers to access when in need of healthcare services (Robert Graham Center, 2007).

Because of the known importance of a usual source of care, this study focuses on associations among population differences and absence of work due to illness or injury to determine if having a usual source of care explains any of these associations or potential health disparities. Previous studies suggest that policymakers looking to increase access to a usual source of care should target vulnerable populations, such as racial and ethnic minorities like Hispanics who have low insurance rates (HHS, 2011), as well as those without a high school education (DeVoe, Fryer, Phillips, & Green, 2003).

Two theories suggest the impact of individual demographics on health disparities. Intersectionality theory realizes the role of demographics and their interactions with one another when examining health disparities. Race, gender, and class interact because they are social

relationships that contribute to various health disparities (Caldwell, Guthrie, & Jackson, 2006). As described in the Behavioral Model of Health Services Use (1995), demographics and social structure can predispose members of society to have limited access to resources, which would then affect societal use of health services. Understanding the predisposing characteristics and enabling resources of patients will help identify the roles of such characteristics and resources in health disparities.

The purpose of this study is to identify any health disparities in terms of missing work due to illness and if such disparities exist, to determine whether they can be explained by a usual source of care. As part of a national commitment to reduce health disparities, the National Institutes of Health has developed a National Center on Minority Health and Health Disparities (Weber & Parra-Medina, 2003). While better understanding health disparities is important, this knowledge could play a large role in better understanding those adults who miss work because they are ill. If employees are legitimately ill and missing work, such a loss of productivity could negatively affect employers. The 2010 Patient Protection and Affordable Care Act will encourage patients' use of a usual source of care, of which the presence leads to more preventive services and timely treatment of health problems (Kaiser Family Foundation [KFF], 2011), so understanding a usual source of care's role in employees' missing work due to illness could be a revolutionary benefit to employers. Weber and Parra-Medina (2003) note that maintaining a healthy workforce necessitates addressing health disparities. Analyzing what affects health disparities has the potential to positively improve the American workforce. The widely adopted patient-centered medical home model encompasses the usual source of care component as the most influential part of this model's delivery of care (Robert Graham Center, 2007). Better understanding a usual source of care has the potential to greatly impact the entire population, especially because of the role a usual source of care plays in preventive services utilization.

BACKGROUND

Several sociodemographic groups show differences in the availability of a usual source of health care. Black, Hispanic and Asian adults are less likely to have a usual source of care compared to white adults (Mead, Cartwright-Smith, Jones, Ramos, & Siegel, 2008). Racial minorities are also less likely to visit a primary care physician; furthermore, Hispanics have nearly twice the likelihood than white adults of having no regular doctor (Collins, Hall, & Neuhaus, 1999) and have the highest rates of being uninsured (30.7%) among all racial and ethnic groups in 2010 (U.S. Department of Health and Human Services [HHS], 2011). While race acts as a predisposing factor for effects on access to care, in addition to sociodemographics (Andersen, 1995), racial disparities remain paramount in examining access to care changes over time (Phillips, Mayer, & Aday, 2000).

White older adult patients are more likely to utilize a doctor's office as their usual source of health care than older adult minorities (Collins et al., 1999). For more than a decade, the age group of 18 to 24 has consistently held the highest rates of not having usual sources of care; furthermore, during 2006-2007, males had a higher percentage of having a usual source of care (23.9%) compared to females (13.3%), which followed a similar trend over the previous 10 years (CDC, 2009). Also, females who reported having a primary source of health care in 2008 differed among various races and ethnicities (HHS, 2010).

Fifty-three percent of uninsured U.S. adults do not have a usual source of care, and those who are below 100% of the federal poverty level are more likely to not have a usual place to receive health care (CDC, 2009). Insured adults are more likely to have a usual source of care than the uninsured (DeVoe, Tillotson, Lesko, Wallace, & Angier, 2011), and of the insured, those with private insurance are more likely to have a usual source of care than recipients of medical

assistance (CDC, 2009). Educational level and employment have been influential factors for the connection between race or ethnicity and the consumption of healthcare services (Corbie-Smith, Flagg, Doyle, & O'Brien, 2002).

In addition to demographics and socio-demographics, chronic diseases have been associated with a usual source of care. Patients suffering from chronic illnesses or mental disorders rely strongly on a physician whom they visit regularly (DeVoe et al., 2002; Stange et al., 1998). Additionally, hypertension, a major risk factor for chronic diseases such as stroke and coronary heart disease, was better managed in patients who had a regular source of care (He et al., 2002). Investigating demographics and their associations with a usual source of care should encompass several types of chronic diseases because a minimal racial disparity exists in health care access among certain diseases (Harris, 2001).

Abundant research illustrates the role that a usual source of care plays in determining health disparities as described above, but some of these characteristics also have an association with the outcome variable, missing work due to illness. Research has shown that women had higher absence rates from work than men, with illness being one reported factor (Vistnes, 1997; Rhoades, 2010). In 2007, those with private health insurance had the highest rate of missing work due to illness (36.5%), while the uninsured had the lowest rate (26.2%). Also, individuals age 16-24 had the lowest number of workdays missed due to illness, injury, or mental or emotional problems compared to other age groups (Rhoades, 2010).

Current smokers have significantly higher absence rates from work than non-smokers (Halpern, Shikiar, Rents & Khan, 2001), and patients with depressive symptoms reported missing five times more work than their non-depressed counterparts (Simon et al., 2000). Diabetic patients who suffered from macrovascular comorbid conditions (MVCCs) missed more days of work than those without MVCCs in consideration of various socio-demographics (Fu, Qiu, Radican & Wells, 2009). Also, chronically ill patients have been shown to perform poorly at

work and are more likely to miss work, which reduces the labor supply and negatively affects the gross domestic product (DeVol & Bedroussian, 2007). Although limited research examines the characteristics of those who miss work due to illness, this study did not uncover any literature discussing the role a usual source of care has on those who are absent from work. Therefore, this study will examine the role of a usual source of care in explaining disparities when predicting illness-related absences from work.

METHODS

Study Population

This study used data from the 2008 Medical Expenditures Panel Survey (MEPS) Household Component (HC). Derived from the Agency for Healthcare Research and Quality database, MEPS is a nationally representative survey that displays information on U.S. families' and individuals' healthcare consumption. The HC is one of the two major components of MEPS and comes from a nationally representative subsample of participants in the prior year's National Health Interview Survey from the National Center for Health Statistics (HHS, 2009). Information collected through household interviews includes demographic characteristics, health conditions/status, utilization of medical services, charges and sources of payments, health insurance status, income, employment status, access to healthcare, and satisfaction with care. The survey involves five rounds of interviews that are illustrative of two calendar years. Survey questions are repeated during several rounds, and responses refer to the specific rounds (HHS, 2009). More information on MEPS is available on the Agency for Healthcare Research and Quality website: www.meps.ahrq.gov.

Measures

Participant Sample

Respondents in the sample were adults age 18-85 who were classified as being employed. Employment was determined by responding “currently employed”, “has a job to return to”, or “employed during the reference period” when asked of current employment status. A respondent was considered employed if he or she had one of the previously listed answers to employment status during any of the rounds of interviewing over the two calendar years. The sample size of this study was 9,101 respondents.

Exposure Status

Respondents who responded “yes” to whether they usually visited a particular doctor’s office, clinic, health center, or other place if they were sick or needed advice about health issues were classified as having a usual source of care (USC). This variable was used as a proxy measure for a USC.

Outcome of Interest

Days missed from work was identified from the Disability Days section of the questionnaire about the number of times the respondent lost a half-day or more from work due to illness, injury, or mental or emotional problems during the three rounds of interviewing (range 0-284). For brevity, the outcome is further referred to as “workdays missed.” The large number of relevant zeros for workdays missed influenced the analysis model chosen. For further information, refer to the description in Appendix A.

Demographics

Participant demographic characteristics included age (continuous), gender (male as referent), participant race or Hispanic ethnicity, insurance status, annual household income, and education level. Self-reported races included non-Hispanic white (referent), non-Hispanic black, non-Hispanic Asian, and Hispanic ethnicity. Insurance status was divided into three categories: private (referent), public, or no insurance. Annual household income was based on percentages relative to federal poverty thresholds and was split into five levels: <100% (referent), 100-124%, 125-199%, 200-399%, and ≥400% (Tarraf et al., 2012). Education level was broken into three categories based on the highest degree earned: less than high school (referent); high school or GED; and college or more (Tarraf et al., 2012).

Chronic Disease Presence

The chronic disease count ranged from 0-7 and was determined by the number of "yes" responses to a diagnosis of 6 individual chronic diseases (high blood pressure, heart disease, stroke, cancer, diabetes, asthma), and presence of non-specific serious psychological distress, determined by a score of 10 or greater of the six variables from the Kessler Index (CDC, 2011). The chronic disease variable was then dichotomized the count of chronic diseases as either having "zero" (referent) or "one or more" chronic diseases.

Smoking Status

Respondents were classified as smokers if they responded "yes" that they currently smoke (non-smoker is referent).

Data Analysis

In order to account for the large number of zero responses and still be able to make inferences about the confounding variables, the study used a zero-inflated negative binomial regression model to determine the effect of a usual source of care on the number of workdays missed.

The zero-inflated negative binomial regression (ZINB) accounts for the excess number of zero responses for the outcome of workdays missed (Institute for Digital Research and Education, n.d.) and aids in understanding the source of the zeros. The zero-inflated or logistic aspect of the model recognizes the significance of the zeros, and the negative binomial regression aspect "includes a random component reflecting the uncertainty about the true rates at which events occur for individual cases" (Gardner, Mulvey, & Shaw, 1995, p. 399). The ZINB sheds light on the differences in those who happen by chance to have a response of zero and those who would most definitely have a response of zero , also classified as a "certain zero" (Institute for Digital Research and Education, n.d.).

Two models are run separately and then combined in the ZINB model. First, the logistic part of the model predicts whether an employee would miss zero workdays, also known as having the probability of being a "certain zero." The negative binomial part of the model then predicts the number of workdays missed for those who are not "certain zeros" or those who would miss work (Statistical Consulting Group, n.d.). For interpretation purposes, the regression coefficients and confidence intervals presented in the ZINB output are calculated with the exponential function in Excel to retrieve odds ratios and expected number of workdays for the tables in the Results section. Person-level weighting was used for analysis.

RESULTS

Table 1 displays the percentages of respondents overall and by usual source of care status for each of the variables of interest as described above (N = 9,101). Due to the weighted sample, proportions were calculated and converted to percentages. Age ranged from 18 to 85 years. Gender was 53.7% male (4,887 respondents) and 46.3% female (4,214 respondents). Approximately 60% of the sample population had zero chronic diseases and 40% had one or more. Over 20% of the sample were current smokers. Approximately 73% of participants identified themselves with having a USC. The sample contains a majority of white respondents and those who have a high school education or more.

The average number of workdays missed is 3.9 days for the overall sample, 2.3 days for those with no usual source of care, and 4.6 days for those with a usual source of care. An independent group t-test was run to determine any significant difference among usual source of care statuses. Statistically significant differences occurred between all covariates ($p = 0.00$): Among those with a usual source of care (Table 1, column 3), a higher percentage have private insurance, a higher education level, and a more equal distribution between those with zero or one or more chronic diseases in comparison to those without a usual source of care (column 2).

No substantive difference in zero-inflated negative binomial regression results occurred between unweighted and weighted data; therefore, weighted results are shown in Tables 2 and 3 and the unweighted results are displayed in Appendix A for reference. The results of the zero-inflated negative binomial regression are presented in two tables to separate the logistic and negative binomial portions of the regression model.

Table 1. Descriptive Statistics of employed[a] U.S. adults age 18-85 (weighted)

	Overall	No Usual Source of Care	With a Usual Source of Care
N	9,101	6,665	2,436
Workdays missed (mean)	3.9 (0.14)	2.3 (0.18)	4.6 (0.18)
Age (mean)*	42.3 (0.15)	37.1 (0.25)	44.2 (0.17)
Race (%)*			
White	73.4 (0.01)	62.0 (0.01)	77.6 (0.01)
Black	11.2 (0.00)	12.2 (0.01)	10.8 (0.00)
Asian	0.5 (0.00)	0.3 (0.00)	0.6 (0.00)
Hispanic	14.9 (0.00)	25.5 (0.01)	11.0 (0.00)
Sex (%)*			
Male	53.8 (0.01)	66.3 (0.01)	49.2 (0.01)
Female	46.3 (0.01)	33.7 (0.01)	50.8 (0.01)
Insurance Status (%)*			
Private Insurance	79.9 (0.01)	61.5 (0.01)	86.6 (0.01)
Public Insurance	4.7 (0.00)	4.3 (0.00)	4.9 (0.00)
Uninsured	15.4 (0.00)	34.3 (0.01)	8.5 (0.00)
Family Income[b] (%) *			
<100%	5.6 (0.00)	10.1 (0.01)	4.0 (0.00)
100-124%	3.0 (0.00)	5.1 (0.00)	2.2 (0.00)
125-199%	11.1 (0.00)	15.3 (0.01)	9.6 (0.00)
200-399%	32.3 (0.00)	34.9 (0.01)	31.3 (0.01)
≥400%	48.0 (0.01)	34.6 (0.01)	52.9 (0.01)
Education (%)*			
Less than High School	11.0 (0.00)	18.9 (0.01)	8.1 (0.00)
High School or GED	55.1 (0.01)	56.5 (0.01)	54.6 (0.01)
College or More	34.0 (0.01)	24.6 (0.01)	37.3 (0.01)
# of Chronic Diseases (%)*			
Zero	60.2 (0.01)	74.9 (0.01)	54.9 (0.01)
One or more	39.8 (0.01)	25.2 (0.01)	45.2 (0.01)
Smoking Status (%)*			
Smoker	21.3 (0.01)	26.6 (0.01)	19.4 (0.01)
Non-smoker	78.7 (0.01)	73.4 (0.01)	80.6 (0.01)
Usual Source of Care (%)			
Yes	26.8 (0.01)	--	--
No	73.2 (0.01)	--	--

Data source: MEPS (2008) Household Component; Standard Error listed in parentheses; [a] Employment status based on if respondent was ever employed or had a job to return to during sampling; [b] Relative to federal poverty thresholds; * Significant differences among usual source of care statuses according to t-test (p = 0.00)

Table 2. Logistic portion of ZINB regression for employed U.S. adults

	Expected odds of being a certain zero					
	Model 1 (N = 9,598)			Model 2 (N = 9,527)		
		95% CI			95% CI	
	OR	Lower	Upper	**OR**	Lower	Upper
Age	1.06**	1.04	1.07	1.06**	1.04	1.08
Race						
White (ref.)	--	--	--	--	--	--
Black	1.73	0.99	3.03	1.49	0.83	2.66
Asian	0.62	0.04	10.91	0.71	0.04	12.55
Hispanic	2.70**	1.73	4.18	2.43**	1.57	3.74
Sex						
Male (ref.)	--	--	--	--	--	--
Female	0.31**	0.19	0.49	0.36**	0.23	0.57
Insurance Status						
Private Insurance (ref.)	--	--	--	--	--	--
Public Insurance	3.99**	1.95	8.17	3.72**	1.84	7.54
Uninsured	2.32**	1.40	3.82	1.74*	1.05	2.89
Family Income						
<100% (ref.)	--	--	--	--	--	--
100-124%	0.71	0.25	2.01	0.67	0.24	1.90
125-199%	0.94	0.44	1.99	0.96	0.47	1.97
200-399%	1.24	0.59	2.61	1.19	0.59	2.44
≥400%	1.08	0.44	2.69	1.15	0.49	2.69
Education						
Less than High School (ref.)	--	--	--	--	--	--
High School or GED	0.75	0.47	1.20	0.81	0.51	1.30
College or More	0.24**	0.10	0.58	0.24**	0.09	0.61
# of Chronic Diseases						
Zero (ref.)	--	--	--	--	--	--
One or more	0.34**	0.22	0.52	0.40**	0.26	0.61
Smoking Status						
Non-smoker (ref.)	--	--	--	--	--	--
Smoker	0.59	0.33	1.06	0.57	0.32	1.01
Usual source of care						
No (ref.)	--	--	--	--	--	--
Yes	--	--	--	0.40**	0.25	0.63

Data source: MEPS (2008) Household Component; Model 1 does not include a usual source of care variable; Model 2 includes a usual source of care variable; CI indicates Confidence Interval; OR indicates Odds Ratio; Significance level: * $p < 0.05$; ** $p < 0.01$

Results for the logistic portion of the zero-inflated negative binomial regression discussion relate to Model 2 (see Table 2), in which a usual source of care variable is included. For each year of age, there are 0.06 higher odds of never missing work, also known as being a "certain zero." Hispanics have 1.43 higher odds than whites of being a certain zero. Females have 64% lower odds than men of never missing work. Those with public insurance or no insurance have 2.72 and 0.74 higher odds, respectively, than those with private insurance of being a certain zero. College or more highly educated individuals have 76% lower odds than those with less than a high school education of never missing work. Also, those suffering from one or more chronic diseases have 60% lower odds than those with zero chronic diseases of never missing work. Lastly, those with a usual source of care have 60% lower odds than those without a usual source of care of being a certain zero.

Table 3. Negative binomial portion of ZINB regression for employed U.S. adults

	Expected number of workdays missed					
	Model 1 (N = 9,598)			Model 2 (N = 9,527)		
		95% CI			95% CI	
	Coeff.	Lower	Upper	**Coeff.**	Lower	Upper
Age	1.01**	0.01	0.02	1.01**	0.01	0.02
Race						
White (ref.)	--	--	--	--	--	--
Black	1.09	- 0.13	0.31	1.08	- 0.14	0.30
Asian	1.49	- 0.25	1.04	1.39	- 0.31	0.97
Hispanic	1.09	- 0.15	0.31	1.13	- 0.11	0.36
Sex						
Male (ref.)	--	--	--	--	--	--
Female	1.30**	0.07	0.45	1.26*	0.04	0.42
Insurance Status						
Private Insurance (ref.)	--	--	--	--	--	--
Public Insurance	1.12	- 0.23	0.45	1.15	- 0.22	0.49
Uninsured	0.58**	- 0.78	- 0.32	0.63**	- 0.70	- 0.22
Family Income						
<100% (ref.)	--	--	--	--	--	--
100-124%	1.03	- 0.54	0.59	0.96	- 0.59	0.50
125-199%	0.85	- 0.54	0.20	0.82	- 0.58	0.18
200-399%	0.60**	- 0.86	- 0.15	0.57**	- 0.92	- 0.21
≥400%	0.52**	- 1.04	- 0.26	0.49**	- 1.10	- 0.32
Education						
Less than High School (ref.)	--	--	--	--	--	--
High School or GED	1.05	- 0.21	0.32	1.07	- 0.20	0.33
College or More	0.80	- 0.53	0.09	0.80	- 0.53	0.09
# of Chronic Diseases						
Zero (ref.)	--	--	--	--	--	--
One or more	1.59**	0.27	0.65	1.53**	0.24	0.62
Smoking Status						
Non-smoker (ref.)	--	--	--	--	--	--
Smoker	1.12	- 0.09	0.31	1.15	- 0.05	0.34
Usual source of care						
No	--	--	--	--	--	--
Yes	--	--	--	1.41**	0.12	0.57
Constant	1.48			1.36		
AIC[a]	35342.88			35023.66		
BIC[a]	35577.97			35272.72		

Data source: MEPS (2008) Household Component; Model 1 does not include a usual source of care variable; Model 2 includes a usual source of care variable; CI indicates Confidence Interval; Coeff. indicates the regression coefficient calculated for interpretation with the exponential function of the ZINB output; Significance level: * $p < 0.05$; ** $p < 0.01$; [a] Akaike and Bayesian Information Criteria model fit statistics calculated from unweighted data (results shown in Appendix A)

Results for the zero-inflated negative binomial regression discussion are from Model 2 (see Table 3) and this portion of the model is predicting expected number of workdays missed for respondents who would not be classified as a certain zero. For each year of age, the expected number of workdays missed increases by 1.01 times when controlling for all other variables (race, sex, insurance status, family income, education, number of chronic diseases, smoking status, and usual source of care status). Females have 1.26 times the expected number of workdays missed than men, while the uninsured have 0.63 expected workdays missed compared to those with private insurance. Compared to those at <100% of the poverty level, those at the 200-399% level have 0.57 times and those at the ≥400% level have 0.49 times the expected number of workdays missed. Those suffering from one or more chronic diseases have 1.53 times the expected number of workdays missed than those with zero chronic diseases. Lastly, those with a usual source of care have 1.41 times the expected number of workdays missed compared to those without a usual source of care. Based on the decrease in the Akaike information criterion (AIC) and Bayesian information criterion (BIC) scores from Model 1 to Model 2 from Table 3 using the unweighted data (see Appendix A), there is modest evidence that Model 2, which includes a usual source of care, is a better fit (Pinherio & Bates, n.d.)

DISCUSSION

Statistically significant differences among those with and without a usual source of care were present for age, race, sex, insurance status, family income, education level, number of chronic diseases, and smoking status. The odds of being someone who never misses work (a certain zero) are *higher* for Hispanics, those with public insurance, the uninsured, and those who are older in comparison to their respective reference groups. Females, those with a college education or beyond, and those with one or more chronic diseases have significantly *lower* odds of being someone who never misses work. Increased age, being a female, and being someone with one or more chronic diseases increase the expected number of missed workdays. The uninsured and those with family incomes above 200% of the federal poverty threshold have lower expected number of missed workdays.

A limited number of studies have examined workdays missed as an outcome variable or looked at usual source of care status to compare to my findings. However, the increase for females and decrease for the uninsured of missed workdays is in agreement with previous literature (Rhoades, 2010). Those with a usual source of care have lower odds of being a certain zero and have a higher expected number of missed workdays than those without a usual source of care.

Due to the known interactions among social relationships that contribute to health disparities and healthcare utilization (Caldwell, Guthrie, & Jackson, 2006; Andersen, 1995), the findings of this study show how disparities by demographics are associated with missing work, whereby missed workdays may be used for seeking treatment. Specifically, those who are older are less likely to miss work, but when they do miss work, they are expected to miss more days

according to the analysis. Therefore, preventive services can target older adults who are reaching Medicare eligibility in order to keep them healthy and decrease the burden on Medicare. In terms of gender disparities, women may be more likely to miss work because of the caregiver role they often assume. Also, one reason the uninsured are expected to miss less work could be because they cannot afford to miss work or cannot afford to pay for medical treatment. Looking at groups who are more likely to be uninsured could explain why they are also less likely to miss work. Furthermore, Hispanics have higher rates of being uninsured (HHS, 2011), and on the basis of this study, they have significantly higher odds of being someone who would never miss work, as well as a low number of expected missed workdays compared to their white counterparts. Due to current lower rates of insurance coverage (HHS, 2011), Hispanics may benefit the most from health reform as the uninsured will begin to be covered. Using intersectionality theory concepts that the interactions of race, gender, and social class affect health disparities (Caldwell, Guthrie, & Jackson, 2006), this study revealed that fixing inequalities of Hispanics through access to care could narrow health disparities overall.

As the model fit statistics show, including a usual source of care in the model is a moderately better fit. This may be emerging evidence about the importance of a usual source of care. The hypothesis of the study was that including a usual source of care in the model would explain observed disparities. Unexpected findings included that those with a usual source of care would have significantly lower odds of being a certain zero and have a higher number of expected workdays missed, as was presented in the results. However, the higher expected number of missed workdays among those with a usual source of care may reflect time away from work to receive treatment because these employees have a place to access care (KFF, 2011).

Limitations

Several limitations occurred with this study. The outcome variable of workdays missed resulted from respondents' answers indicating missed workdays due to illness or injury, but no variables for injury were available in the dataset. Also, the workdays missed variable does not specify that missed work was for one's own illness or injury; therefore, the respondent could have been missing work for a child, parent, etc. The number of chronic diseases was limited to only seven diseases, so additional comorbidities could have had significant effects on the outcome variable. Also, the chronic disease responses were self-reported, which may be subject to recall bias. The smoker variable only included current smokers, so past smokers who were not controlled for may have remaining health issues. The significant results of the t-test for all of the covariates may show a potential for bias between usual source of care status. The zero-inflated negative binomial model allowed for the prediction of being a certain zero but did not explain why this would occur. Employees who have missed zero days of work may have had different causes for being reported as a zero response. For example, some employees may have only taken off less than a half-day of work several times due to illness, but still would have had a response of zero for workdays missed. On the other hand, another employee may have never been sick or needed a day off; therefore, he or she would also have a zero response. Furthermore, due to the cross sectional study design, causal inference cannot be assumed, and a comparison between the average number of workdays missed for those with and without a usual source of care cannot occur. Lastly, employment was not used as a covariate due to collinearity but was used to create a subpopulation. Because the data was narrowed to only those who were employed, inferences from the results can only be made for employed U.S. adults. Employment did not specify a wage

versus salary or part-time versus full-time employee, which may shed a different light on the results since salaried workers may have more flexibility in the ability to miss work.

Strengths and Suggestions for Future Studies

One strength of this study is that the analysis findings are generalizable to the U.S. population because of the person-level weighting to reflect the U.S. general population. Also, the two-part model of a zero-inflated negative binomial regression provides insight not only on how many days someone is predicted to miss work, but also if he or she would never miss work (the certain zeros). Therefore, efforts to reduce missed workdays could focus on the characteristics of those who are not certain zeros since this is a unique insight of the model. A suggestion for future studies is to separate employment into wage and salaried employees to provide a more accurate view of the role of a usual source of care. Furthermore, future research should stratify the analysis by race and ethnicity instead of controlling for these covariates to make specific comparisons across race and ethnic populations. Future studies with a prospective design could identify whether a usual source of care has a causal effect on the number of workdays missed.

Conclusion

Because patients will be encouraged to utilize a usual source of care as the provisions of the Patient Protection and Affordable Care Act unfold (KFF, 2011), evaluating the number of workdays missed once access to healthcare is increased will be necessary. Because approximately 40% of the study population had one or more chronic diseases, this population could greatly benefit from access to preventive services from a usual source of care, which is linked with higher preventive care utilization and timely medical treatment (KFF, 2011); therefore, focusing

on using a usual source of care for preventive services will decrease healthcare utilization over time. Although those with a usual source of care presently experience an increased number of missed workdays, increased access to care and preventive medicine aimed to reduce illness should balance out the absenteeism as people receive treatment that limits the likelihood that they will become ill. As a usual source of care is paramount to the success of a patient-centered medical home (Robert Graham Center, 2007), focusing on the usual source of care component could expedite the projected positive outcomes of the medical home delivery of care model. Such a focus has the opportunity to influence healthcare utilization, health disparities, and the likelihood of missing work due to illness or to access health services.

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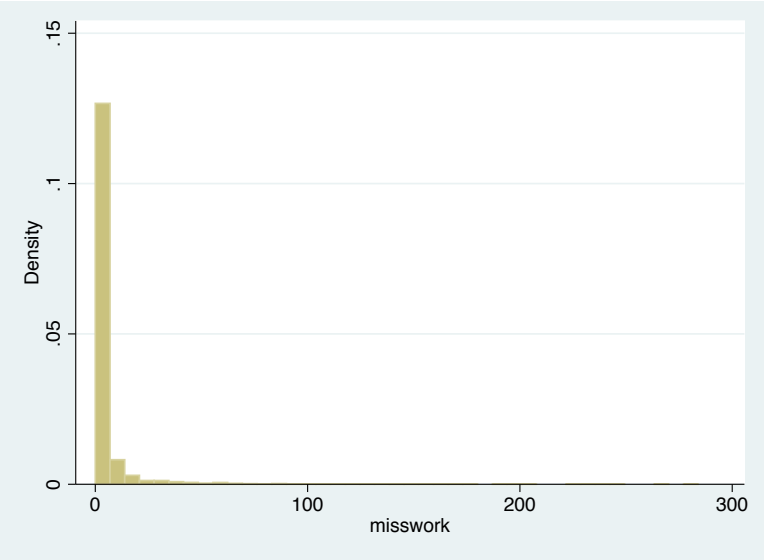
APPENDIX A

Excessive Zero Responses for Outcome Variable



Distribution of "workdays missed" variable for employed U.S. adults ages 18-85 years from MEPS (2008). N = 9,101

Because of the large number of zero responses to the number of workdays missed, several analysis models were considered to account for the relevant zeros. A zero-inflated Poisson regression was considered, but because there is not an adequate distribution of variables, this method was not used. Also, the workdays missed values were not truly continuous, and therefore a linear regression could not be used. A propensity score-matching model was also considered but was not used since the matching method would not allow for discussion of associations between the confounding variables and workdays missed. Because there was a high number of zero responses for workdays missed that were still considered meaningful, a zero-inflated negative binomial model was determined as the most accurate method to determine the effect of a usual source of care on the number of workdays missed due to illness.

APPENDIX B

Unweighted Results of ZINB Regression

Logistic portion of ZINB regression for employed U.S. adults (unweighted).						
	Expected odds of being a certain zero					
	Model 1 N = 9,172			**Model 2 N = 9,101**		
		95% CI			**95% CI**	
	OR	Lower	Upper	**OR**	Lower	Upper
Age	1.04**	0.23	0.05	1.04**	0.03	0.06
Race						
White (ref.)						
Black	2.50**	0.39	1.44	2.01**	0.21	1.19
Asian	0.06	- 35.39	29.91	0.14	- 16.79	12.90
Hispanic	3.50**	0.80	1.71	2.97**	0.68	1.49
Sex						
Male (ref.)						
Female	0.31**	- 1.54	- 0.80	0.36**	- 1.37	- 0.67
Insurance Status						
Private Insurance (ref.)						
Public Insurance	2.57**	0.41	1.48	2.55**	0.41	1.45
Uninsured	2.11**	0.37	1.13	1.73**	0.15	0.94
Family Income						
<100% (ref.)						
100-124%	0.96	- 0.73	0.66	0.89	- 0.81	0.57
125-199%	1.06	- 0.47	0.59	1.08	- 0.44	0.61
200-399%	1.21	- 0.33	0.72	1.19	- 0.34	0.69
≥400%	1.07	- 0.54	0.69	1.23	- 0.39	0.80
Education						
Less than High School (ref.)						
High School or GED	0.69	- 0.74	0.00	0.71	- 0.70	0.03
College or More	0.26**	- 2.14	- 0.57	0.27**	- 2.03	- 0.58
# of Chronic Diseases						
Zero (ref.)						
One or more	0.30**	- 1.60	- 0.81	0.35**	- 1.43	- 0.70
Smoking Status						
Non-smoker (ref.)						
Smoker	0.53**	- 1.09	- 0.19	0.54**	- 1.04	- 0.18
Usual source of care						
No (ref.)	--	--	--			
Yes	--	--	--	0.48**	- 1.08	- 0.39

Data source: MEPS (2008) Household Component; Model 1 does not include a usual source of care variable; Model 2 includes a usual source of care variable; CI indicates Confidence Interval; OR indicates Odds Ratio;
Significance level: * $p < 0.05$; ** $p < 0.01$

Negative binomial portion of ZINB regression for employed U.S. adults (unweighted).						
	Expected number of workdays missed					
	Model 1 N = 9,172			Model 2 N = 9,101		
		95% CI			95% CI	
	Coeff.	Lower	Upper	**Coeff.**	Lower	Upper
Age	1.01**	0.01	0.02	1.01**	0.01	0.02
Race						
White (ref.)						
Black	1.19*	0.03	0.32	1.19*	0.03	0.32
Asian	1.74	- 0.11	1.23	1.66	- 0.17	1.18
Hispanic	1.18*	0.02	0.31	1.22**	0.06	0.34
Sex						
Male (ref.)						
Female	1.27**	0.13	0.34	1.22**	0.09	0.30
Insurance Status						
Private Insurance (ref.)						
Public Insurance	1.13	- 0.11	0.36	1.18	- 0.07	0.40
Uninsured	0.60**	- 0.67	- 0.36	0.67**	- 0.57	- 0.24
Family Income						
<100% (ref.)						
100-124%	1.08	- 0.22	0.36	1.05	- 0.25	0.34
125-199%	0.85	- 0.39	0.07	0.84	- 0.40	0.06
200-399%	0.64**	- 0.66	- 0.23	0.62**	- 0.69	- 0.26
≥400%	0.56**	- 0.81	- 0.36	0.54**	- 0.84	- 0.38
Education						
Less than High School (ref.)						
High School or GED	1.05	- 0.12	0.22	1.06	- 0.11	0.23
College or More	0.90	- 0.30	0.09	0.91	- 0.29	0.10
# of Chronic Diseases						
Zero (ref.)						
One or more	1.15**	0.37	0.59	1.54**	0.32	0.54
Smoking Status						
Non-smoker (ref.)						
Smoker	1.12*	0.01	0.27	1.18*	0.03	0.30
Usual source of care						
No	--	--	--			
Yes	--	--	--	1.43**	0.22	0.49
Constant	1.38			1.22		

Data source: MEPS (2008) Household Component; Model 1 does not include a usual source of care variable; Model 2 includes a usual source of care variable; CI indicates Confidence Interval; Coeff. indicates the regression coefficient calculated for interpretation with the exponential function of the ZINB output; Significance level: * $p < 0.05$; ** $p < 0.01$

APPENDIX C

STATA Code for Data Analysis

```
clear
cd "\\udrive.win.psu.edu\users\t\l\tll5073\Desktop\Thesis"
use "\\udrive.win.psu.edu\users\t\l\tll5073\Desktop\Thesis\121512weight.dta"

** preparing data **
**********************************************************************
** generating race variable **
generate race=.
replace race=1 if racex==1 & hispanx==2
replace race=2 if racex==2 & hispanx==2
replace race=3 if racex==3 & hispanx==2
replace race=4 if hispanx==1

** narrowing data to adults ages 18 to 85 **
keep if age08x>17

** generating education level variable **
generate education=.
replace education=1 if hideg==1
replace education=2 if hideg==2|hideg==3
replace education=3 if hideg==4|hideg==5|hideg==6
```

```
** renaming insurance variable **

generate insured=.

replace insured=1 if inscov08==1

replace insured=2 if inscov08==2

replace insured=3 if inscov08==3


** generating employment status dummy variables **

generate employment=.

replace employment=1 if empst31==1| empst31==2| empst31==3| empst42==1|
empst42==2| empst42==3| empst53==1| empst53==2| empst53==3

replace employment=0 if empst31==4| empst42==4| empst53==4


** generating ever unemployed variable **

generate everunemploy=.

replace everunemploy=1 if empst31==4| empst42==4| empst53==4

replace everunemploy=0 if empst31==1 & empst31==2 & empst31==3 & empst42==1 &
empst42==2 & empst42==3 & empst53==1 & empst53==2 & empst53==3


** preparing chronic disease variables **

generate hibp=.

replace hibp=1 if hibpdx==1

replace hibp=0 if hibpdx==2


generate heart=.

replace heart=1 if chddx==1

replace heart=0 if chddx==2


generate stroke=.
```

```
replace stroke=1 if strkdx==1

replace stroke=0 if strkdx==2

generate cancer=.

replace cancer=1 if cancerdx==1

replace cancer=0 if cancerdx==2

generate diabetes=.

replace diabetes=1 if diabdx==1

replace diabetes=0 if diabdx==2

generate asthma=.

replace asthma=1 if asthdx==1

replace asthma=0 if asthdx==2

generate psych=.

replace psych=1 if k6sum42>9

replace psych=2 if k6sum42<10

generate spd=.

replace spd=1 if psych==1

replace spd=0 if psych==2

** generating chronic disease count variable **

egen chronicdisease= anycount (hibp heart stroke cancer diabetes asthma spd), val(1)

** dichotomizing chronic disease variable to simplify for interpretation in analysis **

** count 0 is 61% and counts 1-6 are 39% **
```

```
generate dichronic=.
replace dichronic=1 if chronicdisease==0
replace dichronic=2 if chronicdisease==1|chronicdisease>1

** generating current smoker variable **
** 1 is smoker**
generate smoke=.
replace smoke=1 if adsmok42==1
replace smoke=0 if adsmok42==2

** generating non-smoker variable if needed **
generate nosmoke=.
replace nosmoke=1 if adsmok42==2
replace nosmoke=0 if adsmok42==1

** generating have a usual source of care variable **
generate usc=.
replace usc=1 if haveus42==1
replace usc=0 if haveus42==2

** generating no usual source of care dummy variable **
generate nousc=.
replace nousc=1 if haveus42==2
replace nousc=0 if haveus42==1

** generating outcome variable: workdays missed due to illness/injury **
generate misswork= ddnwrk31+ddnwrk42+ddnwrk53
keep if misswork==0| misswork>0
```

```
** narrowing data to only those employed **

keep if employment==1

*************************************************************************
** sample descriptives unweighted**

** for continuous variables without weight**

sort usc

by usc: summarize age08x

sort usc

by usc: summarize misswork

** for categorical variables without weight**

tab race usc, col

tab sex usc, col

tab insured usc, col

tab education usc, col

tab povcat08 usc, col

tab employment usc, col

tab smoke usc, col

tab dichronic usc, col

** zero-inflated negative binomial regression **

** inflate portion of model predicts if someone is a certain zero **

*************************************************************************

** running zinb without a usual source of care **
```

```
zinb misswork age08x i.race sex i.insured i.povcat08 i.education dichronic smoke,
inflate(age08x i.race sex i.insured i.povcat08 i.education dichronic smoke)

** running zinb with a usual source of care **

zinb misswork age08x i.race sex i.insured i.povcat08 i.education dichronic smoke usc,
inflate(age08x i.race sex i.insured i.povcat08 i.education dichronic smoke usc)

** model fit statistics **

** ran after zinb for unweighted data **

estat ic

**********************************************************************

** applying weight**

svyset [pw = perwt08f]

svy, subpop(employment): zinb misswork age08x i.race sex i.insured i.povcat08
i.education dichronic smoke, inflate(age08x i.race sex i.insured i.povcat08 i.education
dichronic smoke)

svy, subpop(employment): zinb misswork age08x i.race sex i.insured i.povcat08
i.education dichronic smoke usc, inflate(age08x i.race sex i.insured i.povcat08
i.education dichronic smoke usc)


** getting means for continuous variables by usc using survey weight **

svy: mean misswork, over(usc)

svy: mean age08x, over(usc)

** overall **

svy: mean misswork

svy: mean age08x


** descriptive stats for categorical variables using survey weight **

** overall **

proportion race sex insured education povcat08 smoke dichronic usc [pweight=perwt08f]

** with or without a usc **
```

```
proportion race sex insured education povcat08 smoke dichronic usc [pweight=perwt08f],
over(usc)


** running ttest to see difference in means based on usc status **

ttest age, by (usc)
ttest race, by (usc)
ttest sex, by (usc)
ttest insured, by (usc)
ttest education, by (usc)
ttest povcat08, by (usc)
ttest dichronic, by (usc)
ttest smoke, by (usc)
```

ACADEMIC VITA

Tiana Lukas

2217 Bentley Drive

Bloomsburg, PA 17815

tiana.leigh.lukas@gmail.com

Education

Master of Health Administration, Spring 2013, The Pennsylvania State University, University Park, PA

Bachelor of Science in Health Policy and Administration, Spring 2013, The Pennsylvania State University, University Park, PA
Concentration in Biobehavioral Health

Dean's List: 9/9 semesters

Honors and Awards

Academic Honors in Health Policy and Administration
Thesis Title: *Examining the effects of a usual source of care on disparities among employed U.S. adults who miss work due to illness*

College of Health and Human Development Alumni Recognition of Student Excellence Award, The Pennsylvania State University (2013)

National Merit Scholarship Award (2008-2012)

Association Memberships/Activities

President, Master of Health Administration Association

Team Leader, HealthWorks Peer Education Outreach Program

Student Member, American College of Healthcare Executives

Student Member, Healthcare Financial Management Association

Committee Member, Penn State IFC/Panhellenic Dance MaraTHON