



# HHS Public Access

Author manuscript

*Res Sociol Health Care*. Author manuscript; available in PMC 2019 September 01.

Published in final edited form as:

*Res Sociol Health Care*. 2018 September ; 36: 59–84. doi:10.1108/S0275-495920180000036003.

## ROLE OF CANCER HISTORY AND GENDER IN MAJOR HEALTH INSURANCE TRANSITIONS: A LONGITUDINAL NATIONALLY REPRESENTATIVE STUDY

Katherine S. Virgo, Chun Chieh Lin, Amy Davidoff, Gery P. Guy Jr, Janet S. de Moor, Donatus U. Ekwueme, Erin E. Kent, Neetu Chawla, and K. Robin Yabroff

### Abstract

**Purpose** —To examine associations by gender between cancer history and major health insurance transitions (gains and losses), and relationships between insurance transitions and access to care.

**Methodology** —Longitudinal 2008–2013 Medical Expenditure Panel Survey data pooled yielding 2,223 cancer survivors and 50,692 individuals with no cancer history ages 18–63 years upon survey entry, with gender-specific sub-analyses. Access-to-care implications of insurance loss or gain were compared by cancer history and gender.

**Findings** —Initially uninsured cancer survivors were significantly more likely to gain insurance coverage than individuals with no cancer history (RR: 1.25; 95% CI: 1.08–1.44). Females in particular were significantly more likely to gain insurance (unmarried RR: 1.16; 95% CI: 1.06–1.28; married RR: 1.09; 95% CI: 1.02–1.16). Significantly higher rates of difficulty accessing needed medical care and prescription medications were reported by those remaining uninsured, those who lost insurance, and women in general. Remaining uninsured, losing insurance, and male gender were associated with lack of a usual source of care.

**Research implications** —Additional outreach to disadvantaged populations is needed to improve access to affordable insurance and medical care. Future longitudinal studies should assess whether major Affordable Care Act (ACA) provisions enacted after the 2008–2013 study period (or those of ACA’s replacement) are addressing these important issues.

**Originality** —Loss of health insurance coverage can reduce health care access resulting in poor health outcomes. Cancer survivors may be particularly at risk of insurance coverage gaps due to the long-term chronic disease trajectory. This study is novel in exploring associations between

---

#### Publisher's Disclaimer: DISCLAIMERS

**Publisher's Disclaimer:** The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of Emory University, University of Michigan, Yale University, the American Cancer Society, Centers for Disease Control and Prevention, National Cancer Institute, or the Department of Veterans Affairs.

#### CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest.

#### PRESENTATIONS

A preliminary version of this chapter “Impact of Health Insurance Transitions on Cancer Survivors and Those with No Cancer History,” with less years of data was presented at the 48th Annual Meeting of the American Society of Clinical Oncology, May 29–June 2, 2015, Chicago, IL, <http://meetinglibrary.asco.org/content/150426-156> (*Journal of Clinical Oncology* 33s, 2015; abstract 6539).

cancer history by gender and health insurance transitions, both gains and losses, in a national non-elderly adult sample.

### Keywords

Health insurance; cancer; gender; sex; non-elderly; transition; access; longitudinal

---

## INTRODUCTION

In 2012, prior to the rollout of the major Affordable Care Act (ACA) provisions, 48 million individuals were uninsured in the United States, representing 15.4% of the population (DeNavas-Walt, Proctor, & Smith, 2013). Approximately 25% of the population experienced at least one month without health insurance coverage. Those without insurance coverage face limited access to health care services (Chen, Rizzo, & Rodriguez, 2011; O'Hara & Caswell, 2013) and are less likely to be up-to-date with recommended preventive health services (Institute of Medicine, 2002; Yabroff et al., 2013). Furthermore, the uninsured are less likely to receive recommended treatment, more likely to have poor health outcomes, and are at increased risk of death (Yabroff et al., 2013). This is especially problematic for patients at risk of new or recurrent disease and those with chronic debilitating conditions. Cancer survivors are particularly at risk of losing insurance and access to care, especially during the potentially long survival period after initial treatment ends and management of late and long-term effects of treatment begins. Even if insurance is maintained after initial treatment, high cost sharing and lifetime benefit limits may leave patients with insurmountable debt (Schwartz, Claxton, Martin, & Schmidt, 2009).

Health insurance is often employment-based for the US working age population, whether through one's own or a spouse's place of employment, though temporary, part-time, or low-wage jobs may provide no employment-related health benefits (Gabel, Pickreign, Whitmore, & Schoen, 2001). Typically, individuals become uninsured during job transitions or periods of inability to work.

Among the general population, the literature suggests that employment, higher income, higher educational levels, and non-Hispanic white race/ethnicity are associated with gaining and maintaining insurance coverage. Younger age (19–24 years), male gender, losing or changing jobs, low income, lower educational levels, and fair or poor health status are associated with losing insurance coverage (Bennefield, 1998; Cohen, 2014a; Crimmell, 2004; Cutler & Gelber, 2009; Czajka & Mabli, 2009; Fairlie & London, 2005; Jerant, Fiscella, & Franks, 2012; Ku & Ross, 2002; Short, 1998; Short & Graefe, 2003; Short, Graefe, & Schoen, 2003; Short, Graefe, Swartz, & Uberoi, 2012; Swartz, Marcotte, & McBride, 1993a, 1993b; Zuckerman, Kenney, Dubay, Haley, & Holahan, 2001). Number of months without coverage varies widely by time interval examined and how uninsured is defined, but predictors of longer spells without health insurance are similar to predictors of losing insurance coverage. Short and Graefe (2003) found that most of the uninsured remained so for more than 12 months over a four-year period. Burstin, Swartz, O'Neil, Orav, and Brennan (1998) examined implications of being uninsured. Patients who lost or changed insurance in the past year were more likely to have no usual source of care and delay seeking

care within four months after an emergency room visit than those with no change in coverage (Burstin et al., 1998).

Little research has explored major insurance transitions (becoming insured [insurance gain] and becoming uninsured [insurance loss]) and the predictors thereof among cancer survivors (Parsons et al., 2014), though the impact of insurance status (e.g., Medicaid insured, Medicare insured, privately insured, uninsured) on cancer diagnosis, treatment, and survival is well known (e.g., Grant et al., 2015; Zeng et al., 2015). It is important to understand whether cancer survivors are more likely to undergo a major health insurance transition than those with no cancer history and, if so, which factors are associated with these transitions. Similarly, information is lacking on whether gender plays an important role in major insurance transitions. This study is novel in exploring associations between cancer history and health insurance transitions, both gains and losses, by gender in a national non-elderly adult sample, and also in examining associations between major insurance transitions and access to care by cancer history and gender.

## METHODS

### Data Source

Longitudinal data from the 2008–2013 Medical Expenditure Panel Survey (MEPS) (panels 12–17) Household Component (HC) were pooled to examine associations between cancer history and major health insurance transitions (gain and loss) over the two-year observation periods with specific sub-analyses for females. The HC is drawn annually from a nationally representative subsample of the prior year's National Health Interview Survey (NHIS) household participants. Each panel is followed for two years through five rounds of in-person interviews. One individual typically responds for all household family members. Response rates ranged from 53.5% to 59.3% (Agency for Healthcare Research and Quality, 2014a). Available data for the current study includes socio-demographic characteristics, health status, smoking status, insurance characteristics, and access to care. More detail on survey design is available elsewhere (Agency for Healthcare Research and Quality, 2014b). For analyses of publicly available datasets, Institutional Review Board approval was not required.

### Study Population

Cancer survivors and individuals with no cancer history ages 18–63 years upon MEPS entry during 2008–2013 were selected for study inclusion. Individuals older than 63 years at survey entry were not included due to impending Medicare eligibility during the two-year observation period. Cancer survivors were identified by the question: “Ever been told by a health professional that you had cancer or a malignancy of any kind?” Individuals with no cancer history were the comparison group. Of 2,408 excluded subjects, the majority either did not complete all five survey rounds ( $N = 1,718$ ) or had non-melanoma skin cancer or skin cancer not otherwise classified only ( $N = 663$ ). The remaining 27 had either multiple months of missing insurance data or no employment information. The final unweighted sample size was 52,915 (51% female): 2,223 cancer survivors (72% female) and 50,692 individuals with no cancer history (53% female). Excluded individuals were more likely to

be initially uninsured, 55–63 years of age, male (56%), employed non-continuously during the survey years, high school educated or less, in fair or poor health, and smokers (exclusion table available upon request).

### Covariates

Socio-demographic characteristics measured at MEPS entry included age (18–34, 35–44, 45–54, 55–63 years), gender, marital status, self-reported race/ethnicity (non-Hispanic white, other), education (high school graduate, >high school graduate), and family income as a percentage of the federal poverty level (FPL) (poor or near poor: <125%, low income: 125% to <200%, middle-to-high income: ≥200%). Race/ethnicity was included because of the anticipated significant effect on insurance transitions even after controlling for socioeconomic indicators (income, employment, education). Employment status (always employed (full- or part-time), always unemployed, non-continuously employed) was based on self-report at each survey round. Health-related covariates included health status at survey entry (excellent or very good, good, fair, or poor) and smoking status in round two (yes or no). Risk aversion, also from round two, was defined as whether health insurance was worth the cost (Cohen, 2014b). The original 5-point response scale (1 = disagree strongly to 5 = agree strongly) was recoded: disagree (strongly or somewhat), uncertain, and agree (strongly or somewhat). Survey panel controlled for secular trends over time. Cancer-specific variables included number of cancers (single or multiple) and years since cancer diagnosis. Cancer site was not separately included due to small sample size for most sites.

### Outcomes

**Insurance Status**—For each of the 24 months observed, all individuals (cancer survivors and those with no cancer history) were classified as insured (any private or solely public) or uninsured. Once the first insurance status was identified, initially insured or uninsured, for each individual, each successive month was examined to identify the first month when an insurance transition occurred. Among the initially uninsured, the intent was to identify whether insurance was ever gained. Among the initially insured, the goal was to identify whether insurance was ever lost.

**Access to Care**—Two dichotomous (yes or no) access-to-care measures were included: inability or delay in obtaining needed medical care or prescription medications and having a usual source of care. Individuals with insurance gains or losses occurring after MEPS round four (when access questions were fielded) were excluded from this analysis only (3.9% of 52,915 individuals).

### Statistical Analyses

Descriptive statistics (weighted) were used to characterize study participants by cancer history and gender according to their initial insurance status as well as to analyze months spent in each insurance status. We assessed the relationship between access to care and insurance gain or loss similarly.

To examine associations between cancer history, gender, and insurance transitions for the initially uninsured and insured, two separate multivariable logistic regression analyses were

conducted (Hosmer & Lemeshow, 1989). Due to the likely interaction of marital status with gender and health insurance, gender and marital status were combined in the models (female married, female not married, male married, male not married). Other model inclusion candidates were age, race/ethnicity, family income, employment status, education, perceived health status, smoking status, and risk aversion. Parsimonious models were derived separately for insurance gain and loss using a model entry cut point of  $p < 0.20$ , among the initially uninsured and initially insured, respectively. All models included MEPS panel to control for secular trend. Results are presented as predicted marginal risk ratios (RRs), which directly standardize each group outcome to the covariate distribution of the population (Graubard & Korn, 1999). RRs were used because odds ratios are biased estimators when the outcome is common (Bieler, Brown, Williams, & Brogan, 2010; Lumley, Kronmal, & Ma, 2006). Weighted analyses accounted for the MEPS complex survey design (SAS, 2016; SUDAAN, 2012). All tests were two-tailed and alpha was set at  $p < 0.05$ .

## RESULTS

### Baseline Characteristics

The study sample included 16,123 initially uninsured individuals, of whom 417 (3.0%) were cancer survivors, and 36,792 initially insured individuals, of whom 1,806 (5.2%) were cancer survivors. Cancer survivors were more likely to be older (45–63 years), married (46.9%), non-Hispanic white, and unemployed during both years observed compared to individuals with no cancer history irrespective of initial insurance status (Tables 1 and 2). Cancer survivors were also more likely to perceive their health as fair or poor and to be smokers.

Among initially uninsured cancer survivors (Table 1), only two gender-specific differences were identified. Females were significantly younger (<45 years of age) than males and were more likely to report having multiple cancers. In contrast, initially uninsured females with no cancer history were older (45 + years of age) than their male counterparts, more likely to be married, poor based on family income, unemployed in both study years, have completed at least some college, have rated their health status as good or fair/poor, be non-smokers, and disagree strongly or somewhat with the statement that health insurance is not worth the cost.

In addition to the previously described differences between cancer survivors and those with no cancer history that were common to both initial insurance statuses, initially insured cancer survivors (Table 2) were also more likely than those with no cancer history to be publicly insured at baseline, poor based on family income, and to strongly or somewhat disagree with the statement that “health insurance is not worth the cost.” Several gender-specific differences were also identified. Among initially insured cancer survivors, females were more likely than males to have public insurance at baseline, were younger (<45 years of age), with a family income classified as poor or low, were unemployed or only occasionally employed, and were more likely to report having multiple cancers and a longer elapsed time since cancer diagnosis (six or more years). In contrast, initially insured females with no cancer history were significantly more likely than their male counterparts to have public insurance at baseline, were younger (<35 years of age), unmarried, of other race/

ethnicity, with a family income classified as poor or low, were unemployed or only occasionally employed, to have rated their health status as fair/poor, were non-smokers, and disagreed strongly or somewhat that health insurance is not worth the cost.

Though, for obvious reasons, no comparisons were possible between those with and without a cancer history for the two cancer-specific variables, comparisons were possible between initially uninsured and initially insured cancer survivors. Among all 2,223 cancer survivors, the initially uninsured reported greater elapsed time (six or more years) since cancer diagnosis compared to the initially insured (43.84% and 38.35%, respectively,  $p = 0.0271$ ).

### Health Insurance Transition Frequency

Initially uninsured cancer survivors were more likely to gain insurance (primarily private insurance) than individuals with no cancer history (45.4% and 34.0%, respectively,  $p < 0.01$ ; Table 1). Initially uninsured females with no cancer history were also significantly more likely to gain insurance (with the largest difference for public insurance gain) than initially uninsured males with no cancer history ( $p < 0.001$ ).

Initially insured cancer survivors were significantly less likely to lose insurance when compared with individuals with no cancer history (10.5% and 14.5%, respectively,  $p < 0.001$ ; Table 2). However, the subset of initially insured female cancer survivors was more likely than initially insured male cancer survivors to have lost insurance in general. Similarly, among those with no cancer history, initially insured females were significantly more likely than their male counterparts to have lost public insurance ( $p < 0.001$ ).

### Health Insurance Status Duration in Months

For the 10,787 (19.2%) who eventually had an insurance transition, the average durations of the initial and second insurance statuses (insured or uninsured) within the 24-month data period were 11.4 and 9.4 months, respectively (table available upon request). The initially insured spent 1.1 months longer in their initial insurance status than the initially uninsured did (11.9 and 10.8 months,  $p < 0.001$ ). Thus, time to an insurance transition was slightly longer for the initially insured (becoming uninsured) than for the initially uninsured (becoming insured). The reverse was, therefore, true for subsequent insurance status (7.9 and 11.4 months, respectively,  $p < 0.001$ ). Insurance status duration did not differ by cancer history. Thus, sub-analyses were not conducted by gender.

### Health Insurance Gain or Loss

In unadjusted analyses, cancer survivors were more likely to gain insurance (RR: 1.33; 95% CI: 1.16–1.54; Table 3) and less likely to lose insurance (RR: 0.72; 95% CI: 0.61–0.85; Table 4) than those with no cancer history. In adjusted analyses, cancer history only remained significant for gaining insurance (RR: 1.25; 95% CI: 1.08–1.44; Table 3). The risk of losing insurance was similar between cancer survivors and individuals with no cancer history (RR: 0.88; 95% CI: 0.75–1.02; Table 4). Other factors positively associated with insurance gain among the initially uninsured in the adjusted analyses were younger age (18–34 years), female gender (independent of marital status), being non-Hispanic white, employed at least sometime during both years observed, and disagreeing strongly or

somewhat that “health insurance is not worth the cost.” Factors negatively associated with insurance gain among the initially uninsured were being an unmarried male, poor or low income status, and having no education beyond high school. Sensitivity analyses using Cox proportional hazards regressions were conducted modeling time to insurance change rather than change (yes, no). The results were essentially unchanged.

### Access to Care

The initially uninsured who gained insurance coverage were less likely than those remaining uninsured to be without a usual source of care (36.6% and 59.3%, respectively,  $p < 0.001$ ; Fig. 1). The high rate of no usual source of care among those gaining insurance overall was striking and slightly higher among those with no cancer history who gained insurance (37.3%), but was not seen among initially uninsured cancer survivors who gained insurance. Among cancer survivors who gained insurance coverage, 21.3% reported having no usual source of care compared to 44.1% among cancer survivors who remained uninsured ( $p < 0.001$ ). Cancer survivors who gained insurance were also less likely than those remaining uninsured to report inability or delay in obtaining medical care or prescription medications (18.1% and 29.6%, respectively;  $p < 0.05$ ).

The initially insured who lost insurance coverage were more likely than those remaining insured to report inability or delay in (12.7% and 6.5%, respectively,  $p < 0.001$ ) accessing needed medical care or prescription medications and to be without a usual source of care (39.0% and 17.9%, respectively,  $p < 0.001$ ) (Fig. 2). For no usual source of care, consistently higher rates were identified for cancer survivors (24.2% and 9.3%, respectively,  $p < 0.01$ ) and those with no cancer history (39.6% and 18.4%, respectively,  $p < 0.001$ ) who lost insurance compared to remaining insured, though the rates of no usual source of care for cancer survivors were one-third or one-half lower than the rates among those with no cancer history. For inability or delay obtaining medical care or prescription medications, those who lost insurance consistently reported higher rates than those who remained insured among both cancer survivors (23.7% and 12.5%, respectively,  $p < 0.05$ ) and those with no cancer history (12.3% and 6.2%, respectively,  $p < 0.001$ ). However, among cancer survivors, the rates were approximately double those reported among those with no cancer history.

In gender-specific analyses (not factoring in cancer history due to small sample size), initially uninsured females who gained insurance reported significantly higher rates of inability or delay accessing needed medical care or prescription medications compared to initially uninsured males (13.2% and 9.1%, respectively;  $p < 0.001$ ; Fig. 3). Similar results were seen for those who remained uninsured, but the rates were higher (16.3% and 10.1%, respectively;  $p < 0.001$ ). When inability and delay in accessing needed medical care were examined separately, the rates were slightly less than when combined, but the general patterns were similar. Irrespective of whether initially uninsured females gained insured or not, they remained significantly more likely ( $p < 0.01$ ) to report inability or delay problems than males.

For no usual source of care, initially uninsured females were significantly less likely ( $p < 0.001$ ) to have no usual source of care when compared to initially uninsured males, irrespective of whether they gained insurance or not. Rates of reporting no usual source of

care were high, even among those who gained insurance (30.6% of females and 43.3% of males). Among those remaining uninsured, 49.9% of females and 66.3% of males reported no usual source of care.

Results for the access to care comparisons for the initially insured by gender (Fig. 4) were consistent with those for the initially uninsured. Initially insured females reported significantly ( $p < 0.001$ ) higher rates of inability or delay in accessing needed medical care or prescription medications when compared to initially insured males, irrespective of whether they remained insured (7.5% and 5.3%, respectively) or lost insurance (14.9% and 10.3%, respectively). When inability and delay in accessing needed medical care were examined separately, the rates were slightly less than when combined, but the general patterns were similar. Irrespective of whether initially insured females lost insurance or not, they remained significantly more likely ( $p < 0.01$ ) to report inability or delay problems than males.

For no usual source of care, initially insured females were significantly less likely ( $p < 0.001$ ) to have no usual source of care when compared to initially insured males, irrespective of whether they lost insurance or not. Rates of reporting no usual source of care, though lower than among the initially uninsured, were still somewhat high, even among those who remained insured (14.3% of females and 22.0% of males). Among those who lost insurance, 34.9% of females and 43.6% of males reported no usual source of care.

## DISCUSSION

Based on longitudinal nationally representative data, our findings shed new light regarding insurance transition patterns, particularly regarding gender differences among cancer survivors compared to individuals with no cancer history, and factors associated with insurance gain and loss. Within the 24-month data period, time to an insurance transition was significantly longer for the initially insured (becoming uninsured) than for the initially uninsured (becoming insured) (11.9 and 10.8 months,  $p < 0.001$ ). Uninsured cancer survivors were more likely to gain insurance coverage compared to individuals with no cancer history. Females in particular, both married and unmarried, were significantly more likely to gain insurance. The risk of losing insurance was similar between cancer survivors and their counterparts with no cancer history. Potential implications of these results for promoting access to care among cancer survivors, particularly females, are encouraging.

Our finding that 10.5% of initially insured cancer survivors lost insurance and 54.6% of initially uninsured cancer survivors remained uninsured suggests further efforts are needed to prevent insurance loss and promote insurance gain among those with chronic diseases such as cancer, particularly the disadvantaged in states that opted out of the Medicaid expansion (Sommers, Graves, Swartz, & Rosenbaum, 2014). Major ACA provisions implemented in 2014 (after the study period and not reflected in our data), such as Medicaid program expansion (in most states) to adults with family incomes up to 138% of the FPL, elimination of health insurance denials for pre-existing health conditions, and affordable insurance plan availability through Health Insurance Marketplaces (Kaiser Family Foundation, 2010), have reduced the uninsured rate. Urban Institute data for non-elderly

adults showed a 4 percentage point drop in the uninsured rate from 17.9% in September 2013 to 13.9% in June 2014 (Long et al., 2014). Gallup poll estimates for first quarter 2016 showed an additional drop to 11.0% (Markin, 2016). Rand estimates for September 2013 through February 2015 suggest that 22.8 million people gained insurance coverage and 5.9 million lost coverage, for a net gain of 16.9 million individuals with coverage after the major ACA provisions had taken effect (Carmen, Eibner, & Paddock, 2015).

However, as our analyses of access-to-care effects of insurance transitions show, even among the uninsured who gain insurance, the percent with no usual source of care remains high for both females and males, at levels similar to insured individuals who lost insurance. This suggests that some newly insured individuals may face high deductibles, co-pays, and limited benefits, restricting access to care (Collins, Rasmussen, Beutel, & Doty, 2015). Other barriers may remain, such as transportation costs and difficulty navigating the health care system. Limited understanding of how to choose a health insurance plan may be a factor (Loewenstein et al., 2013). In a recent article, Schleicher, Mullangi, and Feeley (2016) suggest that narrow hospital networks within the ACA exchanges continue to restrict access to high quality cancer care.

Our finding, that a lower percentage of those gaining insurance versus remaining uninsured (overall: 7.6% vs 10.5%; among females: 9.1% vs 13.0%) were unable to obtain needed medical care or prescription medications, was encouraging. Somewhat surprising was the relatively small difference (overall 2.9%; females 3.9%) between groups. We suspect inability to obtain needed services among those remaining uninsured is underreported. The definition of “needed” medical care and prescription medications is likely more precise among those with a usual source of care, but this aspect is difficult to definitely assess from our data. Our preliminary analyses suggest that insurance longevity may also be important.

Though insurance transition frequency was low, this was expected due to the somewhat short (24 month) observation period. Health insurance transitions for non-elderly adults are often employment-related and permitted infrequently (i.e., due to household size, primary residence, or income changes). Even for Medicaid or Tricare enrollees, similar enrollment period restrictions generally apply. With respect to insurance status duration within the 24-month data period, the finding that cancer survivors were initially insured for a longer period than similar cancer survivors were initially uninsured is somewhat reassuring, though the duration of remaining uninsured is still excessively long.

Though longitudinal, nationally representative and utilizing rich patient-level data, our study has limitations. First, the two-year observation window for insurance transitions is relatively short as limited by the dataset. Datasets, such as the Survey of Income and Program Participation, provide longer follow-up, but inadequate cancer-related data. Second, individuals diagnosed with cancers of short survival duration are likely underrepresented in our study, due to the household-based MEPS structure (and NHIS from which it is drawn) and our exclusion of individuals not participating in all survey rounds. Third, the small percentage (4.7%) of excluded individuals differed from the study cohort in some aspects. This was not unexpected, as participation in all five rounds may be more difficult for young adults in transition and disadvantaged populations. Fourth, our cancer survivor sample was

heterogeneous, with varying times since cancer diagnosis relative to the survey observation years, although those who gained and those who lost insurance had similar times since diagnosis. Fifth, panel may not be the perfect proxy for secular trend over time due to the overlapping nature of the panels. Finally, small sample size prohibited multivariable modeling of the relationship between insurance transitions and access to care by cancer history. Studies with larger samples are needed.

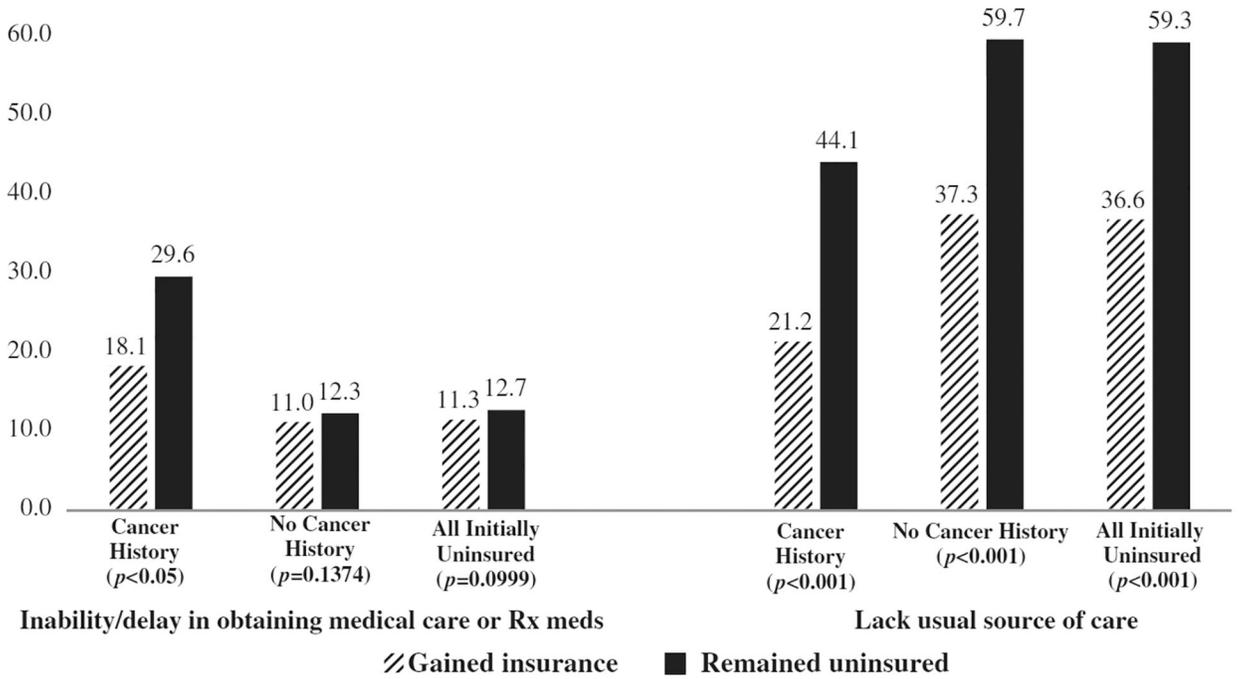
Further study is also needed of the impact of chronic conditions, such as cancer, on insurance gain and loss among younger populations with variable employment status who are at higher risk for losing health insurance. Cancer survivors need consistent health insurance coverage, yet coverage is inconsistent. Providing incentives for those with inconsistent access, such as younger populations, to enroll in health insurance could decrease coverage volatility and improve continuity of care. Analyses of future MEPS panels will permit examination of the major 2014 ACA provision effects on insurance transitions for comparison with the current study's baseline results. Future MEPS panels will also permit examination of the effects on insurance transitions of either a modified ACA or whatever replacement health care legislation is eventually enacted (Kaiser Family Foundation, 2017).

## REFERENCES

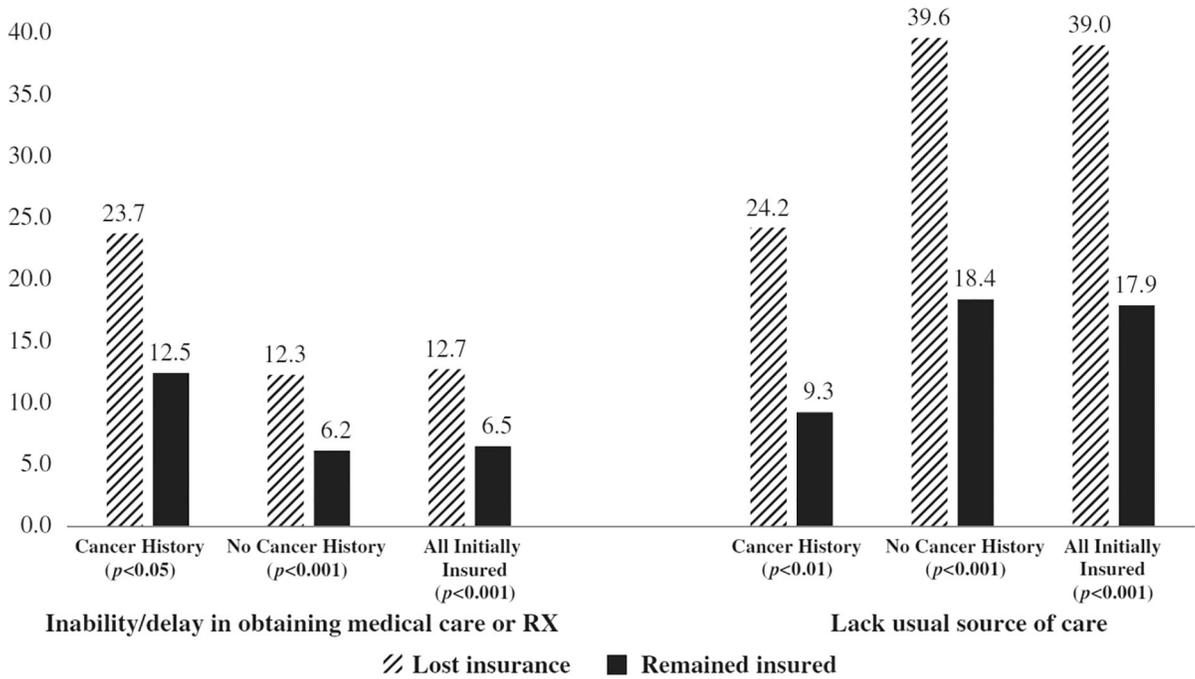
- Agency for Healthcare Research and Quality. (2014a). MEPS-HC response rates. Retrieved from [http://meps.ahrq.gov/mepsweb/survey\\_comp/hc\\_response\\_rate.jsp](http://meps.ahrq.gov/mepsweb/survey_comp/hc_response_rate.jsp). Accessed on July 25, 2014.
- Agency for Healthcare Research and Quality. (2014b). MEPS survey background. Retrieved from [http://meps.ahrq.gov/mepsweb/about\\_meps/survey\\_back.jsp](http://meps.ahrq.gov/mepsweb/about_meps/survey_back.jsp). Accessed on July 25, 2014.
- Bennefield RL (1998). Dynamics of economic well-being: Health insurance, 1993–1995 Current population report P70–64, August 1998. Washington, DC: U.S. Census Bureau Retrieved from <https://www.census.gov/sipp/p70s/p70-64.pdf>. Accessed on July 15, 2014.
- Bieler GS, Brown GG, Williams RL, & Brogan DJ (2010). Estimating model-adjusted risks, risk differences, and risk ratios from complex survey data. *American Journal of Epidemiology*, 171(5), 618–623. [PubMed: 20133516]
- Burstin HR, Swartz K, O'Neil AC, Orav EJ, & Brennan TA (1998). The effect of change of health insurance on access to care. *Inquiry*, 35(4), 389–397. [PubMed: 10047769]
- Carmen KG, Eibner C, & Paddock SM (2015). Trends in health insurance enrollment, 2013–15. *Health Affairs*, 34(5), 1044–1048. [PubMed: 25947173]
- Chen J, Rizzo JA, & Rodriguez HP (2011). The health effects of cost-related treatment delays. *American Journal of Medical Quality*, 26(4), 261–271. [PubMed: 21478458]
- Cohen SB (2014a). Transitions in health insurance coverage over time, 2009–2013 (selected intervals): Estimates for the U.S. civilian noninstitutionalized adult population under Age 65. Statistical Brief #439, May 2014. Rockville, MD: Agency for Healthcare Research and Quality Retrieved from [http://www.meps.ahrq.gov/mepsweb/data\\_files/publications/st439/stat439.pdf](http://www.meps.ahrq.gov/mepsweb/data_files/publications/st439/stat439.pdf). Accessed on July 15, 2014.
- Cohen SB (2014b). Attitudes toward health insurance and their persistence over time, adults, 2001–2011. Statistical Brief #433, April 2014. Rockville, MD: Agency for Healthcare Research and Quality Retrieved from [http://meps.ahrq.gov/data\\_files/publications/st433/stat433.pdf](http://meps.ahrq.gov/data_files/publications/st433/stat433.pdf). Accessed on July 15, 2014.
- Collins SR, Rasmussen PW, Beutel S, & Doty MM (2015). The problem of underinsurance and how rising deductibles will make it worse: Findings from the commonwealth fund biennial health insurance survey, 2014. Issue Brief, May 2015. New York, NY: Commonwealth Fund Retrieved from [http://www.commonwealthfund.org/~media/files/publications/issue-brief/2015/may/1817\\_collins\\_problem\\_of\\_underinsurance\\_ib.pdf](http://www.commonwealthfund.org/~media/files/publications/issue-brief/2015/may/1817_collins_problem_of_underinsurance_ib.pdf). Accessed on June 30, 2015.

- Crimmel BL (2004, 5). Health insurance coverage and income levels for the U.S. noninstitutionalized population under age 65, 2001. Statistical Brief #40, May 2004. Rockville, MD: Agency for Healthcare Research and Quality Retrieved from [http://meps.ahrq.gov/data\\_files/publications/st40/stat40.pdf](http://meps.ahrq.gov/data_files/publications/st40/stat40.pdf). Accessed on July 15, 2014.
- Cutler DM, & Gelber AM (2009). Changes in the incidence and duration of periods without insurance. *New England Journal of Medicine*, 360(17), 1740–1748. [PubMed: 19387016]
- Czajka JL, & Mabli J (2009). Analysis of transition events in health insurance coverage. MPR Reference # 6125–801. Washington, DC: Mathematica Policy Research Retrieved from <https://www.mathematica-mpr.com/our-publications-and-findings/publications/analysis-of-transition-events-in-health-insurance-coverage>. Accessed on June 30, 2015.
- DeNavas-Walt C, Proctor BD, & Smith JC (2013). U.S. Census Bureau, current population reports, P60–245, income, poverty, and health insurance coverage in the United States: 2012. Washington, DC: U.S. Government Printing Office Retrieved from <https://www.census.gov/content/dam/Census/library/publications/2013/demo/p60-245.pdf>. Accessed on July 15, 2014.
- Fairlie RW, & London RA (2005). The dynamics of health insurance coverage: Factors correlated with insurance gain and loss among adults. Final report submitted to the U.S. Department of Labor, August 31, 2005.
- Gabel JR, Pickreign JD, Whitmore HH, & Schoen C (2001). Embraceable you: How employers influence health plan enrollment. *Health Affairs*, 20(4), 196–208. [PubMed: 11463077]
- Grant SR, Walker GV, Guadagnolo BA, Koshy M, Allen PK, & Mahmood U (2015). Variation in insurance status by patient demographics and tumor site among nonelderly adult patients with cancer. *Cancer*, 121(12), 2020–2028. [PubMed: 25917222]
- Graubard BI, & Korn EL (1999). Predictive margins with survey data. *Biometrics*, 55(2), 652–659. [PubMed: 11318229]
- Hosmer DW, & Lemeshow S (1989). Interpretation of the coefficients of the logistic regression model Applied logistic regression (pp. 38–81). New York, NY: Wiley.
- Institute of Medicine, Committee on the Consequences of Uninsurance. (2002). Care without coverage: Too little, too late. Washington, DC: National Academy Press Retrieved from <https://www.nap.edu/download/10367>. Accessed on June 30, 2014.
- Jerant A, Fiscella K, & Franks P (2012). Health characteristics associated with gaining and losing private and public health insurance: A national study. *Medical Care*, 50(2), 145–151. [PubMed: 21945971]
- Kaiser Family Foundation. (2010). Health reform implementation timeline: April 2010. Retrieved from <http://www.nln.org/docs/default-source/advocacy-public-policy/health-reform-implementation-timeline-from-the-kaiser-family-foundation—4-27-10-%28pdf%29-pdf?sfvrsn0>. Accessed on June 30, 2014.
- Kaiser Family Foundation. (2017). Compare proposals to replace the Affordable Care Act. Retrieved from <http://www.kff.org/interactive/proposals-to-replace-the-affordable-care-act/>. Accessed on August 4, 2017.
- Ku L, & Ross DC (12 2002). Staying covered: The importance of retaining health insurance for low-income families. New York, NY: Commonwealth Fund Retrieved from <https://www.commonwealthfund.org/publications/fund-reports/2002/dec/staying-covered-the-importance-of-retaining-health-insurance-for-low-income-families>. Accessed on June 30, 2014.
- Loewenstein G, Friedman JY, McGill B, Ahmad S, Linck S, Sinkula S, ... Volpp KG (2013). Consumers' misunderstanding of health insurance. *Journal of Health Economics*, 32(5), 850–862. [PubMed: 23872676]
- Long SK, Kenney GM, Zuckerman S, Wissoker D, Shartz A, Karpman M, & Anderson N (2014). Quick take: Number of uninsured adults continues to fall under the ACA: Down by 8.0 million in June 2014. July 10, 2014. Washington, DC: Urban Institute Retrieved from <http://hrms.urban.org/quicktakes/Number-of-Uninsured-Adults-Continues-to-Fall.html>. Accessed on July 15, 2014.
- Lumley T, Kronmal R, & Ma S (2006). Relative risk regression in medical research: Models, contrasts, estimators, and algorithms. University of Washington Biostatistics Working Paper Series Paper 293. Retrieved from <http://biostats.bepress.com/uwbiostat/paper293/>. Accessed on July 15, 2014.

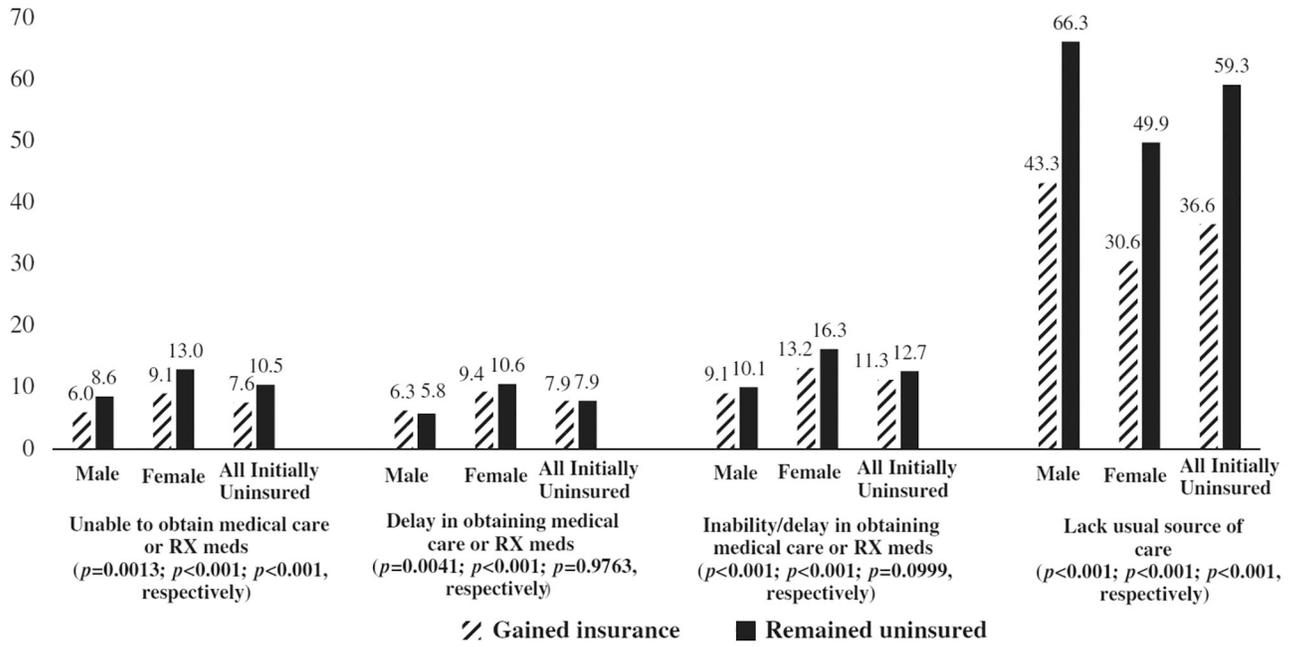
- Markin S (2016). U.S. uninsured rate at 11.0%, lowest in eight-year trend. Washington, DC: Gallup Retrieved from <http://www.gallup.com/poll/190484/uninsured-rate-lowest-eight-year-trend.aspx?version=print>. Accessed on April 7, 2016.
- O'Hara B, & Caswell K (2013). U.S. Census Bureau, current population reports, P70-133RV, health status, health insurance, and medical services utilization: 2010. July 2013. Washington, DC: U.S. Government Printing Office Retrieved from <https://www.census.gov/prod/2012pubs/p70-133.pdf>. Accessed on June 30, 2016.
- Parsons HM, Schmidt S, Harlan LC, Kent EE, Lynch CF, Smith AW, ... the AYA HOPE Collaborative. (2014). Young and uninsured: Insurance patterns of recently diagnosed adolescent and young adult cancer survivors in the AYA HOPE study. *Cancer*, 120(15), 2352–2360. [PubMed: 24899580]
- SAS Institute. (2016). SAS version 9.3. Cary, NC: SAS Institute.
- Schleicher SM, Mullangi S, & Feeley TW (2016). Effects of narrow networks on access to high-quality cancer care. *JAMA Oncology*, 2(4), 427–428. [PubMed: 26967581]
- Schwartz K, Claxton G, Martin K, & Schmidt C (2009). Spending to survive: Cancer patients confront holes in the health insurance system. February 2009. Kaiser Family Foundation and American Cancer Society Retrieved from <https://kaiserfamilyfoundation.files.wordpress.com/2013/01/7851.pdf>. Accessed on June 15, 2014.
- Short PF (1998). Gaps and transitions in health insurance: What are the concerns of women? *Journal of Women's Health*, 7(6), 725–737.
- Short PF, & Graefe DR (2003). Battery-powered health insurance? Stability in coverage of the uninsured. *Health Affairs*, 22(6), 244–255. [PubMed: 14649453]
- Short PF, Graefe DR, & Schoen C (2003). Churn, churn, churn: How instability of health insurance shapes America's uninsured problem Task Force on the Future of Health Insurance Issue Brief, November 2003. New York, NY: Commonwealth Fund Retrieved from <http://www.commonwealthfund.org/publications/issue-briefs/2003/nov/churn-churn-churn-how-instability-of-health-insurance-shapes-americas-uninsured-problem>. Accessed on June 30, 2014.
- Short PF, Graefe DR, Swartz K, & Uheroi N (2012). New estimates of gaps and transitions in health insurance. *Medical Care Research Review*, 69(6), 721–736. [PubMed: 22833452]
- Sommers BD, Graves JA, Swartz K, & Rosenbaum S (2014). Medicaid and marketplace eligibility changes will occur often in all states: Policy options can ease impact. *Health Affairs*, 33(4), 700–707. [PubMed: 24622387]
- SUDAAN. (2012). SUDAAN online support files. Raleigh, NC: Research Triangle Institute Retrieved from [http://sudaansupport.rti.org/sudaan/pdf\\_files/110Example/Logistic%20Example%203.pdf](http://sudaansupport.rti.org/sudaan/pdf_files/110Example/Logistic%20Example%203.pdf)
- Swartz K, Marcotte J, & McBride TD (1993a). Personal characteristics and spells without health insurance. *Inquiry*, 30(1), 64–76. [PubMed: 8454317]
- Swartz K, Marcotte J, & McBride TD (1993b). Spells without health insurance: The distribution of durations when left-censored spells are included. *Inquiry*, 30(1), 77–83. [PubMed: 8454318]
- Yabroff KR, Short PF, Machlin S, Dowling E, Rozjabek H, Li C, ... Virgo KS (2013). Access to preventive health care for cancer survivors. *American Journal of Preventive Medicine*, 45(3), 304–312. [PubMed: 23953357]
- Zeng C, Wen W, Morgans AK, Pao W, Shu X-O, & Zheng W (2015). Disparities by race, age, and sex in the improvement of survival for major cancers: Results from the National Cancer Institute Surveillance, Epidemiology, and End Results (SEER) program in the United States, 1990 to 2010. *JAMA Oncology*, 1(1), 88–96. [PubMed: 26182310]
- Zuckerman S, Kenney GM, Dubay L, Haley J, & Holahan J (2001). Shifting health insurance coverage, 1997–1999. *Health Affairs*, 20(1), 169–177.



**Fig. 1.** Insurance Gains and Access to Care by Cancer History. *Source:* Medical Expenditure Panel Survey 2008–2013 longitudinal data (panels 12–17). *Notes:* Among the initially uninsured, the figure depicts by cancer history the impact on various access-to-care measures of gaining insurance versus remaining uninsured. For example, a significantly higher percentage (44.1%) of initially uninsured cancer survivors who remained uninsured lacked a usual source of care compared to initially uninsured cancer survivors who gained insurance (21.2%).

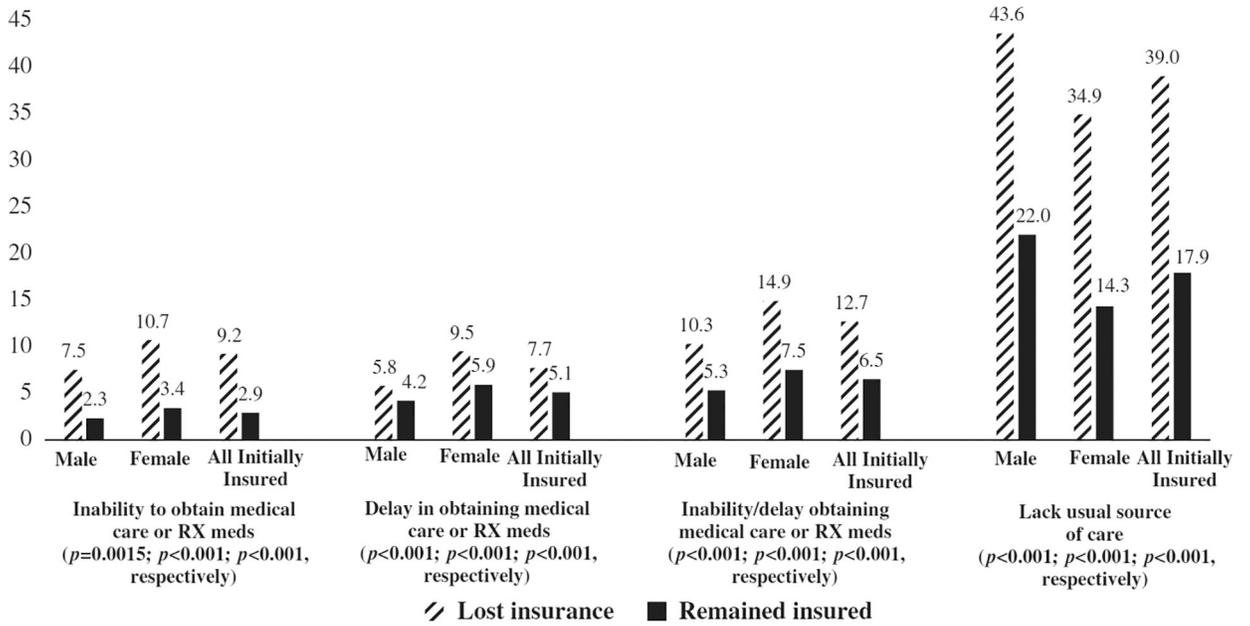


**Fig. 2.** Insurance Losses and Access to Care by Cancer History. *Source:* Medical Expenditure Panel Survey 2008–2013 longitudinal data (panels 12–17). *Notes:* Among the initially insured, the figure depicts by cancer history the impact on various access-to-care measures of losing insurance versus remaining insured. For example, a significantly higher percentage (23.7%) of cancer survivors who were initially insured and lost insurance subsequently experienced inability/delay obtaining medical care or RX meds compared to cancer survivors who were initially insured and remained insured (12.5%).



**Fig. 3.** Insurance Gains and Access to Care by Gender. *Source:* Medical Expenditure Panel Survey 2008–2013 longitudinal data (panels 12–17). *Notes:* Among the initially uninsured, the figure depicts by gender the impact on various access-to-care measures of gaining insurance or remaining uninsured. For example, a significantly higher percentage (13.2%) of females who were initially uninsured and gained insurance subsequently experienced inability/delay obtaining medical care or RX meds compared to males who were initially uninsured and gained insurance (9.1%). The third  $p$ -value in each set pertains to the comparison of all who gained insurance versus all who remained uninsured for each access measure.

Author Manuscript  
Author Manuscript  
Author Manuscript  
Author Manuscript



**Fig. 4.** Insurance Losses and Access to Care by Gender. Source: Medical Expenditure Panel Survey 2008–2013 longitudinal data (panels 12–17). *Notes:* Among the initially insured, the figure depicts by gender the impact on various access-to-care measures of losing insurance or remaining insured. For example, a significantly higher percentage (14.9%) of females who were initially insured and lost insurance subsequently experienced inability/delay obtaining medical care or RX meds compared to males who were initially insured and lost insurance (10.3%). The third  $p$ -value in each set pertains to the comparison of all who lost insurance versus all who remain insured for each access measure.

**Table 1.**

Characteristics of 16,123 Initially Uninsured Individuals by Cancer History and Gender.<sup>a</sup>

	Cancer History (N = 84)			No History of Cancer (N = 8,051)			Cancer History vs No Cancer History		
	Male (N = 333)	Female (N = 417)	Total (N = 15,706)	Male vs Female p-value	Male (N = 7,655)	Female (N = 15,706)	Total (N = 15,706)	Male vs Female p-value	p-value
Baseline insurance				N/A				N/A	N/A
Uninsured	100	100	100		100	100	100		
Insurance transition				0.830				<0.001	0.0012
Gained private insurance	29.79	26.69	27.44		22.44	24.03	23.15		
Gained public insurance	18.92	17.67	17.98		7.78	14.68	10.88		
Gained insurance (total) <sup>b</sup>	48.71	44.36	45.42		30.21	38.71	34.03		
No change in insurance	51.29	55.64	54.58		69.79	61.29	65.97		
Age				0.002				<0.001	<0.001
18–34	13.39	24.95	22.14		50.10	44.91	47.77		
35–44	11.04	23.64	20.57		20.65	21.67	21.11		
45–54	33.32	25.08	27.08		18.74	21.15	19.82		
55–63	42.26	26.34	30.21		10.51	12.26	11.3		
Marital status				0.754				<0.001	0.0183
Married	48.62	46.33	46.89		36.92	42.09	39.24		
Not married	51.38	53.67	53.11		63.08	57.91	60.76		
Race/ethnicity				0.660				0.633	<0.001
Non-Hispanic Whites	47.14	43.42	44.33		32.46	31.99	32.25		
Others	52.86	56.58	55.67		67.54	68.01	67.75		
Family income based on poverty level				0.745				<0.001	0.7132
Poor	27.98	32.53	31.43		29.10	36.96	32.63		
Low income	23.89	20.68	21.46		22.62	23.42	22.98		
Middle and high income	48.12	46.78	47.11		48.28	39.63	44.39		
Employed				0.098				<0.001	<0.001
Always employed both years	28.77	39.48	36.88		54.04	41.18	48.27		
Not employed both years	34.49	22.96	25.77		11.07	24.06	16.91		
Employed sometime	36.73	37.56	37.36		34.89	34.76	34.83		

	Cancer History			Male vs Female <i>p</i> -value	No History of Cancer ( <i>N</i> = 15,706)			Male vs Female <i>p</i> -value	Cancer History vs No Cancer History <i>p</i> -value
	Male ( <i>N</i> = 84)	Female ( <i>N</i> = 333)	Total ( <i>N</i> = 417)		Male ( <i>N</i> = 8,051)	Female ( <i>N</i> = 7,655)	Total		
Education				0.823				0.004	0.4163
High school graduate or less	19.88	18.81	19.07		19.50	20.80			
Some college or more	54.80	59.41	58.29		61.91	60.29			
Missing	25.32	21.79	22.65		18.59	18.91			
Perceived health status				0.435				<0.001	<0.001
Excellent/very good	22.03	28.44	26.88		53.96	56.92			
Good	31.19	32.55	32.22		29.82	28.71			
Fair/poor	46.78	39.01	40.90		16.22	14.37			
Smoking status				0.537				<0.001	<0.001
Smoker	44.60	37.36	39.12		22.21	26.93			
Non-smoker	48.85	53.33	52.24		71.20	65.61			
Missing	6.55	9.31	8.64		6.59	7.46			
Risk aversion: health insurance not worth cost				0.629				<0.001	0.1449
Disagree strongly/somewhat	58.63	53.12	54.46		50.80	48.38			
Uncertain	13.12	18.53	17.21		18.82	19.12			
Agree strongly/somewhat	28.25	28.35	28.32		30.38	32.50			
Number of cancers				0.024				N/A	N/A
Single or unknown <sup>c</sup>	94.64	85.20	87.50		N/A	N/A			
Multiple	5.36	14.80	12.50		N/A	N/A			
Time since cancer diagnosis <sup>d</sup>				0.466				N/A	N/A
<2 years	18.23	13.63	14.77		N/A	N/A			
2–5 years	12.54	16.50	15.52		N/A	N/A			
6–10 years	16.43	14.57	15.03		N/A	N/A			
>10 years	20.26	31.61	28.81		N/A	N/A			
Missing	32.54	23.69	25.88		N/A	N/A			
Panel				0.690				0.5	0.3048
12	10.91	12.87	12.39		16.26	16.50			
13	10.61	15.42	14.25		16.62	16.50			

	Cancer History			No History of Cancer			Cancer History vs No Cancer History	
	Male (N = 84)	Female (N=333)	Total (N=417)	Male vs Female p-value	Male (N= 8,051)	Female (N= 7,655)	Total (N= 15,706)	Male vs Female p-value
14	21.58	14.77	16.43		16.32	15.64	16.02	
15	16.83	18.05	17.75		15.85	16.93	16.34	
16	15.40	18.61	17.83		16.59	16.96	16.75	
17	24.68	20.28	21.35		17.92	17.85	17.89	

Source: Medical Expenditure Panel Survey 2008–2013 longitudinal data (panels 12–17).

Notes:

<sup>a</sup> Values represent weighted percentages.

<sup>b</sup> Among all study participants (Tables 1 and 2 combined), 10,787/52,915 (19.2% weighted) had at least one insurance transition (gain or loss) during the 24 months. Compared to all cancer survivors (403/2,223), a higher percentage of all individuals with no cancer history (10,384/50,692) had at least one insurance transition (15.9% and 19.3% weighted, respectively,  $p < 0.001$ ). The division between public and private is provided in Tables 1 and 2 only as the numbers were too small to model gains and losses of public insurance separately from those of private insurance.

<sup>c</sup> Less than 3% were unsure whether they had more than one cancer.

<sup>d</sup> Time since cancer diagnosis was only available for panels 13–17.

**Table 2.**

Characteristics of 36,792 Initially Insured Individuals by Cancer History and Gender.<sup>a</sup>

	Cancer History (N=1,806)			No History of Cancer (N=19,145)			Cancer History vs No Cancer History		
	Male (N=541)	Female (N=1,265)	Total (N=1,806)	Male (N=15,841)	Female (N=19,145)	Total (N=34,986)	Male vs Female p-value	Male vs Female p-value	p-value
Baseline insurance							<0.001	<0.001	<0.001
Private insurance	85.59	79.04	81.23	89.56	84.44	86.89			
Public insurance	14.41	20.96	18.77	10.44	15.56	13.11			
Insurance transition							0.021	<0.001	<0.001
Lost private insurance	6.53	7.79	7.37	11.98	10.19	11.05			
Lost public insurance	1.89	3.68	3.08	2.54	4.33	3.47			
Lost insurance (total) <sup>b</sup>	8.42	11.47	10.45	14.52	14.52	14.52			
No change in insurance	91.58	88.53	89.55	85.48	85.48	85.48			
Age							<0.001	<0.001	<0.001
18–34	5.68	10.66	8.99	33.11	35.40	34.30			
35–44	9.25	16.75	14.24	23.33	22.43	22.86			
45–54	31.15	30.88	30.97	25.52	24.09	24.78			
55–63	53.92	41.71	45.79	18.03	18.08	18.06			
Marital status							0.080	0.045	0.0078
Married	66.09	60.47	62.35	59.05	57.86	58.43			
Not married	33.91	39.53	37.65	40.95	42.14	41.57			
Race/ethnicity							0.719	<0.001	<0.001
Non-Hispanic Whites	53.86	52.86	53.20	47.56	45.50	46.49			
Others	46.14	47.14	46.80	52.44	54.50	53.51			
Family income based on poverty level							0.023	<0.001	0.0044
Poor	11.89	16.76	15.13	9.87	13.97	11.98			
Low income	9.91	10.48	10.29	9.50	11.26	10.42			
Middle and high income	78.20	72.77	74.58	80.63	74.82	77.61			
Employed							0.002	<0.001	<0.001
Always employed both years	61.72	52.04	55.28	73.15	62.01	67.35			
Not employed both years	22.02	29.85	27.24	9.88	17.79	14.00			

	Cancer History				No History of Cancer				Cancer History vs No Cancer History	
	Male (N=541)	Female (N=1,265)	Total (N=1,806)	Male vs Female p-value	Male (N=15,841)	Female (N=19,145)	Total (N=34,986)	Male vs Female p-value	p-value	p-value
Employed sometime	16.26	18.11	17.49	0.940	16.98	20.20	18.66	0.090	0.2419	
Education										
High school graduate or less	8.62	9.09	8.93		8.16	7.47	7.80			
Some college or more	74.47	73.89	74.08		74.98	75.59	75.30			
Missing	16.90	17.03	16.98		16.85	16.94	16.90			
Perceived health status				0.653				0.001	<0.001	
Excellent/very good	43.79	42.18	42.72		66.51	64.78	65.61			
Good	30.34	29.37	29.69		23.14	23.43	23.29			
Fair/poor	25.87	28.45	27.59		10.34	11.79	11.09			
Smoking status				0.054				<0.001	0.0041	
Smoker	21.76	20.85	21.16		18.83	15.32	17.00			
Non-smoker	69.59	73.70	72.33		73.72	78.98	76.46			
Missing	8.65	5.45	6.52		7.45	5.70	6.54			
Risk aversion: health insurance not worth cost				0.918				<0.001	<0.001	
Disagree strongly/somewhat	70.66	71.58	71.27		64.79	68.76	66.86			
Uncertain	9.25	8.59	8.81		11.15	11.11	11.13			
Agree strongly/somewhat	20.09	19.83	19.91		24.06	20.13	22.01			
Number of cancers				0.002				N/A	N/A	
Single or unknown <sup>c</sup>	94.20	89.42	91.02		N/A	N/A	N/A			
Multiple	5.80	10.58	8.98		N/A	N/A	N/A			
Time since cancer diagnosis <sup>d</sup>				<0.001				N/A	N/A	
<2 years	26.21	17.86	20.58		N/A	N/A	N/A			
2-5 years	23.24	17.29	19.23		N/A	N/A	N/A			
6-10 years	10.34	14.88	13.40		N/A	N/A	N/A			
>10 years	18.21	28.20	24.95		N/A	N/A	N/A			
Missing	22.01	21.76	21.84		N/A	N/A	N/A			
Panel				0.522				0.953	0.8769	
12	18.68	15.36	16.47		16.15	16.33	16.24			

	Cancer History				No History of Cancer				Cancer History vs No Cancer History	
	Male (N=541)	Female (N=1,265)	Total (N=1,806)	Male vs Female p-value	Male (N=15,841)	Female (N=19,145)	Total (N=34,986)	Male vs Female p-value		p-value
13	17.28	17.93	17.72		16.66	16.38	16.51			
14	14.37	17.29	16.32		16.91	16.79	16.85			
15	14.84	16.57	15.99		16.99	16.90	16.95			
16	17.92	15.95	16.61		16.80	16.97	16.89			
17	16.90	16.89	16.90		16.50	16.63	16.56			

Source: Medical Expenditure Panel Survey 2008–2013 longitudinal data (panels 12–17).

<sup>a</sup>Values represent weighted percentages.

<sup>b</sup> Among all study participants (Tables 1 and 2 combined), 10,787/52,915 (19.2% weighted) had at least one insurance transition (gain or loss) during the 24 months. Compared to all cancer survivors (403/2,223), a higher percentage of all individuals with no cancer history (10,384/50,692) had at least one insurance transition (15.9% and 19.3% weighted, respectively,  $p < 0.001$ ). The division between public and private is provided in Tables 1 and 2 only as the numbers were too small to model gains and losses of public insurance separately from those of private insurance.

<sup>c</sup> Less than 3% were unsure whether they had more than one cancer.

<sup>d</sup> Time since cancer diagnosis was only available for panels 13–17.

**Table 3.**

Weighted Unadjusted and Adjusted Relative Risk (RR) of Health Insurance Gain among Initially Uninsured Non-elderly Adults MEPS Panels 12–17,  $N = 16,123$ .

	Unadjusted RR		Adjusted RR <sup>a</sup>	
	(95% CI)	<i>p</i> -value	(95% CI)	<i>p</i> -value
Cancer history				
Yes	1.33 (1.16–1.54)	<0.001	1.25 (1.08–1.44)	0.0045
No	1.00 (referent)		1.00 (referent)	
Age				
18–34	1.14(1.04–1.25)	0.0052	1.24 (1.12–1.37)	<0.001
35–44	0.98 (0.87–1.10)	0.7028	1.08 (0.96–1.21)	0.1807
45–54	0.98 (0.88–1.09)	0.7218	1.04 (0.93–1.16)	0.5011
55–63	1.00 (referent)		1.00 (referent)	
Gender/marital status				
Male, not married	0.91 (0.82–1.01)	0.0883	0.83 (0.75–0.92)	<0.001
Male, married	1.00 (referent)		1.00 (referent)	
Female, not married	1.26 (1.15–1.39)	<0.001	1.16 (1.06–1.28)	0.0017
Female, married	1.14(1.06–1.21)	<0.001	1.09 (1.02–1.16)	0.0101
Race/ethnicity				
Non-Hispanic Whites	1.28 (1.17–1.40)	<0.001	1.30 (1.18–1.43)	<0.001
Other	1.00 (referent)		1.00 (referent)	
Family income based on poverty level				
Poor	0.79 (0.72–0.86)	<0.001	0.81 (0.76–0.88)	<0.001
Low income	0.82 (0.75–0.89)	<0.001	0.85 (0.79–0.92)	<0.001
Middle and high income	1.00 (referent)		1.00 (referent)	
Employed <sup>b</sup>				
Always employed both years	1.07 (0.97–1.17)	0.1649	0.99 (0.90–1.08)	0.8276
Employed sometime	1.29(1.19–1.41)	<0.001	1.22 (1.12–1.32)	<0.001
Not employed both years	1.00 (referent)		1.00 (referent)	
Education				
High school graduate or less	0.61 (0.56–0.67)	<0.001	0.71 (0.65–0.77)	<0.001
Some college or more	1.00 (referent)		1.00 (referent)	
Non-smoker				
Yes	1.07 (0.99–1.16)	0.0669	1.06 (0.99–1.14)	0.1016
No	1.00 (referent)		1.00 (referent)	
Risk aversion: health insurance not worth cost				
Disagree strongly/somewhat	1.27 (1.19–1.36)	<0.001	1.26 (1.18–1.34)	<0.001
Uncertain	0.94(0.85–1.04)	0.2212	0.99 (0.90–1.08)	0.7666
Agree strongly/somewhat	1.00 (referent)		1.00 (referent)	
Panel <sup>c</sup>				
17	0.88 (0.78–0.99)	0.0277	1.29 (1.15–1.45)	<0.001
16	0.86 (0.76–0.96)	0.011	1.01 (0.89–1.13)	0.9154

	Unadjusted RR		Adjusted RR <sup>a</sup>	
	(95% CI)	<i>p</i> -value	(95% CI)	<i>p</i> -value
15	0.92(0.83–1.03)	0.15	0.94 (0.84–1.05)	0.264
14	0.76 (0.67–0.87)	<0.001	0.78 (0.69–0.88)	<0.001
13	0.84(0.75–0.94)	0.0027	0.86 (0.77–0.97)	0.0116
12	1.00 (referent)		1.00 (referent)	

*Source:* Medical Expenditure Panel Survey 2008–2013 longitudinal data (panels 12–17).

<sup>a</sup>Multivariate logistic regression models examined the relationship between cancer history and health insurance gain adjusting for all other factors displayed above. Results are reported as predicted marginal risk ratios. Gains of public insurance are not modeled separately from gains in private insurance due to the small N among cancer survivors.

<sup>b</sup>Sensitivity analyses excluding employment from the models did not significantly change the results. Additional sensitivity analyses using Cox proportional hazards regressions were conducted modeling time to insurance gain rather than gain (yes or no). The results were basically the same.

<sup>c</sup>Panel was included in the model solely to control for secular trend. The results are only displayed for completeness of reporting. No attempt is made to derive any specific meaning from the related estimates.

**Table 4.**

Weighted Unadjusted and Adjusted Relative Risk (RR) of Health Insurance Loss among Initially Insured Non-elderly Adults MEPS Panels 12–17,  $N = 36,792$ .

	Unadjusted RR		Adjusted RR <sup>a</sup>	
	(95% CI)	<i>p</i> -value	(95% CI)	<i>p</i> -value
Cancer history				
Yes	0.72 (0.61–0.85)	<0.001	0.88 (0.75–1.02)	0.0942
No	1.00 (referent)		1.00 (referent)	
Age				
18–34	2.69 (2.40–3.02)	<0.001	1.78 (1.59–1.98)	<0.001
35–44	1.47 (1.30–1.67)	<0.001	1.35 (1.21–1.51)	<0.001
45–54	1.18 (1.04–1.33)	0.0082	1.16 (1.05–1.30)	0.0054
55–63	1.00 (referent)		1.00 (referent)	
Gender/marital status				
Male, not married	2.08 (1.91–2.27)	<0.001	1.34 (1.23–1.46)	<0.001
Male, married	1.00 (referent)		1.00 (referent)	
Female, not married	2.01 (1.87–2.17)	<0.001	1.27 (1.18–1.37)	<0.001
Female, married	1.03 (0.96–1.10)	0.4344	0.92 (0.86–0.99)	0.0239
Race/ethnicity				
Non-Hispanic Whites	0.88 (0.82–0.95)	<0.001	0.92 (0.85–1.00)	0.0383
Other	1.00 (referent)		1.00 (referent)	
Family income based on poverty level				
Poor	2.32(2.14–2.52)	<0.001	1.53 (1.40–1.67)	<0.001
Low income	2.28 (2.07–2.51)	<0.001	1.77 (1.62–1.95)	<0.001
Middle and high income	1.00 (referent)		1.00 (referent)	
Employed <sup>b</sup>				
Always employed both years	0.77 (0.70–0.86)	<0.001	0.97 (0.86–1.08)	0.5677
Employed sometime	3.07 (2.79–3.39)	<0.001	2.99 (2.70–3.32)	<0.001
Not employed both years	1.00 (referent)		1.00 (referent)	
Perceived health status				
Fair/poor	1.14(1.03–1.26)	0.01	1.09 (0.99–1.20)	0.0945
Good	1.12(1.05–1.20)	<0.001	1.09 (1.02–1.16)	0.013
Excellent/very good	1.00 (referent)		1.00 (referent)	
Non-smoker				
Yes	0.65 (0.60–0.70)	<0.001	0.81 (0.75–0.87)	<0.001
No	1.00 (referent)		1.00 (referent)	
Risk aversion: health insurance not worth cost				
Disagree strongly/somewhat	0.66 (0.62–0.71)	<0.001	0.70 (0.65–0.75)	<0.001
Uncertain	0.98 (0.89–1.09)	0.7147	0.83 (0.75–0.91)	<0.001
Agree strongly/somewhat	1.00 (referent)		1.00 (referent)	
Panel <sup>c</sup>				
17	0.92 (0.81–1.05)	0.2198	0.84 (0.74–0.95)	0.0079

	Unadjusted RR		Adjusted RR <sup>a</sup>	
	(95% CI)	<i>p</i> -value	(95% CI)	<i>p</i> -value
16	0.92(0.81–1.04)	0.1902	0.82 (0.72–0.93)	0.0023
15	0.88 (0.77–0.99)	0.0395	0.85 (0.76–0.95)	0.0061
14	0.96 (0.85–1.10)	0.5875	0.92 (0.82–1.03)	0.1354
13	1.07 (0.96–1.19)	0.2331	1.03 (0.94–1.13)	0.5573
12	1.00 (referent)		1.00 (referent)	

*Source:* Medical Expenditure Panel Survey 2008–2013 longitudinal data (panels 12–17).

<sup>a</sup>Multivariate logistic regression models examined the relationship between cancer history and health insurance loss adjusting for all other factors displayed above. Results are reported as predicted marginal risk ratios. Losses of public insurance are not modeled separately from losses of private insurance due to the small N among cancer survivors.

<sup>b</sup>Sensitivity analyses excluding employment from the models did not significantly change the results. Additional sensitivity analyses using Cox proportional hazards regressions were conducted modeling time to insurance loss rather than loss (yes or no). The results were basically the same.

<sup>c</sup>Panel was included in the model solely to control for secular trend. The results are only displayed for completeness of reporting. No attempt is made to derive any specific meaning from the related estimates.