Multimorbidity and Employment Outcomes among Middle-Aged US Cancer Survivors

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Abstract

Objective: The objective of this study was to evaluate the relationship between multimorbidity and subsequent two-year employment outcomes among middle-aged United States (US) cancer survivors. In addition, we examined whether the relationship differed by survivor characteristics.

Methods: Data of 633 cancer survivors (ages 51–64) from the 2014 Health and Retirement Study were used to identify multimorbidity profiles and evaluate associations between multimorbidity and prolonged unemployment during follow-up.

Results: Approximately 64% of cancer survivors met the criteria for multimorbidity. Latent class analysis revealed three distinct multimorbidity profiles distinguished by the presence or absence of psychiatric disorders. We observed a significant association between high psychiatric multimorbidity and prolonged unemployment after two-year follow-up (Relative Risk = 2.78, 95% Confidence Interval = 1.28–6.00), with the effect more pronounced among low-income survivors.

Conclusions: Psychiatric multimorbidity was associated with prolonged unemployment among middle-aged cancer survivors, particularly among low-income survivors.

Keywords

Multimorbidity; Cancer; Employment; Survivorship

INTRODUCTION

The cancer survivor population in the United States (US) has grown in the recent decades due to advances in early detection and treatment.[1] This rising number of cancer survivors,

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combined with longer life expectancies after cancer treatment, has led to an increasing need to better understand the long-term impact of cancer and its treatment. Multimorbidity, the co-occurrence of two or more chronic conditions in a single individual, has also become more common due to increases in longevity and survivorship.[2, 3] In the US, cancer survivors are more likely to experience multimorbidity than individuals without a history of cancer.[4] Approximately 70% of US cancer survivors report one comorbid chronic condition, and more than 30% percent report two or more chronic conditions.[4–6]

Among cancer survivors, multimorbidity may be an indicator of increased risk for poor prognosis. Previous research has demonstrated a relationship between multimorbidity and poor response to cancer treatment and worse overall survival.[4, 7–9] Mulitmorbidity has also been associated with higher healthcare utilization, and in the US, relationships between multimorbidity and increased healthcare expenditures have been well documented.[10–12] Less well studied, however, is the influence of multimorbidity on the economic lives of cancer survivors, particularly survivors under the age of 65.

Employment is a key aspect of an individual's economic welfare. In addition to economic benefits, there is also evidence to suggest that paid work provides benefits to health and well-being.[13] For adults with a history of cancer, employment has been associated with higher self-esteem, greater social support, and fewer symptoms of depression.[14–16] Thus, in addition to financial benefits, employment after diagnosis may confer significant improvements in quality of life.

Multiple chronic conditions may result in reduced physical and mental work ability, leading to reduced productivity and the cessation of employment. However, it is unknown how chronic conditions pattern among middle-aged (50<65 years old) cancer survivors and whether multimorbidity patterning influences employment outcomes. We addresses this knowledge gap by examining multimorbidity and employment outcomes among cancer survivors in the Health and Retirement Study, a nationally representative sample of middle-age and older US adults.[17] The objectives of the current study were to identify the multimorbidity profiles of middle-aged cancer survivors and evaluate the relationship between multimorbidity and subsequent two-year employment outcomes. We also examined whether the relationship between multimorbidity and employment outcomes differed for subgroups, based on survivor characteristics (income, gender, education, race/ethnicity, and length of survivorship). A better understanding of the employment consequences of multimorbidity will be instrumental in developing comprehensive strategies to maintain and promote quality of life after cancer.

METHODS

Data and Sample

Data were obtained from the 2014 and 2016 waves of Health and Retirement Study (HRS), a nationally representative panel survey of adults aged 51 and older in the US. Details of the HRS study design have been described previously.[18, 19] Briefly, the HRS uses a multistage area probability design to sample respondents in US households, aged over 51. Since 1992, respondents have been surveyed every 2 years and continue to be followed upon moving

into long-term care facilities. Our sample was restricted to cancer survivors aged between 51 and 64 at the baseline (2014) and remained in the survey in 2016. Of the respondents who were 51–64 years of age at the baseline (N=7,786), 728 individuals (9.35%) were cancer survivors. We excluded 95 respondents who were lost to follow-up. Therefore, our final sample includes 633 respondents.

The HRS is conducted by the University of Michigan with support from the National Institute on Aging. The Institutional Review Board at the University of Michigan approved the HRS and all participants provided informed consent. The data used in the present study are publicly available and contain no unique identifiers.

Measures

Multimorbidity Profiles—We included the following chronic conditions to identify distinct multimorbidity profiles: high blood pressure, diabetes, lung disease, cardiovascular disease (heart disease or stroke), psychiatric disorders and arthritis. A respondent was considered to have a specific chronic condition if they responded affirmatively to the question "Has a doctor ever told you that you have [condition]?" In order to identify multimorbidity profiles, Latent Class Analysis (LCA) was used to identify distinct patterns of multimorbidity in our sample.

Employment outcomes—Employment outcome measures were derived from the baseline (2014) and follow-up (2016) responses to the question: "Are you currently working for pay?" Based on the respondent's answers to this question at both time-points, we categorized changes in employment status as four mutually exclusive categories: (1) Prolonged employment ("yes" at both time-points), (2) Prolonged unemployment ("no" at both time-points), (3) New unemployment ("yes" at baseline and "no" at follow-up) and (4) New employment ("no" at baseline and "yes" at follow-up). Due to small numbers of newly unemployed (n=51, 8.06%) and newly employed (n=29, 4.58%) respondents, we merged these two groups into one category, intermittent employment. Therefore, the three employment outcomes in this study were: (1) Prolonged employment, (2) Prolonged unemployment, and (3) Intermittent employment.

Covariates—To adjust for potential confounding, we included the following covariates based on previous literature [16, 20, 21]: age, sex (female or male), race/ethnicity (White, Black, Hispanic, Other race), marital status (married or not married), education (high school graduate or less, some college, college graduate or higher), household-adjusted income (<138% federal poverty level (FPL); 138–250% FPL; 250–400% FPL; >400% FPL), health insurance, and length of cancer survivorship (5 years or < 5 years).

Statistical Analyses

Latent Class Analysis (LCA) was used to identify the multimorbidity profiles of cancer survivors in this study. LCA categorizes individuals into groups where the individuals within a group were similar to one another and different from individuals in other groups.[18] After a series of models were estimated for one to five classes, we assessed the model fit of LCA with four criteria: Akaike's Information Criterion (AIC), Bayesian Information

Criterion (BIC), Entropy's score and Vuong-Lo-Mendell-Rubin adjusted likelihood ratio test (VLMR).[19]

Characteristics of the multimorbidity profile groups derived from the LCA were compared using descriptive statistics. Categorical variables were described using frequencies, proportions and chi-square tests. Continuous variables were described using means, standard deviations, and the Wald test. In order to evaluate the relationship between multimorbidity profile groups and employment outcomes, a multinomial logistic regression was used to determine the relative risk (RR) and 95% confidence interval (CI) for prolonged unemployment or intermittent employment, with prolonged employment as the reference category. Multinomial models were adjusted for age, sex, race/ethnicity, marital status, household-adjusted income, health insurance, and length of cancer survivorship. The effect of interactions between multimorbidity and survivor characteristics (income, gender, education, race/ethnicity, and length of survivorship) was also investigated. LCA was conducted in Mplus 8.0 statistical software, and all other analyses were conducted in Stata 13.0 statistical software.

RESULTS

The final sample included 633 middle-aged cancer survivors. Baseline characteristics of the sample are shown in Table 1. The mean age at baseline was 59 years, and more than two-thirds of the sample were long-term (>5 years since diagnosis) cancer survivors. The majority of the sample was female (68%), white (60%), married (66%), and had at least some college education (84%). A two-year follow-up, approximately 44% of the sample reported prolonged employment, 44% reported prolonged unemployment, and 13% reported intermittent employment. Slightly more than half of the sample were employed for pay at baseline, and 24% reported a household income of less than 138% of the federal poverty level.

Multimorbidity profiles among middle-aged cancer survivors

Approximately 64% of our study sample met the criteria for multimorbidity, reporting an average of two co-occurring chronic conditions. High blood pressure (61%), arthritis (61%), and psychiatric disorders (33%) were the most commonly reported conditions (Table 1). Latent class analysis revealed three distinct multimorbidity profiles that differed markedly by the presence of a co-occurring psychiatric disorder: a High multimorbidity profile group, with 90% of survivors reporting a psychiatric disorder; a Moderate multimorbidity profile group, with 21% of survivors reporting a psychiatric disorder; and a predominantly Hypertension and Diabetes profile group, with all survivors reporting both high blood pressure and diabetes, but without any reporting a psychiatric disorder (Figure 1).

The demographic characteristics of the multimorbidity profiles are presented in Table 2. The High multimorbidity profile group accounted for 21% of the sample and reported the greatest number of chronic conditions (mean = 4.5, SD=0.8). Compared to the other two groups, this group had the lowest percentage of the married survivors (44%) and lower education and income levels. The Moderate multimorbidity profile group was the largest group, comprising of 68% of this sample. This grouping of cancer survivors had the lowest

number of chronic conditions (mean=1.4, SD=0.9). The majority of this group was White (64%) and married (72%), and compared to the other groups, had the highest education and income levels. Finally, the Hypertension and Diabetes profile group made up 11% of the sample. This group had an average of 2.9 (SD=0.7) chronic conditions and had the greatest proportion of Black (36%) and Hispanic (26%) survivors across all multimorbidity groups.

Associations between multimorbidity profiles and employment outcomes

Table 3 shows the results of the multinomial logistic regression model for prolonged unemployment and intermittent employment, with prolonged employment as the reference group. We observed a significant association between High multimorbidity and prolonged unemployment after two-year follow-up (RR = 2.78, 95% CI = 1.28–6.00). There were no associations between multimorbidity profiles and intermittent employment. Independent of multimorbidity, age and low household income were associated with both prolonged unemployment and intermittent employment. Additional factors independently associated with prolonged unemployment included being female, married, and less well-educated, and <5 years survivorship. In analyses with alternative reference groups (i.e. prolonged unemployment or intermittent employment), we did not find any significant associations between multimorbidity and employment outcomes (data not shown).

Multimorbidity and prolonged unemployment by survivor characteristics

While the likelihood of prolonged unemployment was elevated for the High and Moderate multimorbidity groups overall, household income significantly modified the relationship between multimorbidity and prolonged unemployment. (P=<0.05 for interaction of multimorbidity group*income). Among survivors with household income below 138% of the FPL, both the High (RR = 12.63, 95% CI = 2.41 – 66.25) and Moderate (RR = 7.95, 95% CI = 1.82–34.65) multimorbidity had greater likelihoods of prolonged unemployment than the Hypertension and Diabetes group. We did not observe any significant associations between multimorbidity and prolonged unemployment among survivors in the higher income groups. The association between multimorbidity and prolonged unemployment showed no significant interactions with gender, education, race/ethnicity, or length of cancer survivorship

DISCUSSION

In the present study, we examined multimorbidity and two-year employment outcomes among middle-aged cancer survivors. We identified three profiles of multimorbidity: the first profile included a high burden of psychiatric multimorbidity, the second profile had a relatively moderate burden of psychiatric multimorbidity, and the third profile had a high burden of high blood pressure and diabetes, but no psychiatric multimorbidity. We found that cancer survivors with psychiatric multimorbidity profiles had an increased likelihood of prolonged unemployment at two-year follow-up; this likelihood was particularly high for low-income survivors. To the best of our knowledge, this study is the first to evaluate the relationship between multimorbidity and employment outcomes among cancer survivors during middle age, a critical, wage-earning time period for survivors as they prepare their economic and physical health for old age.

The burden of multimorbidity was high in our sample. Approximately 23% of the sample reported one additional chronic condition, and 64% reported two or more chronic conditions. The prevalence of multimorbidity in our sample was similar to prevalences found in other US studies of cancer survivors,[22–29] with hypertension, arthritis, and psychiatric disorders being the three most common comorbid chronic conditions. Hypertension and arthritis are very common among US adults, and the prevalence of these conditions in our study were comparable to those observed in other studies of cancer survivors and in the general US population. In contrast, at 33%, the prevalence of psychological disorders in our sample, albeit similar to other studies of cancer survivors, was much higher than reported in the general US adult population.[30, 31]

Few cancer studies have detailed the patterning of chronic conditions among middle-aged survivors. Most multimorbidity studies utilize an aggregate or summary measure, such as a comorbidity index, that does not take into account specific combinations of conditions.[32, 33] Using latent class analysis, we identified three distinct multimorbidity groups. These groups primarily differed in the prevalence of psychiatric disorders, ranging from 95% in the high psychiatric multimorbidity group to 0% in the no psychiatric multimorbidity group. This data-driven approach allowed us to determine the extent to which specific multimorbidity profiles were associated with unique correlates and subsequent employment outcomes in our sample.

We observed significant socioeconomic differences between the three multimorbidity groups, as cancer survivors in the High multimorbidity group tended to have lower levels of household income and education than survivors in the other two multimorbidity groups. These associations between indicators of low socioeconomic status and multimorbidity are consistent with the findings from previous studies of cancer and non-cancer patient populations.[5, 34–36] However, while gender differences in multimorbidity have been reported in the non-cancer populations,[37, 38] we did not observe any gender differences across the three multimorbidity groups. Also, there were no significant differences with respect to age or the proportion of long-term survivors (5+ years since diagnosis), indicating that our multimorbidity profiles were not dependent on the length of cancer survivorship.

The results of our two-year study suggest that psychiatric multimorbidity may play a role in prolonged unemployment among middle-aged cancer survivors. Prior studies of cancer survivors have reported on the financial impact of multimorbidity, with mental health disorders such as depression associated with excess medical costs.[12, 39–41] Our study adds to the limited, but emerging, literature on the economic burden of multimorbidity in cancer survivors, indicating that the effects of psychiatric multimorbidity extend beyond health-care expenditures. Cancer survivors with comorbid psychiatric disorders may have more difficulty overcoming periods of prolonged unemployment due to real or perceived functional limitations. These disorders may interfere with one's ability to perform work-related tasks or they may influence self-perceptions of work ability. As the HRS did not collect information on perceived work ability or intent to seek employment, the underlying factors remain unclear. Further work is necessary to elucidate the mechanisms by which multimorbidity influences employment outcomes.

Although income was an independent and significant correlate of multimorbidity, the relationship between multimorbidity and persistent unemployment was not consistent across all income categories in stratified analyses. Our observation that the significant associations between high and moderate psychiatric multimorbidity profiles and prolonged unemployment were found only among low income (<138% of federal poverty level) cancer survivors is especially important, given the well-documented adverse financial impacts of cancer care and the fact that low-income survivors are more likely to report co-occurring chronic conditions than their wealthier counterparts.[5, 35, 36] All together, these findings may have implications for mitigating the adverse effects of multimorbidity in middle-aged cancer survivors, as interventions to treat and manage co-occurring psychiatric conditions may confer significant economic benefits, particularly among lower income survivors.

The strengths of this study include it's large, nationally representative sample, which allows results to be generalized to non-institutionalized US adults. The HRS collected detailed information on demographics, employment, and health outcomes. Furthermore, baseline and follow-up measures allowed for a longitudinal analysis of employment outcomes. However, the limitations of this study should be considered when interpreting its results. We relied on self reports of employment, cancer, and other chronic conditions, and although the HRS assesses the presence of these chronic conditions using common measures, we were unable to account for disease severity. For cancer in particular, we could not assess the effects of cancer type or type of treatment received as the HRS data did not include detailed information on these potential confounders. Finally, our analyses were limited to only two years of follow-up data. Longer studies will be necessary to evaluate the long-term employment consequences of multimorbidity. Despite these limitations, this study reveals new insights about the complexity of multimorbidity among cancer survivors and it's previously understudied impact on employment.

In conclusion, psychiatric multimorbidity was associated with prolonged unemployment among middle-aged cancer survivors. Our findings have implications for research and practice. More research should focus on the impact of different multimorbidity profiles on indirect employment outcomes, such as presenteeism and absenteeism. Also, in clinical practice, the prevention and management of psychiatric disorders and other chronic conditions in middle-aged survivors may improve employment participation. A deeper understanding of multimorbidity among cancer survivors has the potential to inform strategies that improve the quality of life in this rapidly growing population.

Funding Sources

Data availability

The data that support the findings of this study are openly available at https://hrsonline.isr.umich.edu/.

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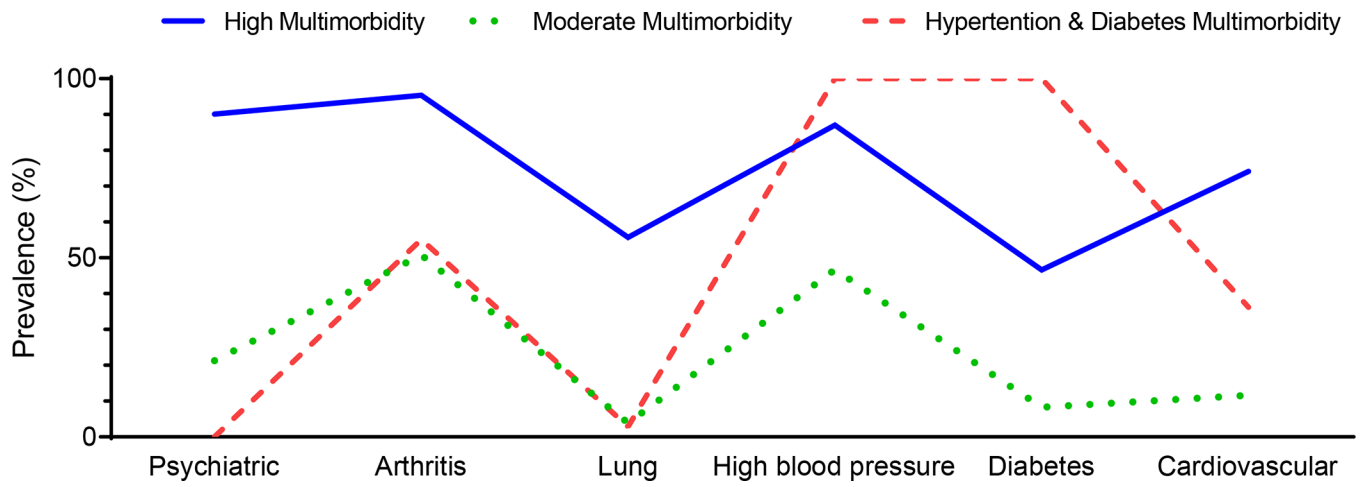
Figure 1.
Prevalence of chronic conditions across multimorbidity profiles

Table 1.

Characteristics of middle-aged cancer survivors, Health and Retirement Study, 2014–2016

Total Study Sample, *n*	633	
Age (mean years (SD))	58.9 (3.4)	
Chronic conditions (mean (SD))	2.2 (1.5)	

	n	%
Female	428	67.6%
Race		
Black	132	20.9%
Hispanic	103	16.3%
Other race	20	3.2%
White	378	59.7%
Married	416	65.7%
Education		
16+yrs	169	26.7%
12–16yrs	366	57.8%
<12yrs	92	14.5%
Employment outcomes		
Prolonged employment	276	43.5%
Prolonged unemployment	277	43.8%
Intermittent employment	80	12.6 %
Income		
<138% FPL	150	23.7%
138–250% FPL	95	15.0%
250–400% FPL	114	18.0%
400+% FPL	274	43.3%
Health insurance	565	89.3%
Long-term (5+ years) cancer survivor	433	68.4%
Chronic conditions		
Psychiatric disorders	210	33.1%
Arthritis	383	60.5%
Lung disease	92	14.5%
High blood pressure	385	60.8%
Diabetes	169	26.7%
Cardiovascular	172	27.2%

Table 2.

Comparison of demographic characteristics across multimorbidity profiles

	High Multimorbidity n = 131 (21%)	Moderate Multimorbidity n = 433 (68%)	Hypertension and Diabetes Multimorbidity n = 69 (11%)	p-value[*]
Age (mean years (SD))	59.2 (3.2)	58.8 (3.5)	59.5 (3.3)	0.32
Female (%)	74.8%	66.5%	60.9%	0.09
Race (%)				<.001
Black	22.1%	18.0%	36.2%	
Hispanic	21.4%	17.8%	26.1%	
Other race	6.1%	2.3%	2.9%	
White	56.5%	64.2%	37.7%	
Married (%)	44.6%	71.6%	68.1%	<.001
Education (%)				<.001
16+yrs	14.5%	31.6%	18.8%	
12–16yrs	60.3%	58.2%	59.4%	
<12yrs	25.2%	10.2%	21.7%	
Income (%)				<.001
<138% FPL	42.8%	16.9%	30.4%	
138–250% FPL	22.1%	12.9%	14.5%	
250–400% FPL	20.6%	18.0%	17.4%	
400+% FPL	14.5%	43.3%	37.7%	
Health insurance (%)	93.1%	59.2%	82.6%	0.07
Long-term (5+ years) survivor (%)	73.3%	68.4%	59.3%	0.13
Chronic conditions (mean (SD))	4.5 (0.8)	1.4 (0.9)	2.9 (0.7)	<0.001

[*] P-value derived from t-tests for continuous variables and Chi-square tests for categorical variables

Table 3.

Multinomial logistic regression of the association between multimorbidity and two-year employment outcomes among middle-aged cancer survivors

	Prolonged Unemployment versus Prolonged Employment	Intermittent Employment versus Prolonged Employment
	RR (95% CI)[a]	RR (95% CI)[a]
Multimorbidity Profile		
High Multimorbidity	**2.78 (1.28, 6.03)**	1.46(0.50, 4.20)
Moderate Multimorbidity	0.99 (0.52, 1.87)	0.97 (0.42, 2.20)
Hypertension and Diabetes Multimorbidity	Ref	Ref
Age	**1.22 (1.15, 1.30)**	**1.10 (1.02, 1.20)**
Female	**1.95 (1.26, 3.03)**	1.67 (0.93, 2.97)
Race (%)		
Black	1.09 (0.64, 1.86)	0.97 (0.46, 2.03)
Hispanic	0.70 (0.38, 1.29)	1.17 (0.56, 2.44)
Other race	1.73 (0.54, 5.58)	0.99 (0.19, 5.24)
White	Ref	Ref
Married (%)	**1.98 (1.21, 3.27)**	1.54 (0.80, 2.95)
Education (%)		
16+yrs	**0.46 (0.21, 0.99)**	1.15 (0.42, 3.13)
12–16yrs	0.72 (0.37, 1.41)	0.99 (0.41, 2.46)
<12yrs	Ref	Ref
Income (%)		
400+% FPL	**0.07 (0.03, 0.01)**	**0.26 (0.11, 0.65)**
250–400% FPL	**0.13 (0.07, 0.27)**	**0.24 (0.09, 0.65)**
138–250% FPL	**0.29 (0.14, 0.58)**	0.75 (0.30, 1.85)
<138% FPL	Ref	Ref
Health insurance (%)	1.25 (0.61, 2.56)	**0.42 (0.19, 0.91)**
Long-term (5+ years) survivor (%)	**0.70 (0.38, 0.90)**	0.64 (0.36, 1.12)

RR = Relative Risk; CI = Confidence Interval; *Multinomial models were adjusted for age, sex, race/ethnicity, marital status, education, household-adjusted income, health insurance, and length of cancer survivorship; Reference group is prolonged employment; Bold type indicates statistical significance at $p < 0.05$.