OUTCOMES & INSIGHTS
In Health Management
Vol. 4; Issue 1 August 2013

# Assessing Correlation Between Clinical and Utilization Rates and the Gallup-Healthways Well-Being Index™ At the Hospital Referral Region Level

Brian Bankert, MA; Carter Coberley, Ph.D.; James Pope, MD; Aaron Wells, Ph.D.

## ABSTRACT

Hospital referral regions (HRRs) are 306 distinct areas across the U.S. where patients receive regional medical care. Developed for the Dartmouth Atlas Project and used by researchers and the federal government, HRRs provide a uniform boundary to examine disparities in health care utilization and spending. Since its inception in 2008, the Gallup-Healthways Well-Being Index™ (WBI) has been measuring subjective well-being in the U.S. at national, state, and regional levels. The objective of this paper is to determine the correlation between WBI scores and rates of disease and health care utilization at the HRR level. The analysis utilized 2008 to 2010 publicly available HRR-level data of Medicare fee-for-service beneficiaries age 65 or older.

In general, the cross-sectional analyses resulted in negative correlation coefficients between the WBI and rates of disease and utilization, meaning HRRs with higher well-being had lower disease and utilization. Rates of heart attack, failure, and disease; chronic obstructive pulmonary disease; diabetes; and hypertension were correlated with the composite WBI and emotional health, physical health, healthy behavior, and basic access sub-indices of the WBI. Inpatient stay rates and emergency department visits per 1,000 beneficiaries were correlated with the composite WBI and life evaluation, emotional health, physical health, healthy behavior, and basic access sub-indices. Hospital readmission rates were correlated with the composite WBI and emotional health and healthy behavior sub-indices.

Overall, the results corroborate the WBI as a holistic measure of well-being and clinical health at the regional level. The results also suggest well-being has a moderate to high relationship with key drivers and measures of health care utilization.

## Introduction

The purpose of this study is to build upon existing research related to the regional variation in U.S. health care in two ways. First, we summarize the literature and explore the relationship in regional variation among well-being and health care spending and utilization. Second, we examine the statistical relationship between well-being and disease prevalence and health care utilization in the fee-for-service Medicare population at the Hospital Referral Region (HRR) level, which as far as we know has yet to be studied for this particular geographical boundary.

Regional variation in health care spending in the U.S. is a problem that has been studied by researchers for decades, with the majority of research conducted at the HRR level based on the fee-for-service Medicare population by the Dartmouth Atlas Project (Kaiser Family Foundation, 2009). Per beneficiary Medicare spending in 2006 varied among the 306 U.S. HRRs, with high spending regions like Miami, FL and McAllen, TX spending approximately three times more than low-spending regions of Honolulu, HI and Minot, ND (Fisher et al, 2009). Similar results have been found previously where the highest quintile of HRRs had average end-of-life expenditures 1.61 times that of the lowest quintile for the same population (Fisher et al, 2003).

According to researchers, there are a multitude of reasons with differential influence on the issue of regional variation in health care. Regional differences in prices and population health explain some of the variation while differences in demographics and patient preferences for treatment explain a relatively lower amount. However, much of the variation is residual meaning it cannot be explained by the differences in prices, health, demographics, or treatment preference (Congressional Budget Office, 2008). The residual or unexplained portion of variation has been attributed to differences in the volume of care received across regions, which is based upon health care supply where more supply leads to more care (Fisher et al, 2004), as well as differences in physician practices. In the latter case, the belief is that in high health care cost regions, physician judgment concerning individual health care treatment results in more care (Sirovich et al, 2008). However, these explanations of the variation in expenditures are difficult to assess quantitatively (Congressional Budget Office, 2008) and some researchers have found that health status and socio-economic factors are indeed significant factors in explaining variation (Hadley et al, 2009). Across much of this research, the HRR was utilized as the means by which to compare different geographic areas.

One of the few publicly available data sources at the HRR level is provided by the Institute of Medicine (IOM). The IOM

receives data at the U.S. state and HRR levels from the Centers for Medicare and Medicaid Services (CMS) on a regular basis in order to inform its Committee on Geographic Variation in Health Care Spending and Promotion of High-Value Care, who advise the executive and legislative braches of the federal government on health care matters. CMS uses Medicare claims data to calculate utilization measures and total standardized risk-adjusted spending for a fee-for-service (i.e., non-Medicare Advantage), age 65 and older Medicare population. The IOM data also contain information related to demographics and clinical and quality indicators.

The Gallup-Healthways Well-Being Index™ (WBI) is a prominent measure of well-being in the U.S. and is derived from a survey of no fewer than 1,000 U.S. residents, aged 18 and older, 350 days per year (Gallup and Healthways, 2009). The WBI began in January 2008 and is reported monthly and annually with total respondents exceeding three hundred and fifty thousand each year. In addition to national index scores, scores are available for all 50 states, approximately 185 metropolitan statistical areas (MSAs), and 435 congressional districts. The frequency and granularity of the WBI allow researchers to reliably study well-being across different areas of the U.S. and to compare the WBI with other secondary data. The WBI, when presented along with any of its sub-indices, is known as the composite WBI.

The composite WBI is comprised of six sub-indices: the Life Evaluation Index (LEI), the Emotional Health Index (EHI), the Work Environment Index (WEI), the Physical Health Index (PHI), the Healthy Behavior Index (HBI), and the Basic Access Index (BAI). A complete description of the sub-indices can be found on the WBI website (Gallup and Healthways, 2009). Of the six sub-indices, the EHI, PHI, and HBI are hypothesized to be associated with health-related measures like the clinical and utilization variables found in the IOM data.

## Methodology

### *Data*

Annual WBI scores from 2008 to 2010 were obtained for all 306 U.S. hospital referral regions (HRRs) by assigning WBI respondents to HRRs using the most recent zip code to HRR crosswalk file obtained from the Dartmouth Atlas of Health Care website (Dartmouth Institute for Health Policy & Clinical Practice, 2012). The WBI scores consisted of the composite WBI and each of its six component sub-indices. Only WBI respondents age 65 and older were used in the analysis in order to align with the clinical and utilization data's population. A complete description of the WBI indices can be found on the WBI website (Gallup and Healthways, 2009).

Clinical and utilization variables were obtained from the HRR Level Demographic, Cost, Utilization, and Quality Data files from the IOM website (Institute of Medicine, 2012), which is provided to IOM by CMS. The population of the IOM data is Medicare fee-for-service beneficiaries age 65 or older who were enrolled in Medicare Parts A and B. The clinical and utilization variables selected from the IOM data for the analysis are listed in Table 1.

**Table 1: Selected Clinical and Utilization Variables**

| Variable Name | Detailed Description |
|---|---|
| Heart Attack | Percent of Medicare beneficiaries who have had a heart attack |
| CKD | Percent of Medicare beneficiaries with chronic kidney disease (CKD) |
| COPD | Percent of Medicare beneficiaries with chronic obstructive pulmonary disease (COPD) |
| Depression | Percent of Medicare beneficiaries with depression |
| Diabetes | Percent of Medicare beneficiaries with diabetes |
| Heart Failure | Percent of Medicare beneficiaries with heart failure |
| Heart Disease | Percent of Medicare beneficiaries with ischemic heart disease |
| Hypertension | Percent of Medicare beneficiaries with hypertension |
| IP Stays | Percent of Medicare beneficiaries using hospital inpatient (IP) services with at least one stay covered by Medicare |
| DME Use | Percent of Medicare beneficiaries using durable medical equipment (DME) services |
| Hospital Readmission Rate | Percent of inpatient readmissions within 30 days of an acute hospital stay |
| ER Visits Per 1,000 | Rate per 1,000 Medicare beneficiaries of inpatient or hospital outpatient emergency department (ER) visits |

### *HRR-Level Analysis of the Variation of Well-Being*

Minimum, maximum, and coefficient of variation (COV) statistics were computed for the composite WBI and sub-indices by HRR and compared to the variation in health care spending and utilization listed in other studies. The COV, which is a univariate statistical metric of variation and is computed as the standard deviation divided by the mean, has been utilized in previous regional health care research (Congressional Budget Office, 2008). Maximum to minimum ratios were computed by dividing the maximums by the minimums and provide a separate indicator of the variability as well as the range of each evaluated factor.

### *Cross-Sectional Analysis of Well-Being by HRR*

Each cross-sectional composite WBI and sub-index data series by HRR were tested for statistically significant correlation with the IOM data variables in Table 1 using Pearson's correlation coefficient. Correlation coefficients with p-values less than or equal to 0.01 correspond to significance at the 99% level; coefficients with p-values greater than 0.01 were denoted not significant (NS).

### *Results*

### *Variation of Well-Being Analysis*

After examining the maximum to minimum ratios and coefficient of variation (COV) statistics for the composite WBI and sub-indices, it was determined that the Work Environment Index (WEI) should not be used for an age 65 and older population due to its high variance stemming from low coverage in the cohort. Specifically, we observed only 12% of the 65 and older population had non-missing values for the WEI, with most of the missing values attributed to respondents no longer

being employed. Therefore, the composite WBI was adjusted by excluding the WEI and re-averaging across the remaining five sub-indices, which are not dependent upon employment status. This new formulation of the composite WBI is henceforth referred to as the adjusted composite WBI. Table 2 summarizes the variation statistics for the original composite and adjusted composite WBI as well as for the sub-indices for 2010. Table 3 presents variation statistics for the 2010 IOM data.

**Table 2: Variation Statistics for the 2010 Composite and Sub-Index WBI at the HRR Level.**

| Data Variable | Mean | Standard Deviation | Minimum | Maximum | Minimum to Maximum Ratio | Coefficient of Variation (COV) |
|---|---|---|---|---|---|---|
| Composite WBI | 69.5 | 2.4 | 60.7 | 78.3 | 1.29 | 0.03 |
| Adjusted Composite WBI | 72.0 | 2.0 | 65.1 | 77.8 | 1.20 | 0.03 |
| LEI | 39.5 | 5.2 | 21.9 | 55.2 | 2.52 | 0.13 |
| EHI | 84.8 | 1.8 | 76.7 | 89.0 | 1.16 | 0.02 |
| PHI | 75.1 | 2.3 | 66.9 | 80.3 | 1.20 | 0.03 |
| HBI | 73.7 | 2.4 | 64.1 | 80.6 | 1.26 | 0.03 |
| WEI | 57.2 | 10.5 | 25.0 | 88.9 | 3.56 | 0.18 |
| BAI | 86.9 | 2.2 | 80.4 | 92.3 | 1.15 | 0.03 |

**Table 3: Variation Statistics for the 2010 IOM Data at the HRR Level**

| Data Variable | Mean | Standard Deviation | Coefficient of Variation | Data Variable | Mean | Standard Deviation | Coefficient of Variation |
|---|---|---|---|---|---|---|---|
| Heart Attack | 1.02 | 0.22 | 0.21 | Heart Disease | 32.80 | 6.20 | 0.19 |
| CKD | 14.93 | 2.22 | 0.15 | Hypertension | 60.33 | 6.56 | 0.11 |
| COPD | 11.84 | 2.43 | 0.21 | IP Stays | 20.18 | 2.21 | 0.11 |
| Depression | 11.60 | 1.78 | 0.15 | DME Use | 30.59 | 3.58 | 0.12 |
| Diabetes | 27.29 | 4.10 | 0.15 | Hospital Readmission Rate | 17.53 | 2.13 | 0.12 |
| Heart Failure | 17.17 | 2.96 | 0.17 | ER Visits Per 1,000 | 564.79 | 68.32 | 0.12 |

***Cross-Sectional Analysis***

Table 4 demonstrates that at the HRR level all twelve selected clinical and utilization variables were consistently negatively correlated with the adjusted composite WBI over the three examination years of 2008, 2009, and 2010. For the adjusted composite WBI, the correlation coefficients ranged from -0.22 to -0.59 with the highest values for the rates of chronic obstructive pulmonary disease (COPD), inpatient (IP) stays, durable medical equipment (DME) use, and emergency department (ER) visits per 1,000 beneficiaries.

**Table 4: Significant Correlation Coefficients at the HRR Level for the Adjusted Composite WBI (Sorted by Descending Average Three-Year Correlation)**

| Data Variable | 2008 | 2009 | 2010 | Data Variable | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|
| COPD | -0.55 | -0.50 | -0.59 | Diabetes | -0.25 | -0.34 | -0.35 |
| IP Stays | -0.55 | -0.49 | -0.51 | Hypertension | -0.29 | -0.31 | -0.33 |
| ER Visits Per 1,000 | -0.53 | -0.46 | -0.50 | Heart Disease | -0.26 | -0.32 | -0.35 |
| DME Use | -0.47 | -0.44 | -0.58 | Depression | -0.30 | -0.26 | -0.25 |
| Heart Attack | -0.48 | -0.38 | -0.41 | Hospital Readmission Rate | -0.25 | -0.28 | -0.23 |
| Heart Failure | -0.35 | -0.39 | -0.46 | CKD | -0.25 | -0.22 | -0.25 |

Tables 5 and 6 display the significant correlation coefficients for the five (the WEI was not included for the reason listed in the Variation of Well-Being Analysis section) WBI component sub-indices. The variables recording the highest negative correlations on a consistent basis were again the rates of COPD, IP stays, DME use, and ER visits. Specifically, for the LEI, the correlation coefficients ranged from -0.16 to -0.46 with the highest values for the rates of heart attack, IP stays, and COPD. Correlation coefficients for the EHI ranged from -0.18 to -0.44 with the highest values for the rates of heart failure, heart disease, COPD, diabetes, and hospital readmissions. Correlation coefficients for the PHI ranged from -0.16 to -0.58 with the highest values for the rates of DME use, ER visits, COPD, and IP stays. For the HBI, the correlation coefficients ranged from -0.22 to -0.56 with the highest values for the rates of IP stays, COPD, hypertension, and hospital readmissions. Correlation coefficients for the BAI ranged from -0.15 to -0.56 with the highest values for the rates of DME use, COPD, and ER visits.

Extending the correlation analysis results, the coefficient of determination, which is the square of the correlation coefficients, quantifies the proportion of variation of one variable that is explained by the variation of the other variable. For example, the coefficient of determination between the adjusted composite WBI and ER Visits in 2010 would be 0.25 or 25% based upon the correlation coefficient of -0.50. Thus, the variation in the adjusted composite WBI explains 25% of the variation in ER visits and vice versa. The coefficient of determination is important because it helps segment the correlation coefficient magnitudes into low, moderate, and high correlation. General guidelines for ranking correlation coefficients state that coefficients of magnitude less than 0.30, between 0.30 and 0.50, and greater than 0.50 are considered low, moderate, and high correlations, respectively (Cohen, 1988); these thresholds approximate coefficients of determination of 9% and 25%. Based on a meta-analysis by Hemphill (2003), correlation coefficients above 0.30 were indicative of being in the upper third of all such coefficients reported across 380 studies.

**Table 5: Significant Correlations at the HRR Level for the LEI, EHI, and PHI Component Sub-Indices (2008, 2009, 2010)**

| | Year and Sub-Index | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 2008 | | | 2009 | | | 2010 | | |
| Data Variable | LEI | EHI | PHI | LEI | EHI | PHI | LEI | EHI | PHI |
| Heart Attack | -0.46 | -0.21 | -0.35 | -0.27 | -0.25 | -0.30 | -0.30 | -0.30 | -0.36 |
| CKD | -0.16 | -0.21 | -0.20 | NS* | -0.23 | -0.16 | NS* | -0.22 | -0.17 |
| COPD | -0.33 | -0.32 | -0.45 | -0.27 | -0.32 | -0.41 | -0.31 | -0.44 | -0.49 |
| Depression | -0.32 | NS* | -0.22 | -0.20 | -0.18 | -0.23 | -0.17 | -0.18 | -0.23 |
| Diabetes | NS* | -0.30 | -0.20 | NS* | -0.37 | -0.31 | NS* | -0.40 | -0.28 |
| Heart Failure | NS* | -0.34 | -0.30 | NS* | -0.39 | -0.32 | -0.21 | -0.44 | -0.36 |
| Heart Disease | NS* | -0.35 | -0.17 | NS* | -0.38 | -0.18 | -0.19 | -0.37 | -0.19 |
| Hypertension | NS* | -0.27 | -0.19 | NS* | -0.31 | -0.22 | NS* | -0.35 | -0.27 |
| IP Stays | -0.39 | -0.27 | -0.38 | -0.27 | -0.26 | -0.33 | -0.38 | -0.36 | -0.39 |
| DME Use | -0.27 | -NS* | -0.47 | -0.25 | NS* | -0.49 | -0.34 | -0.34 | -0.58 |
| Hospital Readmission Rate | NS* | -0.35 | NS* | NS* | -0.36 | NS* | NS* | -0.35 | NS* |
| ER Visits Per 1,000 | -0.34 | -0.26 | -0.47 | -0.24 | -0.29 | -0.43 | -0.21 | -0.39 | -0.53 |

*NS* Denotes Not Significant*

**Table 6: Significant Correlations at the HRR Level for the HBI and BAI Component Sub-Indices (2008, 2009, 2010)**

| | Year and Sub-Index | | | | | |
|---|---|---|---|---|---|---|
| | 2008 | | 2009 | | 2010 | |
| Data Variable | HBI | BAI | HBI | BAI | HBI | BAI |
| Heart Attack | -0.32 | -0.20 | -0.28 | -0.27 | -0.29 | -0.27 |
| CKD | -0.22 | NS* | -0.34 | -0.19 | -0.35 | -0.20 |
| COPD | -0.40 | -0.49 | -0.41 | -0.50 | -0.54 | -0.56 |
| Depression | NS* | -0.16 | NS* | NS* | -0.24 | NS* |
| Diabetes | -0.23 | -0.24 | -0.37 | -0.42 | -0.34 | -0.41 |
| Heart Failure | -0.32 | -0.32 | -0.37 | -0.40 | -0.46 | -0.42 |
| Heart Disease | -0.25 | -0.15 | -0.39 | -0.24 | -0.39 | -0.27 |
| Hypertension | -0.37 | -0.19 | -0.43 | -0.36 | -0.44 | -0.37 |
| IP Stays | -0.48 | -0.37 | -0.52 | -0.37 | -0.56 | -0.40 |
| DME Use | -0.34 | -0.52 | -0.31 | -0.51 | -0.43 | -0.56 |
| Hospital Readmission Rate | -0.33 | NS* | -0.46 | -0.27 | -0.37 | -0.27 |
| ER Visits Per 1,000 | -0.38 | -0.43 | -0.33 | -0.47 | -0.41 | -0.48 |

*NS* Denotes Not Significant*

## Discussion

The variation statistics for the composite Well-Being Index (WBI) and its sub-indices shown in Table 2 display a high level of variation for the Life Evaluation (LEI) and Work Environment Indices (WEI). Although the high COV for the WEI should be ignored due to the low levels of employment in the 65 and older population, the high COV for the LEI implies there is a large degree of variation in the life evaluation component of well-being at the HRR-level. Other than the LEI and WEI, the other components of well-being and the composite WBI exhibit much lower levels of variation.

The correlation coefficient statistics between the WBI series and the IOM clinical and utilization variables shown in Tables 4, 5, and 6 were consistently negative over the three examination years of 2008, 2009, and 2010. The consistent negative correlations over the three years suggest that overall and by component well-being has an inverse relationship to disease and health care utilization. While causality (i.e, Does well-being affect disease prevalence and health care utilization or vice versa or both?) is not examined in this analysis, the results have laid the groundwork for further study. For example, the results indicate differential magnitudes of relationship between well-being and disease and health care utilization that may guide future research. Specifically, a consistent, moderate correlative relationship was found for the variables heart attack, COPD, heart failure, IP stays, DME use, and ER visits; for the remainder of variables the correlation coefficients were low to moderate. Future research emphasis, then, should be focused on exploring the six disease and utilization variables listed above.

Limitations of this study include the IOM data source and the sole use of correlation statistics. The IOM data population consists of the age 65 and older fee-for-service Medicare population. Medicare beneficiaries under age 65 and those with a Medicare HMO plan like Medicare Advantage are not included. In addition, since there is a lack of data at the HRR level for non-Medicare individuals, relationships between well-being and clinical prevalence and utilization cannot be assessed even though the WBI data consists of both Medicare and non-Medicare individuals. Correlation statistics, which are usually a first step in assessing variables to include in a causal model, do not imply causality. The correlation coefficients presented here should not be interpreted that well-being is causal or predictive of disease and utilization, only that a relationship exists.

## Conclusion

The correlation analysis findings presented here show a moderate to strong relationship between specific domains of well-being and levels of disease prevalence, health care spending and utilization at the Hospital Referral Region level of analysis. Further, the results indicate that well-being may be a valuable source of information for minimizing unexplained variance observed in Medicare spending across geographic regions. Across 306 distinct areas, the HRRs that had higher well-being tended to have lower prevalence of disease and utilization. Specifically, rates of heart attack, COPD, heart failure, IP stays, DME use, and ER visits were shown to have the strongest relationships to well-being among the clinical and utilization variables examined in the 65 and older Medicare fee-for-service population.

Future research should be directed toward quantifying the relationship between well-being and geographic variation in utilization of Medicare and commercial heath care spending. If

this research finds that the inclusion of well-being information not only helps to refine existing formulas used to account for geographic disparities in health care payments but also shows an omitted variable bias type of effect, the policy implications are profound. Specifically, current payment policies directed at health care provider utilization and compensation may fail to create the desired outcome of better health at lower cost due to a focus on considering a limited set of factors with the inappropriate level of intensity. In other words, by focusing policy change on physicians and hospitals without due diligence concerning the demographic, morbidity, and well-being of patients – as well their potential engagement with health care providers – across geographies, then health care spending will continue along the current upward trajectory.

### *ABOUT HEALTHWAYS*

*For three decades, Healthways has been dedicated to improving the human condition. Each year, we learn more and do more for the millions of individuals who count on us to make a difference in their health and well-being. Healthways solutions deliver clear value. We are enhancing well-being, improving business performance and reducing healthcare costs. We have a long history of adapting to the customers we serve and honing our solutions for improved impact. Our approach is straightforward. Our solutions are complete, flexible, precise and personal.*

### *ABOUT THE CENTER FOR HEALTH RESEARCH*

*The Center for Health Research performs advanced analytics with data collected from millions of participants over twenty-five years of Healthways programming. Currently, Healthways houses six times the volume of data contained in the Library of Congress. That depth and breadth of information allows the team to conduct a vast range of research, and it is used to advance their thinking in all levels of healthcare. For access to our Virtual Research Library, and the reports published by the team at the Healthways Center for Health Research, go to www.healthways.com/research.*

***NOTES***

*[1] Pearson's correlation coefficient is also known as r or rho.*

*[2] In the 2010 WBI dataset, 25% of the 65 and older population was in the work force compared to 78% of the under 65 population.*

*[3] These thresholds refer to the absolute value of the correlation coefficients as they can be negative or positive.*

## REFERENCES

1 Blanchflower, D. & Oswald, A. (2004). Well-being over time in Britain and the USA. Journal of Public Economics, 88(7-8), 1359-1386.

2 Cohen, J. (1988). Statistical Power Analysis for the Behavioral Sciences (2nd edition). Hillsdale, NJ: Erlbaum.

3 Congressional Budget Office (2008). Geographic Variation in Health Care Spending, February 2008, http://www.cbo.gov/publication/41669. Accessed 1 August 2012.

4 Dartmouth Institute for Health Policy & Clinical Practice (2012). Dartmouth Atlas of Health Care: 2010 Zip Code to HSA and HRR Crosswalk File. Resource document. The Trustees of Dartmouth College. http://www.dartmouthatlas.org/downloads/geography/ZipHSAHRR10.xls. Accessed 1 May 2012.

5 Fisher, E., Wennberg, D., Stukel, T, Gottlieb, D., Lucas, F. & Pinder, E. (2003). The Implications of Regional Variations in Medicare Spending, Part1: The Content, Quality, and Accessibility of Care. Annals of Internal Medicine, 138, 273-287.

6 Fisher, E., Wennberg, D., Stukel, T., & Gottlieb, D. (2004). Variations in the Longitudinal Efficiency of Academic Medical Centers. October 2004, Health Affairs, Web exclusive, http://content.healthaffairs.org/cgi/content/full/hlthaff.var.19/DC3.

7 Fisher, E., Goodman, D., Skinner, J., & Bronner, K. (2009) Health Care Spending, Quality, and Outcomes – More Isn't Always Better, February 27, 2009, The Dartmouth Institute for Health Policy & Clinical Practice, www.dartmouthatlas.org/downloads/reports/Spending_Brief_022709.pdf, Accessed 1 August 2012.

8 Hadley, J., Berenson, R., Waidmann, T., & Zuckerman, S. (2006). Variations in Medical Care Spending per Medicare Beneficiary: The First Stage of an Instrumental Variable Analysis. Final report submitted May 2006 to Changes in Health Care Financing and Organization Program, Project ID 53269.

9 Hemphill, J. (2003). Interpreting the Magnitudes of Correlation Coefficients. American Psychologist, 58, 78-79.

10 Gallup, Inc. & Healthways, Inc. (2009). Gallup-Healthways Well-Being Index: Methodology report for indexes. Resource document. Gallup-Healthways Well-Being Index. http://www.well-beingindex.com/methodology.asp. Accessed 1 August 2012.

11 Institute of Medicine (2012). Institute of Medicine: HRR Level Demographic, Cost, Utilization, and Quality Data. Resource document. National Academy of Sciences. http://iom.edu/Activities/HealthServices/GeographicVariation/Data-Resources.aspx. Accessed 1 May 2012.

12 Kaiser Family Foundation (2009). Explaining Health Care Reform: How Do Health Care Costs Vary by Region?, December 2009, http://www.kff.org/healthreform/8030.cfm. Accessed 1 August 2012.

13 Oswald, A. (2010). Objective confirmation of subjective measures of human well-being: Evidence from the U.S.A. Science, 327(1), 576-579.

14 Sirovich, B., Gallagher, P., Wennberg, D. & Fisher, E. (2008). Discretionary Decision Making by Primary Care Physicians and the Cost of U.S. Health Care. Health Affairs, 27(3), 813-823.

15 Stevenson, B. & Wolfers, J. (2008). Economic growth and subjective well-being: Reassessing the Easterlin Paradox. Brookings Papers on Economic Activity, Spring.