Explaining the Urban-Rural Divergence in Disability among Older Chinese Using a Large Scale National Dataset

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Abstract

Objectives. To examine divergences in the urban/rural disability among older adults in China and decompose these into variation represented by characteristics of individuals and communities and the different ways determinants impact on disability.

Methods. Oaxaca-Blinder regression-based decomposition is applied to older adults 60 and older in China using the 20,000 observation sample from the 2000 Sample Survey on Aged Population in Urban/Rural China. Disability is determined by limitations in conducting Activities of Daily Living. Determinants represent four domains: socioeconomic status (SES), access, behaviors and social engagement.

Results. Rural elders are significantly more likely to have a disability (21% vs. 15%). The urban advantage is explained by differences in compositional variables, particularly those representing individual and community level SES. Rural elders benefit more from economic, social, and infrastructural resources differs by urban versus rural residence when it comes to determining disability.

Conclusions. Programs aimed at increasing education and income of rural residents would go a long way toward minimizing the rural disability disadvantage, as would investments in rural infrastructure.

Introduction

The current paper examines urban/rural disability differences among older adults in China using in inability to conduct Activities of Daily Living (ADLs) as an indicator of disability. It then decomposes the difference into the proportion explained by two types of variation – that represented by differences in levels of disability determinants between urban and rural residents, and that explained by differences in the way in which the same determinants impact differentially on disability. The determinants are measured at both community and individual levels and are representative of four domains of social indicators thought to impact on health generally.

From the time of the industrial revolution, urban/rural residence has been recognized as an important determinant shaping health [1]. While the total body of research on rural/urban health differences in more modern times is modest given the potential magnitude of influence, the importance of residence for a variety of health outcomes across an assortment of global settings has been demonstrated on occasion [2-8]. A small number of recent studies from China have illustrated particularly wide urban/rural health inequalities among older adults in that country, with a considerable urban advantage. Examples include an approximately 30% mortality rate advantage and, of greater consequence for the current study, a substantial benefit across a number of mobility indicators [9-14].

The mechanisms underlying this urban-rural disability gap is likely to be complex and a wide range of factors may be involved. First, urban and rural communities will be different from each other in that they will have distinctive characteristics related to various domains such as socioeconomic status (SES) of the community, health care availability, social engagement opportunities, and normative behaviors. These types of community characteristics can be

important in influencing disability outcomes[15-17]. Second, urban and rural people will be different in that they will have different individual level characteristics representing the same types of domains. Third, not only do the characteristics of individuals in rural and urban areas and the communities in which they live diverge, so too will the impacts of similar characteristics. As one salient example, two individuals may have similar levels of SES, but SES advantages may go further in, for instance, purchasing better health care in one area versus another depending upon differences in the cost of health care.

The current study adopts this multifaceted perspective for explaining urban/rural health differences in disability among older Chinese. Predictors are conceptualized as being positioned within the four conceptual domains mentioned above. These are domains that have proven to be important for determining health on an individual level, and to a lesser extent, on a community level [12, 17-27]. Indeed, the confluence of individual and community level determinants may hold some promise for explaining spatial variation in health[28]. Specifically, these include socioeconomic status (SES), health care access, health behaviors, and social engagement. Each domain is represented by one or more characteristics on individual and community levels depending on availability of variables in the current dataset. The current study examines whether disability differences are a function of differences in the level of these characteristics and/or the actual way in which the characteristics impact upon disability. Put another way, we examine the extent to which disability differences can be explained by individual and community characteristics that distinguish those living in these areas and/or the magnitude of the effects of these individual and community characteristics across areas.

China is a particularly interesting setting for the study for a number of reasons. While urban-rural health difference in old age has received limited attention to date in China the issue is

particularly important in the context of the country's development. In China, as in other rapidly developing societies, high rates of rural-to-urban migration among the younger population in search of new economic opportunities has meant that growing numbers of older adults in rural areas are living with fewer children nearby, creating the need to care for themselves or to find non-traditional sources of care existing outside the family[29-32]. Moreover, urban and rural life has remained particularly distinct under various social and economic policies introduced since the Communist Party took power in early 1950s. This includes allocation of health care resources and labor force structure that likely have had long lasting consequences on the health of urban and rural residents[33-36]. In addition, China's population is aging at one of the fastest rates in the world, and efforts to close the urban-rural health gap among the older population can inform policies on how to provide for the growing proportion of elderly [37-40].

Methods

Analytic Approach

We begin by describing differences in the proportion of urban and rural elderly who report at least one of several ADL limitations, which is our measure for being disabled. Then, we conduct a decomposition of rural/urban difference in disability using the approach developed by Oaxaca and Blinder [41-44]. This approach separates the differences of a dichotomously measured outcome into the proportion that is attributable to levels of predictor characteristics and the proportion attributable to differences in the predictive power of these characteristics. The decomposition is conducted in three steps. First, means for predictor variables are computed for urban and rural elderly separately. Second, linear probability models predicting disability are

estimated for urban and rural elderly separately[1]. Third, using the means from the first step and the coefficients from the second, the actual difference in the proportion of elderly with a disability is determined as:

$$\overline{Y}_r - \overline{Y}_u = \left[(\hat{\beta}_{r0} - \hat{\beta}_{u0}) + \sum_{j=1}^{N} \overline{X}'_{uj} (\hat{\beta}_{rj} - \hat{\beta}_{uj}) \right] + \left[\sum_{j=1}^{N} (\overline{X}'_{rj} - \overline{X}'_{uj}) \hat{\beta}_{rj} \right]$$

where the subscript *u* corresponds to urban elderly, the subscript *r* corresponds to rural elderly, $\overline{Y}$ is the proportion of elderly with an ADL, $\hat{\beta}_0$ is the estimated intercept, and $\hat{\beta}_j$ is a column vector of estimated slope coefficients for the set of *j* regressors, $\overline{X}'_j$. The first bracketed term corresponds to that part of $\overline{Y}_r - \overline{Y}_u$ that is due to differences in the coefficient estimates across regression equations, while the second bracketed term corresponds to the part that is due to differences in the means of the underlying explanatory variables. The extent to which specific variables or groups of variables contribute to differences in the proportion with a disability across groups can be calculated by evaluating the second term for selected variables of interest.

In the current paper, results of the decomposition are presented in terms of expected differences. That is, we ask several questions: What would be the expected difference in the probability of having a disability if the means of all explanatory variables were equal across rural and urban areas? What would be the expected difference if the means of variables representing domains were equal? Finally, what would be the expected difference in the probability of having a disability if instead of equality of explanatory variables the effects or coefficients of explanatory variables were equal? The decomposition method is determined such that the initial

[1] The decomposition method requires linear OLS modeling even though the outcome is dichotomous. In supplemental analysis, however, logistic and probit models yielded results consistent with the linear probability models.

observed difference is exactly equal to the expected difference if means of explanatory variables were equal plus the difference if coefficients were equal.

Data

Data come from the 2000 wave of the Sample Survey on Aged Population in Urban/Rural China (SSAPUR), conducted by the China Research Center on Aging (CRCA). The survey consists of a representative sample of the civilian non-institutionalized population age 60 and older in 27 provinces of China. Approximately 20,000 older people were sampled based on a stratified multi-stage sample design, with about half the sample coming from urban and half from rural areas. The response rate was 99.3 percent. The survey also contains community-level data from 50 urban residential committees and 50 rural village committees from where the respondents were selected. The community level surveys were completed by a knowledgeable community leader. Weights are provided to enable the distribution of the older population from SSAPUR to be close to the 2000 census figures for the older population for each region by urban/rural stratum, sex, and age, and at the same time reflect the different stages of the sample design to provide statistically unbiased survey estimates.

Variables

Using measures associated with ADLs, we define disability as the incapacity to conduct necessary and usual tasks needed for daily survival, like bathing and dressing[45]. Specifically, it is considered as having a difficulty performing any of the following without help from others: eating, bathing, dressing, toileting, getting in and out of bed, and walking indoors.

Explanatory variables consist of individual- and community-level variables grouped in four domains. Community level variables are at times taken directly from the community survey, but when sufficient information is unavailable we create variables that are aggregations from the individual level. For the SES domain, we consider the individual level characteristics of whether one has any formal education, whether one considers themselves to have enough savings, and whether the house he or she lives in has modern utilities (e.g., water, gas, heating and toilet). Community-level SES characteristics are revenue per capita and proportion of houses in the community with modern utilities (e.g., water, gas, heating and toilet). For the health care domain, individual level characteristics include having health insurance, having a clinic nearby, and whether it is convenient to access a doctor. Community-level health care indicators are number of doctors and the number of hospital beds in the community, both measured per 1,000 residents. The behavior domain includes individual-level measures of smoking and alcohol drinking. One community-level behavior variable is considered, and it is the proportion in the community who engage in any exercise (e.g., taichi), an indicator meant to capture the community normative value around physical activity. The social engagement domain is measured at the individual-level by marital status, engaging in social activities (i.e., playing Majiang, cards, or chess, watching movies or opera, or singing or dancing), and whether one visits with neighbors. For the community-level, indicators are the proportions of older adults in a community who engage in social activities and the proportion who visit with neighbors, again, measures that are considered to capture community normative values around social engagement. All models control for age and sex.

Results

Figure 1 shows the unadjusted proportion with a disability across urban and rural areas by age and sex for the 20,000 SSAPUR data. Overall, 19% of Chinese age 60 and older has a disability. Figure 1 indicates that consistently, across each age group and for both sexes, with the exception of males 85 and older, the prevalence of disability is much greater among urbanites than those in rural areas. In addition, disability increases with age, as expected, and females have higher disability prevalence than males.

Table 1 provides means for all variables in the analysis. In cases where variables are categorical, means have the same interpretation as proportions. The proportions having a disability can be seen as being .145 in urban areas and .206 in rural areas. The difference is statistically significant. Other explanatory characteristics differ substantially and significantly across urban and rural residence. For instance, 70.0% of urban residents have at least primary education versus 33.3% of their rural counterparts. Urbanites are also significantly more likely to be living in a house with modern utilities, have access to health care and never to have drunk alcohol. Social engagement and support indicators are mixed. Urbanites are more likely to be married and engage in social activities but less likely to visit with neighbors. Characteristics of the communities in which elderly live also differ by rural-urban residence. Urbanites live in communities that, on average, have higher revenue per capita, higher proportion of households with modern utilities, more hospital beds per capita and a greater proportion of urbanites participating in social activities. Rural elderly are more likely to live in communities that have higher proportion of older adults visiting neighbors.

While the characteristics of those living in rural and urban areas, and the characteristics of the areas themselves, may explain differences in disability, differences may also be explained by differences in effects. The results in Table 2, which indicate the effects of each variable on

disability in rural and urban areas separately, shed light on this. Among the individual variables, age is positively associated with disability in both urban and rural areas. Having enough saving has a strong negative association in both areas, but the effect is stronger in rural areas. Being married and participating in social activities are significant predictors in both areas, but the effect is stronger among urbanites. Having a doctor who is convenient to access and visiting with neighbors are negatively associated with disability among urbanites. At the community-level, revenue per capita is negatively associated with disability among urban elderly. On the whole, the individual level predictors appear more significantly able to predict disability than the community level predictors.

Results from the above tables indicate that urban-rural differences in disability could be a function characteristics and the extent to which characteristics predict the likelihood of disability. Table 3 disentangles these mechanisms by way of decomposition. This table first shows the initial observed difference (which is 6.1 percentage points or a proportional difference of .061). Then, using the Oaxaca-Blinder decomposition, it displays the difference between rural and urban disability that would exist if means (shown in Table 1) of all explanatory variables were to be made equal, and the difference that would exist if the effects (shown in Table 2) were to be made equal. The sum of these two is the observed difference of .061.

If the means of all the explanatory variables were the same for urban and rural residents, the difference in disability would not only vanish, but would reverse; urban elderly would be disadvantaged by .078, which is to say, they would be more likely to have a disability. Therefore, the urban disability advantage is more than explained by the fact that urbanites are advantaged across most of the predictor variables. In contrast, if the coefficients were made equal, the urban proportional advantage would increase to .139. Since rural residents are

disadvantaged with respect to the levels of predictor variables, this means that effects are overall more robust for rural residents.

The next several rows decompose this further by showing expected urban-rural differences if specific variable domains were made equal. The one domain that stands out as being particularly important is SES. Equalizing individual level SES across areas would bring the rural disadvantage down to .025. Equalizing community level SES would bring it down to about 0. All other domains also reduce the difference, except for health behaviors, which seems to have minimal influence overall on explaining disability differences.

Discussion:

The current paper took advantage of a very large sample survey in China to examine disability differences between older adults living in rural and urban areas. Like several previous studies [9, 10, 12-14] we find a large overall urban advantage. The proportional difference in the prevalence of disability is .061, with about 15% of urbanites reporting a disability compared to about 21% of rural counterparts. The difference is maintained fairly consistently across age and sex. The current paper went on to ask what accounts for this urban advantage. Our analysis suggests that it is explained by differences in compositional variables including those representing domains of SES, health care access, health behaviors, and social engagement. In fact, if rural elderly had the same characteristics as urbanites across these domains, the difference in the proportion with a disability would favor rural elderly.

We also find that the extent to which elderly benefit from economic, social, and infrastructure-related resources differs greatly by urban versus rural residence. Decomposition results suggest that rather than explaining the rural-urban difference in disability, the magnitude

of effects masks more of a difference. If rural elderly benefited in the same way from economic, social, and infrastructure resources then the difference in disability would be greater. Since rural residents are disadvantaged in compositional variables, it translates into effects that count being more robust in rural areas. For instance, a rural resident is much less likely than an urban resident to report they have enough savings. But, if they do have enough savings, the impact on reducing disability is greater than for urban residents. It is also notable that the individual and community level SES variables, more so than variables from other domains, have strong effects on disability. As such, urbanites benefit greatly because they have much higher levels of SES. If individual or community level SES characteristics were equalized, the difference in disability would pretty much disappear.

These findings have several implications. First, programs aimed at increasing education and income of rural residents would go a long way toward minimizing the rural disability disadvantage. Indeed, urban-rural disparities in both individual and community-level SES seem to be the chief culprit in explaining the wide rural-urban difference in disability. In addition, investments on infrastructure, health care, and economic development in rural areas are also worthwhile, as results indicate that rural elderly benefit from these resources more than urbanites. Second, and somewhat surprisingly, differences in health behaviors between urban and rural elderly have little to do with differences in disability. If shrinking urban-rural disparities in disability is a goal, above and beyond reducing aggregate levels of disability, behavior should not necessarily be a high priority policy target.

The study has limitations that should be kept in mind when interpreting these results. First, we cannot measure all factors that affect disability and that differ between urban and rural residents. Naturally, we are limited by those that are available in this survey. While one of the

advantages of SSAPUR is that it covers nearly the entire country with a very large sample, one of its disadvantages is a relative lack in breadth of explanatory variables. If some of these omitted factors are correlated with those in our model, we could spuriously assign a part of the urban-rural difference in disability to a variable or variables that were not responsible. Second, there is some arbitrariness in grouping variables in our decomposition, which is done for heuristic purposes. We understand fully that variables often represent and cut across multiple domains. If grouped differently, we might conclude that some domains explain more or less of the urban-rural difference in disability. On this point, we have endeavored to carefully group like-variables, but readers should note this limitation, which is present for any decomposition.

Despite disadvantages, the current analysis expands the current literature in a few ways. First, we have provided a valid estimate of elderly disability in China given our definition of disability, which is linked to ADL limitations, and a valid estimate of rural urban differences. The validity is hinged on the wide coverage of the current dataset across the country with a large sample. Second, we have provided what is to our knowledge the first decomposition of this difference. Earlier studies have determined there is an urban advantage in health in China, and this does not disappear in models that control for variables similar to those considered in the current paper (citations here). This study suggests that rural effects decline because of the compositional difference, but some effect remains because of the robustness of effects in rural areas.

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Figure 1: Proportion with a Disability by Urban-Rural Area, Sex, and 5-year Age Groups

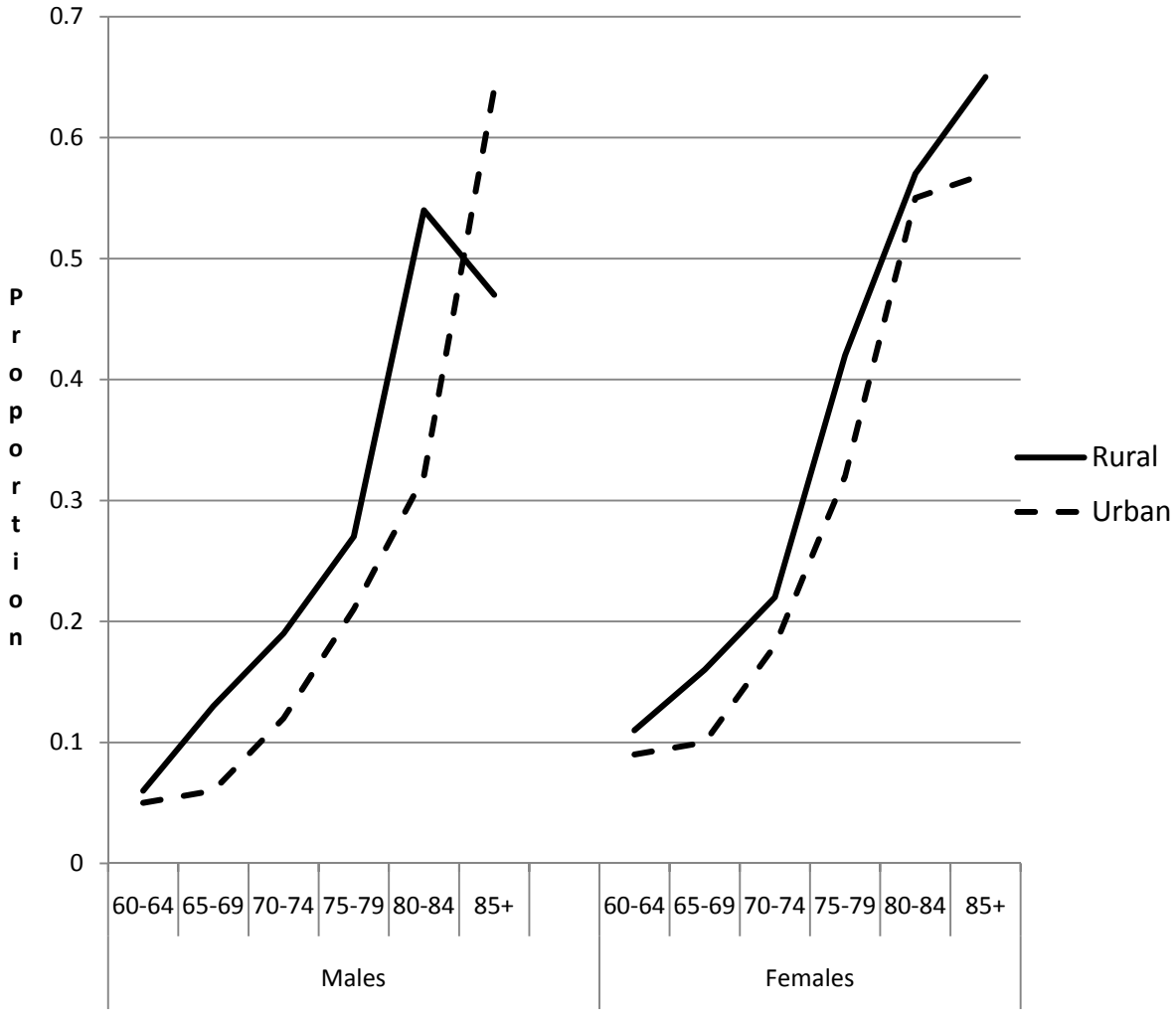

Table 1. Means and standard deviations (in parentheses) for all variables

	Mean		
	All	Urban	Rural
Has a disability	0.192	0.145	0.206*
	(0.013)	(0.010)	(0.017)
Age	69.056	68.528	69.212
	(0.208)	(0.367)	(0.237)
Female	0.516	0.508	0.519
	(0.015)	(0.022)	(0.019)
Individual-level SES			
Having at least primary school education	0.417	0.700	0.333*
	(0.024)	(0.021)	(0.021)
Having enough savings	0.633	0.806	0.581*
	(0.019)	(0.014)	(0.020)
Living in house with modern utilities	0.656	0.975	0.562*
	(0.037)	(0.007)	(0.046)
Individual-level Health Care Access			
Has health insurance coverage	0.004	0.007	0.003*
	(0.001)	(0.001)	(0.001)
Has a clinic in the neighborhood	0.855	0.908	0.839*
	(0.020)	(0.016)	(0.025)
Has a doctor who is convenient to access	0.744	0.827	0.719*
	(0.017)	(0.017)	(0.020)
Individual-level Health Behaviors			
Has never smoked	0.552	0.596	0.539
	(0.020)	(0.028)	(0.025)
Has never had any alcohol	0.587	0.637	0.572*
	(0.020)	(0.016)	(0.025)
Individual-level Social Engagement and Support			
Currently married	0.676	0.765	0.650*
	(0.015)	(0.021)	(0.016)
Engages in any social activities	0.321	0.407	0.296*
	(0.025)	(0.020)	(0.031)
Visit with neighbors	0.731	0.609	0.767*
	(0.019)	(0.029)	(0.022)
Community-level SES			
Community revenue per capita	387.536	561.781	335.756*
	(46.405)	(92.944)	(53.538)
Proportion of house with modern utilities	0.651	0.972	0.556*
	(0.037)	(0.008)	(0.046)
Community-level Health Care Access			
Number of beds per 1,000 residents	21.454	36.409	17.010*
	(1.741)	(5.317)	(0.997)
Number of doctors per 1,000 residents	24.309	27.947	23.228
	(1.625)	(2.794)	(1.945)

(Continued next page)

Community-level Health Behaviors			
Proportion of older adults who engage in exercise	0.636	0.814	0.583*
	(0.024)	(0.017)	(0.027)
Community-level Social Engagement and Support			
Proportion of older adults who participates in social Activities	0.317	0.404	0.291*
	(0.026)	(0.020)	(0.032)
Proportion of older adults who visits with neighbors	0.726	0.611	0.760*
	(0.021)	(0.028)	(0.026)
N	18208	8866	9342

Note: for dichotomous variables, means are equivalent to proportions
*Significantly different from urban elderly at α=0.05

Table 2. Coefficients from Linear Probability Models on the Presence of an ADL by Urban-Rural Residence

	Coefficients	
	Urban	Rural
Age	0.013***	0.019***
	(0.001)	(0.001)
Female	0.036	0.002
	(0.027)	(0.025)
Individual-level SES		
Having at least primary school education	-0.002	-0.031
	(0.025)	(0.023)
Having enough savings	-0.067*	-0.082***
	(0.028)	(0.017)
Living in house with modern utilities	-0.049	0.017
	(0.051)	(0.018)
Individual-level Health Care Access		
Has health insurance coverage	0.024	-0.077
	(0.039)	(0.040)
Has a clinic in the neighborhood	0.014	-0.025
	(0.021)	(0.031)
Has a doctor who is convenient to access	-0.118***	-0.038
	(0.022)	(0.030)
Individual-level Health Behaviors		
Has never smoked	-0.007	0.038
	(0.024)	(0.025)
Has never had any alcohol	0.005	-0.028
	(0.025)	(0.022)
Individual-level Social Engagement and Support		
Currently married	-0.061**	-0.041**
	(0.020)	(0.014)
Engages in any social activities	-0.085***	-0.069***
	(0.022)	(0.011)
Visit with neighbors	-0.034**	0.007
	(0.012)	(0.025)
Community-level SES		
Community revenue per capita	-0.000*	-0.000
	(0.000)	(0.000)
Proportion of house with modern utilities	-0.157	0.005
	(0.202)	(0.056)
Community-level Health Care Access		
Number of beds per 1,000 residents	-0.001	0.003
	(0.000)	(0.002)
Number of doctors per 1,000 residents	0.001	0.000
	(0.001)	(0.001)

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Community-level Health Behaviors		
Proportion of older adults who engage in exercise	0.055	-0.085
	(0.123)	(0.078)
Community-level Social Engagement and Support		
Proportion of older adults who participates in social Activities	-0.045	0.068
	(0.069)	(0.078)
Proportion of older adults who visits with neighbors	0.007	-0.164
	(0.072)	(0.111)
Constant	-0.372	-0.875***
	(0.251)	(0.123)
N	8866	9342

* p<0.05, ** p<0.01, *** p<0.001

Table 3. Decomposition Results

	Urban-Rural Difference
Observed Difference	0.061
Expected Difference If Means Were Equal	-0.078
Expected Difference If Coefficients Were Equal	0.139
Expected Difference If Means on Specific Variables Groups Were Equal:	
Demographics (Age, Sex)	0.051
Individual-level SES	0.025
Individual-level Health Care Access	0.049
Individual-level Health Behaviors	0.061
Individual-level Social Engagement and Support	0.050
Community-level SES	-0.009
Community-level Health Care Access	0.054
Community-level Health Behaviors	0.074
Community-level Social Engagement and Support	0.055