

The Concentration of Health Care Expenditures in the U.S. and Predictions of Future Spending

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Abstract: Estimates of health care expenses for the U.S. population are critical to policymakers and others concerned with access to medical care and the cost and sources of payment for that care. Medical care expenses, however, are highly concentrated among a relatively small proportion of individuals in the community population. Using information from the Household Component of the Medical Expenditure Panel Survey (MEPS-HC), this study provides detailed estimates of the concentration and persistence in the level of health care expenditures in the United States. Attention is given to identifying the characteristics of individuals with the highest levels of medical expenditures, in addition to those factors that are associated with low medical expense profiles. Analyses are included to discern the most salient factors that serve to predict the likelihood of experiencing high levels of medical expenditures in a subsequent year, in addition to the factors operational in predictions of experiencing low levels of medical expenditures in a subsequent year.

Key words: medical expenditures; distributions; predictions.

Introduction: Health care expenditures represent more than one-sixth of the U.S. gross domestic product, exhibit a rate of growth that exceeds other sectors of the economy, and constitute one of the largest components of the federal budget and states' budgets. Although the rate of growth in health care spending has slowed in the past few years, costs continue to rise, in particular for hospital care and prescription medications. As a result, an evaluation of the current health care system requires an understanding of the patterns and trends in the use of health care services and their associated costs and sources of payment. Studies that examine the concentration and persistence of high levels of expenditures over time are essential to help discern the factors most likely to drive health care spending and the characteristics of the individuals who incur them. Estimates of health care expenses for the U.S. civilian noninstitutionalized (community) population are critical to policymakers and others concerned with access to medical care and the cost and sources of payment for that care. In 2012, health care expenses among the U.S. community population totaled \$1.351 trillion. Medical care expenses, however, are highly concentrated among a relatively small proportion of individuals in the community population. Based on estimates from the 1977 National Medical Care Expenditure Survey, 1987 National Medical Expenditure Survey, and the 1996 Medical Expenditure Survey (MEPS), it was determined that the top one percent of the population with the highest costs consistently accounted for more than one-quarter of all expenses, while the top five percent accounted for more than half [4]. More recent data have revealed that over time there has been some decrease in the extent of this concentration at the upper tail of the expenditure distribution [7, 8].

Using information from the Household Component of the Medical Expenditure Panel Survey (MEPS-HC), this study provides detailed estimates of the concentration and persistence in the level of health care expenditures in the United States. Attention is given to identifying the characteristics of individuals with the highest levels of medical expenditures, in addition to those factors that are associated with low medical expense profiles. Analyses are included to discern the most salient factors that serve to predict the likelihood of experiencing high levels of medical expenditures in a subsequent year, in addition to the factors operational in predictions of experiencing low levels of medical expenditures in a subsequent year. The MEPS-HC data are particularly well suited to facilitate these analyses.

Data: The Medical Expenditure Panel Survey (MEPS), sponsored by the Agency for Healthcare Research and Quality, is the primary national source for comprehensive annual data on how Americans use and pay for medical care. The survey collects detailed information from families on access, use, expenses, insurance coverage and quality. Data from the MEPS have become a linchpin for public and private economic models projecting health care expenditures and utilization. The MEPS is designed to provide annual estimates at the national level of the health care utilization, expenditures, sources of payment and health insurance coverage of the U.S. civilian non-institutionalized population. The MEPS consists of a family of interrelated surveys, which include a Household Component (HC), a Medical Provider Component (MPC), and an Insurance Component (IC). In addition to collecting data that support annual estimates for a variety of measures related to health insurance coverage, healthcare use and expenditures, MEPS provides estimates of measures related to health status, demographic characteristics, employment, access to health care and health care quality. The survey also supports estimates for individuals, families and population subgroups of interest. The data collected in this ongoing longitudinal study also permit studies of the determinants of insurance take-up, use of services and expenditures as well as changes in the provision of health care in relation to social and demographic factors such as employment and income; the health status and satisfaction with care of individuals and families; and the health needs of specific population groups such as racial and ethnic minorities, the elderly and children [5, 10, 13].

Concentration of Health Care Expenditures: In 2012, the top 1 percent of the U.S. civilian non-institutionalized population, ranked by their health care expenses, accounted for 22.7 percent of total health care expenditures with an

annual mean expenditure of \$97,956. The top 5 percent of the population accounted for 50.0 percent of total expenditures with an annual mean expenditure of \$43,058. In addition, the top 10 percent of the population accounted for 66.0 percent of total expenditures with an annual mean expenditure of \$28,468. Overall, the top 50 percent of the population ranked by their expenditures accounted for 97.3 percent of overall health care expenditures while the lower 50 percent accounted for only 2.7 percent of the total. Those individuals ranked in the top half of the health care expenditure distribution had an annual mean expenditure of \$8,384. The MEPS-HC defines total expense as the sum of payments from all sources to hospitals, physicians, other health care providers (including dental care and home health), and pharmacies for services reported by respondents in the survey. In 2012, the top 5 percent of individuals without a treated chronic condition accounted for 57.0 percent of health care expenditures for this subpopulation with an annual mean of \$13,132. For persons with a single chronic condition, the top 5 percent comprised 48.8 percent of health care expenditures incurred by this subgroup, exhibiting a mean of \$31,460. Among individuals with two chronic conditions, the top 5 percent accounted for 46.9 percent of health care expenditures for this subgroup, with a mean expenditure of \$53,384. For those persons with three chronic conditions, the top 5 percent were associated with 40.5 percent of this groups overall health care expenses, exhibiting a mean of \$60,976. The top 5 percent of individuals with four or more chronic conditions accounted for 29.7 percent of health care expenditures for this subpopulation with an annual mean of \$78,198. Based on chronic condition status, persons with four or more chronic conditions had the lowest concentrated levels of health care expenditures and the highest annual mean expenses at the top quantiles of the expenditure distribution [7].

Distribution of Healthcare Expenses over Time: In 2011, 1 percent of the population accounted for 21.5 percent of total health care expenditures. Of those individuals ranked at the top 1 percent of the health care expenditure distribution in 2011 (with a mean expenditure of \$92,825), 19.6 percent maintained this ranking with respect to their 2012 health care expenditures. Among those individuals ranked in the top 5 percent of the health care expenditure distribution in 2011 (with a mean expenditure of \$42,228), approximately 35 percent retained this ranking with respect to their 2012 health care expenditures (Table 2). Similarly, the top 10 percent of the population accounted for 65.3 percent of overall health care expenditures in 2011 (with a mean expenditure of \$27,927), and 41.5 percent of this subgroup retained this top decile ranking with respect to their 2012 health care expenditures. The data also indicate that a small percentage of the individuals in the top percentiles in 2011 had expenditures for only one year because they died, were institutionalized, or were otherwise ineligible for the survey in the subsequent year. In both 2011 and 2012, the top 30 percent of the population accounted for 90 percent of health care expenditures. Among those individuals ranked in the top 30 percent of the health care expenditure distribution in 2011, 63.2 percent retained this ranking with respect to their 2012 health care expenditures. Furthermore, individuals ranked in the top half of the health care expenditure distribution in 2011 accounted for 97 percent of all health care expenditures. Among this population subgroup, 75 percent maintained this ranking in 2012. Alternatively, individuals ranked in the bottom half of the health care expenditure distribution accounted for only 2.8 percent of medical expenditures (with a mean expenditure of \$240 in 2011). Similar to the experience of the top half of the population based on their medical expenditure rankings, 74.3 percent of those in the lower half of the expenditure distribution retained this classification in 2012 [8]. Given the high concentration of medical expenditures incurred by the top decile of the population ranked by health care spending (65.3 percent), identifying the characteristics of those individuals exhibiting significant reductions in health care spending in a subsequent year is also of interest. Among those ranked in the top decile in 2011 based on their high level of medical expenditures, 28.4 percent shifted to a ranking in the lower 75 percent of the expenditure distribution in 2012. Individuals ranked in the lower 75 percent of health care spending accounted for only 13.3 percent of all medical expenditures in 2012.

Prediction of Future Likelihood of Concentrated Expenditures: Recent examinations of the characteristics of high cost individuals have also revealed that expenditures are directly related to age and those in the highest five percent of the medical expenditure distribution relative to the lower half were more likely to be in fair or poor physical or mental health and to need help with at least one activity of daily living [14]. Several studies have demonstrated persistence of high medical spending over time and nationally representative data have been used to examine the most costly medical conditions which may also relate to persistently high expenditures [1-4, 6, 15-19]. The subpopulation of high medical spenders is a particularly important health policy group and the ability to predict or identify these individuals is important for the study of various health policy issues. Some of the previous prediction modeling efforts in this area have focused on diagnoses to predict costs [2,15], while others have used regression modeling to examine the predictive capacity of demographic, socioeconomic, and health status and conditions data to identify those individuals likely to incur high levels of medical care expenditures [14,17]. Further research on predictors of persistence of individuals to remain in the top decile of spending has made use of information on prior year's medical care expenses [8].

We build upon prior research efforts that have identified predictors and predictive models helpful in targeting those individuals likely to incur high levels of medical expenditures in a subsequent year. With the MEPS longitudinal design, analysts have assessed the persistence of high health care expenditures by examining whether individuals in high percentiles of the health care expenditure distribution in a particular year remain in the upper percentiles in the following

year or shift to a higher or lower percentile [20]. The primary objective of this analysis is to identify the most salient factors that 1) predict the likelihood of experiencing high levels of medical expenditures in a subsequent year, and 2) are predictors of experiencing low levels of medical expenditures in a subsequent year. The models that are developed in this study have particular relevance as statistical tools to inform efficient sampling strategies to ensure adequate coverage of high expenditure individuals in national sample surveys. Furthermore, such modeling efforts are particularly attractive to assist in the targeting of disease management programs for high cost cases, which may facilitate reductions in the concentration of overall future year health care expenditures.

Given the analytical and substantive importance of those individuals that are characterized by a high concentration of medical expenditures in a subsequent year or longer period duration, the development and specification of accurate models to predict the future likelihood of the occurrence of this event based on predispositional information is highly desirable. A similar argument can be made for the utility of prediction models that accurately identify those individuals at the opposite end of the expenditure distribution, those characterized by the lowest levels of health care spending. Competing criterion measures for this effort include annual total medical expenditures; rank order of annual medical expenditures; and the likelihood of medical expenditures in the top and lower deciles of the medical expenditure distribution. For these analyses, a logistic model was specified and defined individuals with highly concentrated expenditures in a subsequent year as those in the top 10% of the health care expenditure distribution ($Y=1$, with all other individuals classified as $Y=0$). Similarly, a logistic model was specified and defined individuals with low levels of expenditures in a subsequent year as those in the lower 50% of the health care expenditure distribution ($Y=1$, with all other individuals classified as $Y=0$). All the predispositional variables under consideration as potential predictors were based on an individual's year 1 data profile. Based on prior studies that have assessed the relationship between an individual's characteristics at an initial time period, (year 1, $t(1)$) relative to their significant association with future year expenditures (year 2, $t(2)$), the following pre-dispositional factors were given consideration in this study: Demographic and geographical characteristics: Age; sex; race/ethnicity; marital status; family size; region; MSA classification; Income: poverty status classification; Health insurance coverage: full year insured; part year insured; uninsured; Health status measures: health status; limitations in activity; Health conditions: Number of chronic conditions; Diagnosis of arthritis; back problems; cancer; cerebrovascular disease; skin disorders; diabetes; heart disease; high blood pressure; infectious diseases; stomach or intestinal disorders; lupus; high cholesterol; mental disorders; pneumonia; other respiratory disorders; Accidental events: poisoning; trauma; Health care utilization measures: inpatient events; ambulatory visits; number of prescribed medicine purchases; Health care expenditure measures: total health care spending.

Likelihood of Being in the Top Decile of Expenditures in 2012, Based on 2011 Profiles: In the final logistic regression model developed for predicting individuals likely to incur high levels of medical expenditures in a subsequent year, prior year expenditures, frequency of prescribed medication purchases, the number of ambulatory visits, activity limitations and health status were among the most significant predictors among the resultant set of significant factors that defined the model (Table 1). Individuals with higher levels of prior year medical expenditures were significantly more likely to be in the top decile of the expenditure distribution in a subsequent year. Those individuals with the higher frequency of prescribed medicines and/or office based physician visits in 2011 were also more likely to incur high levels of expenditures in 2012. Furthermore, the presence of a work, housework or school related limitation in 2011 and/or exhibiting poor health status were associated with a greater likelihood of incurring the higher health expenditures in 2012. Other measures that were significant factors in distinguishing the likelihood of higher healthcare expenditures in a subsequent year included age, gender, insurance coverage, the number of chronic diseases, poverty status and the presence of cerebrovascular disease or pneumonia in the prior year. Women were more likely to incur the higher expenditures in 2012 as were individuals aged 80 or older relative to those under age 65, those with multiple chronic conditions and those uninsured for all of 2011. Alternatively, individuals with incomes below the poverty level, near poor, low or middle income in 2011 relative to those with high income were less likely to incur high levels of medical expenditures in the subsequent year. Finally, a likelihood ratio test for the goodness of fit for this model rejected the null hypothesis that the model's coefficients were jointly equal to zero and the pseudo- R^2 for the model is 0.159. Individual attitudes and opinions may also visibly impact upon an individual's decisions on how and when to use health care services and associated decisions with respect to medical expenditures. These health care preference measures often serve as important inputs in helping predict health behaviors that include health care coverage, utilization and medical expenditure decisions [9].

Likelihood of Being in the Lower Half of the Medical Expenditure Distribution in 2012, Based on 2011 Profiles: In the final logistic regression model developed for predicting individuals likely to incur low levels of medical expenditures in a subsequent year, prior year expenditures, frequency of prescribed medication purchases, the number of ambulatory visits, health status, number of chronic conditions and poverty status were among the most significant predictors among the resultant set of significant factors that defined the model. Individuals with lower levels of prior year medical expenditures were significantly more likely to be in the bottom half of the expenditure distribution in a subsequent year. Those

individuals with fewer prescribed medicine purchases and/or fewer office based physician visits in 2011 were also more likely to incur low levels of expenditures in 2012. Furthermore, non-high income individuals, individuals exhibiting excellent health status in 2011 and those with no chronic diseases were associated with a greater likelihood of incurring the lowest levels of health expenditures in 2012. Other measures that were significant factors in distinguishing the likelihood of lower healthcare expenditures in a subsequent year included age, gender, insurance coverage, race/ethnicity, family size, region, MSA status, and the absence of chronic conditions in the prior year. Men were more likely to incur the lower levels of health expenditures in 2012 as were the youngest individuals, Hispanics, those in large families, and those residing in non-MSA areas. In addition, the absence of trauma, cancer, mental disorders, skin disorder and poisoning in the prior year, were predictive of lower health care expenditure profiles in a subsequent year. Finally, a likelihood ratio test for the goodness of fit for this model rejected the null hypothesis that the model's coefficients were jointly equal to zero and the pseudo-R² for the model is 0.355.

Discussion: Study findings continue to demonstrate that medical care expenses are highly concentrated among a relatively small proportion of individuals in the population. In 2012, the top 1 percent ranked by their health care expenses accounted for 22.7 percent of total health care expenditures with an annual mean expenditure of \$97,956 while the lower 50 percent accounted for only 2.7 percent of the total. Furthermore, the characteristics that distinguish these two disparate groups of individuals are notably distinct. Individuals with higher levels of prior year medical expenditures, higher levels of prior year health care utilization, poorer health status and those with multiple chronic conditions were significantly more likely to be in the top decile of the expenditure distribution in a subsequent year. Alternatively, individuals with the lowest levels of prior year medical expenditures, infrequent use of health care services and limited prescribed medicine purchases, in excellent health status and with no chronic conditions were significantly more likely to be in the lower half of the expenditure distribution in a subsequent year. In addition to the socio-economic profiles that distinguish individuals predicted to incur high levels of medical expenditures in a subsequent year, the findings restricted to adults demonstrate that attitudes regarding the value of health insurance coverage also impact on subsequent medical expenditure behaviors.

The implementation of health insurance exchanges in 2014 and other changes in the U.S. health care system due to the Affordable Care Act are affecting employer decisions about health insurance offerings and the behavior of individuals in signing up for insurance plans. Consequently, predicting future estimates of the concentration of health care expenditures and the persistence of this concentration on current trends is problematic. As more individuals and households alter their decisions with respect to acquiring health insurance coverage, the take-up of coverage for those newly insured will be accompanied by corresponding changes in their health care access, their use of services and associated medical expenditures. These changes in behavior for the newly insured will likely reflect significant changes relative to their prior interactions with the health care system. In order to improve upon accuracy, it is essential that future modeling efforts focused on predicting out-year health care expenditure patterns will need to control for the impact of the ACA on healthcare utilization and expenditures. As a consequence of its representativeness, scope, content, and breadth, the MEPS is well positioned to continue to serve as a vital resource to inform provisions of the Affordable Care Act. Its capacity to measure the impact of changes in health insurance coverage on access to care, service utilization, and related expenditures, health outcomes, and quality coincides with several evaluative needs of the ACA legislation [13].

These research findings from the MEPS provide clear evidence of the utility and appropriateness of probabilistic models as prediction tools for identifying individuals likely to incur high levels of medical expenditures in future years. To the extent that this policy-relevant subset of the population is amenable to successful prediction through the application of well-developed models, the methodology continues to find several appropriate venues. Prominent examples ripe for application include the adoption of oversampling strategies for national health care surveys to improve the precision of analyses that characterize individuals with high levels of medical expenditures. In addition, such models help facilitate the identification of individuals who may benefit in terms of health status improvements through disease management programs, which in turn, could potentially yield substantial reductions in their subsequent health care expenditures.

Note: The views expressed in this paper are those of the author and no official endorsement by the Department of Health and Human Services or the Agency for Healthcare Research and Quality is intended or should be inferred.

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Table 1: Logistic Regression Model to Identify Individuals Likely to Be in the Top Decile of the Medical Expenditure Distribution in 2012, Based on 2011 Profiles (2011-2012 MEPS)

Independent Variables	Beta Coeff.	SE Beta	P-value T-Test B=0	d.f	Wald F	P-value Wald F
OVERALL MODEL				26	148.52	<0.0001
Intercept	-2.21017	0.48106	0.00001			
AGECAT				6	4.39	0.0003
0-11 yrs	-1.27068	0.34904	0.00035			
12-17 yrs	-0.97522	0.27506	0.00049			
18-39 yrs	-0.53764	0.17437	0.00234			
40-54 yrs	-0.67241	0.16723	0.00008			
55-64 yrs	-0.44945	0.17089	0.00921			
65-79 yrs	-0.24412	0.15552	0.11808			
SEX				1	19.91	<0.0001
male	-0.35570	0.07971	0.00001			
INS12M				2	10.96	<0.0001
FY INSURED	0.76026	0.18040	0.00004			
PY INSURED	0.50375	0.25370	0.04847			
Poverty				4	11.01	<0.0001
poor	-0.54683	0.11484	<0.00001			
near poor	-0.62922	0.18509	0.00082			
low income	-0.59835	0.12043	<0.00001			
middle income	-0.45433	0.09935	0.00001			
Health status				4	11.37	<0.0001
Excellent	-1.20449	0.21101	<0.00001			
Very Good	-0.89278	0.18919	<0.00001			
Good	-0.68838	0.19184	0.00042			
Fair	-0.38089	0.19069	0.04717			
ACTLIM				2	18.99	<0.0001
Yes	0.97725	0.37830	0.01052			
No (N.A. reference)	0.25707	0.37817	0.49745			
Cerebrovascular				1	10.48	0.0014
yes	-0.78870	0.24361	0.00142			
Pneumonia				1	11.27	0.0009
yes	0.85829	0.25571	0.00095			
# of CHRONIC COND.	0.14809	0.02509	<0.00001	1	34.84	<0.0001
# of RX Purchases	0.01333	0.00226	<0.00001	1	34.87	<0.0001
# of amb. visits	0.02116	0.00357	<0.00001	1	35.04	<0.0001
Total medical \$s 2011	0.00002	0.00001	<0.00004	1	17.66	<0.0001

n= 18,057, Restricted to individuals in the population in both 2011-2012

-2 * Normalized Log-Likelihood with Intercepts Only : 11735.98

-2 * Normalized Log-Likelihood Full Model : 8607.87

Approximate Chi-Square (-2 * Log-L Ratio) : 3128.11

Degrees of Freedom : 25

Source: 2011 -2012 Medical Expenditure Panel Survey Household Component, Center for Financing, Access and Cost Trends, Agency for Healthcare Research and Quality