Published in final edited form as:
Am J Geriatr Psychiatry. 2014 December ; 22(12): 1399–1409. doi:10.1016/j.jagp.2013.08.003.

The Moderating Effect of Age on the 12-Month Prevalence of Anxiety and Depressive Disorders in Adults with a Lifetime History of Cancer

Adam Simning, M.D., Ph.D.[1], **Yeates Conwell, M.D.**[1,2], **Supriya G. Mohile, M.D.**[3], and **Edwin van Wijngaarden, Ph.D.**[4]

[1] University of Rochester School of Medicine and Dentistry, Department of Psychiatry

[2] University of Rochester Medical Center, Office for Aging Research and Health Services

[3] University of Rochester School of Medicine and Dentistry, Department of Medicine, Hematology/Oncology Division

[4] University of Rochester School of Medicine and Dentistry, Department of Public Health Sciences

Abstract

Objectives—To determine how age may modulate the association of a history of cancer with a 12-month history of anxiety and depressive disorders.

Design—Population-based, cross-sectional surveys.

Setting—The Collaborative Psychiatric Epidemiology Surveys (CPES) occurred in the United States and were conducted in 2001-2003.

Participants—CPES included 16,423 adult participants, of whom 702 reported a cancer history.

Measurements—The Composite International Diagnostic Interview evaluated the presence of a 12-month history of anxiety and depressive disorders.

Results—Among those with a cancer history, older adults (≥ 60 years old) were less likely than younger adults (18-59 years old) to have a 12-month history of an anxiety or depressive disorder. Compared to their peers without cancer, younger adults with a cancer history had more anxiety

Corresponding Author: Adam Simning, M.D., Ph.D. Department of Psychiatry University of Rochester School of Medicine and Dentistry 300 Crittenden Boulevard Rochester, NY 14642 Telephone: 585-474-9534 Fax: 585-461-4532 adam_simning@urmc.rochester.edu.
Other Authors: Yeates Conwell, M.D. Department of Psychiatry University of Rochester School of Medicine and Dentistry 300 Crittenden Boulevard Rochester, NY 14642 yeates_conwell@urmc.rochester.edu Supriya G. Mohile, M.D. Department of Medicine, Hematology/Oncology Division University of Rochester School of Medicine and Dentistry 601 Elmwood Avenue, Box 704 Rochester, NY 14642 supriya_mohile@urmc.rochester.edu Edwin van Wijngaarden, Ph.D. Department of Public Health Sciences University of Rochester School of Medicine and Dentistry 265 Crittenden Boulevard, CU 420644 Rochester, NY 14642 edwin_van_wijngaarden@urmc.rochester.edu

Conflicts of Interest: No disclosures to report.

(23.8% vs. 13.9%) and depressive (16.0% vs. 9.5%) disorders, whereas older adults with a cancer history had lower levels of anxiety (3.7% vs. 6.3%) and depressive (1.9% vs. 3.9%) disorders. In multivariable modeling, there was a statistically significant interaction between age group and cancer history, with the risk for anxiety and depressive disorders elevated in the younger age group with a cancer history (OR=5.84 and OR=6.13, respectively), but decreased in the older age group with a cancer history (OR=0.55 and OR=0.45).

Conclusions—Our findings suggest that there is considerable age-dependent variation with regard to anxiety and depressive disorders in adults with a cancer history. Investigation of the mechanisms contributing to this apparent age differential in risk could have important mental illness treatment implications in this population.

Keywords

Epidemiology; comorbidity; resilience; diversity

OBJECTIVE

From 1971 to 2007 the number of people living with a history of cancer in the United States nearly quadrupled from 3.0 to 11.7 million.[1] Cancer can be a source of considerable mental distress,[2] and a recent meta-analysis (most generalizable to patients within the first five years after a cancer diagnosis) estimated the point prevalence of anxiety disorders and major depression to be 10.3% and 16.3%, respectively.[3] Anxiety and depression can vary by cancer type with some cancers (e.g., lung cancer) being more strongly associated with anxiety and depression than others (e.g., prostate cancer).[4, 5] A review of anxiety and depression in cancer patients, which primarily consisted of data limited to less than two years of follow-up, found that anxiety in cancer patients tends to decrease with time, whereas depression is more stable over the short-term.[6]

Compared to the short-term mental health outcomes in cancer patients, much less is known about the prevalence and trajectory of anxiety and depressive disorders in those with a previous diagnosis of cancer, which includes both active cancer patients and cancer survivors. Cancer survivors are often defined as having lived at least five years past the initial cancer diagnosis without evidence of current disease or recurrence.[7, 8] In the United States, nearly two-thirds (64.8%) of those with a history of cancer in 2007 had lived with a cancer diagnosis for five or more years,[1] and cancer survivors may be at an increased risk for anxiety and depression.[9, 10] Analyses using data from the National Comorbidity Survey-Replication estimate that the risk for a 12-month history of an anxiety disorder is 1.5 times higher in long-term cancer survivors after accounting for sociodemographic variables.[8] There was no difference, however, in the 12-month risk for major depression[11] or late-life depression severity.[12] Anxiety (but not depression) was similarly elevated in long-term testicular cancer survivors.[13]

The prevalence and incidence of cancer increase dramatically with age.[14] Anxiety and depression also vary across age groups.[15] Specifically, while loss, chronic medical illness, and stressful life events are typically more common in later life, anxiety and depressive disorders are less prevalent in older than younger adults.[15-18] Paralleling these findings,

short-term anxiety and depression symptoms are less severe in older adult than younger adult cancer patients,[5] with both age groups being more anxious and depressed than population norms.[6] In long-term cancer survivors, younger and middle age adults were at greater risk for serious psychological distress than were cancer survivors aged 65 years and older after adjusting for sociodemographic and clinical variables.[19] In a nationally representative dataset, cancer survivors had an increased risk for anxiety disorders only after accounting for sociodemographic variables such as age.[8] This epidemiologic evidence suggests that age may be an important factor in the assessment of anxiety and depressive disorder risk.

The literature on the relationship between a lifetime history of cancer, mental illness, and age is limited in that studies frequently did not have long-term follow-up data, relied on symptom severity scales rather than a diagnostic interview, had a small sample, were generalizable to a single cancer type, and/or only examined age as a covariate in analyses rather than as an independent variable of primary interest. Many studies also did not concurrently study anxiety and depression, illnesses which co-occur frequently,[18] with comorbidity typically representing more severe anxiety and depression.[20] A more comprehensive investigation of age may have implications for the identification of cancer patients at greatest risk for developing anxiety and depressive disorders. Additionally, among those with a cancer history, sociodemographic characteristics' association with anxiety and depressive disorders may vary by age (e.g., insurance status may be more relevant to younger adults who do not qualify for Medicare), knowledge of which could lead to more targeted anxiety and depression interventions.

Using data from the Collaborative Psychiatric Epidemiology Surveys, we aimed to characterize the effect age may have on the relationship between psychopathology and cancer history. We hypothesized that: 1) irrespective of age, the 12-month history of anxiety and depressive disorders was more prevalent in those with a history of cancer than those without and 2) among those with a history of cancer, the 12-month history of anxiety and depressive disorders was less prevalent in older adults than in younger adults before and after accounting for sociodemographics and medical comorbidity.

METHODS

Participants

The Collaborative Psychiatric Epidemiology Surveys (CPES) consisted of three nationally-representative studies conducted from 2001-2003 that characterized mental illness with the World Mental Health Composite International Diagnostic Interview.[21, 22] Non-institutionalized adults aged 18 years and older living in the United States were eligible to participant.[21] The three cross-sectional studies were: 1) the National Comorbidity Survey-Replication (NCS-R), which interviewed 9,282 adults (70.9% response);[21]) the National Survey of American Life (NSAL), which interviewed 3,570 African Americans, 1,623 Afro-Caribbeans, and 1,006 non-Hispanic whites (72.3% response);[21, 22] and 3) the National Latino and Asian American Study (NSAAL), which interviewed 2,554 Latinos and 2,095 Asians (73.2% response).[21] The NCS-R and NSAL interviewed English speakers while the NSAAL also interviewed non-English speakers.[21] The University of Rochester Subjects

Review Board determined that our analyses of the CPES database did not warrant the board's oversight.

Cancer History

The NCS-R and NSAAL assessed a history of cancer with this question: “Did a doctor or other health professional ever tell you that you had cancer?” Those endorsing a cancer history were subsequently asked if they were “currently in treatment for your cancer, in remission, or has it been cured?” The NCS-R and NSAAL also had information on when participants were first diagnosed with cancer, and the NCS-R participants were asked where the cancer was located. The NSAL evaluated cancer with this item: “Please indicate whether a doctor or health professional has ever told you that you have cancer.” The NSAL further asked the participants with a history of cancer: “Currently how much does this health problem keep you from working or carrying out your daily tasks? Would you say a great deal, only a little, or not at all?”[23] In total, from a sample of 16,423 adults, 702 had a history of cancer and 15,530 denied cancer (cancer status missing in 191 participants), with current cancer status only known for the NCS-R and NSAAL participants.

Psychiatric Diagnoses

Algorithms based on DSM-IV criteria assigned the 12-month presence of psychiatric disorders. We included psychiatric diagnoses that were assessed in each of the three CPES studies. Our study examined anxiety (agoraphobia with and without panic disorder, generalized anxiety disorder, panic disorder, posttraumatic stress disorder, and social phobia) and depressive disorders (dysthymia and major depression without hierarchy), with the diagnostic labels corresponding to the classifications used in the CPES database.[23] In the NSAL, the subsample of white participants did not have information on posttraumatic stress disorder. Our analyses examined four summary psychiatric disorder classes: twelve-month history of 1) an anxiety disorder, 2) a depressive disorder, 3) any anxiety or depressive disorder, and 4) comorbid anxiety and depressive disorders. Accordingly, a participant with a 12-month history of both an anxiety disorder and a depressive disorder would be included in the “anxiety disorder,” “depressive disorder,” “any anxiety or depressive disorder,” and “comorbid anxiety and depressive disorder” groupings.

Covariates

We divided our sample into younger and older adults (18-59 and ≥60 years old). We used 60 years as the age threshold to be consistent with other national psychiatric epidemiology studies[15] and because the CPES dataset contains large numbers of racial and ethnic minorities who are at risk of early health deterioration[24] and mortality.[25] In addition to race and ethnicity, we examined characteristics previously associated with psychopathology in cancer survivors such as gender,[7] education level,[19] marital status,[19] economic problems,[13] medical comorbidity,[7, 19] and insurance status.[19]

Statistical Analyses

We used bivariate and multivariable analyses to characterize the effect age grouping had on the association of a lifetime history of cancer with anxiety and depressive disorders. We

used the Rao-Scott chi-square test[26] to examine: 1) the 12-month anxiety and depressive disorder prevalence and sample characteristic differences between age groups of those with a history of cancer and 2) the 12-month anxiety and depressive disorder prevalence and sample characteristic differences between those with and without a history of cancer stratified by age group. With anxiety and depressive disorders as our dependent variables, we included the following in logistic regression analyses: 1) history of cancer, 2) history of cancer stratified by age group, 3) history of cancer, age group, and the covariates discussed in the methods, and 4) history of cancer, age group, covariates, and an interaction term between age and history of cancer. We accounted for the variability of participants with missing data by using the "not missing completely at random" (i.e., nomcar) option in SAS 9.2. Due to the complex survey design of the NCS-R, NSAL, and NSAAL, we calculated population-weighted adjusted estimates using SAS survey procedures (SAS Institute, Inc., Cary, NC); weights adjusted for sampling design and nonresponse.

RESULTS

Sample

Of those who completed the full NCS-R interview (N=5,692), in addition to the NSAAL interviewees (N=4,649), 464 participants endorsed having a cancer history (NCS-R N=383; NSAAL N=81) and 9,873 denied having had cancer (NCS-R N=5,308; NSAAL N=4,565). In the NSAL sample, 238 participants endorsed having had cancer and 5,657 denied a cancer history. In total, 3.5% of the participants aged 18-59 years and 17.0% of those aged 60 years and older reported a history of cancer.

Characteristics by Age and Cancer Status

Of those with a cancer history, older adults were less likely than younger adults to have a 12-month history of an anxiety and/or depressive disorder, be female, be racially and ethnically diverse, have advanced education, be never married, be in the highest income to needs categories, be without a chronic medical illness, and be uninsured (Table 1). In the NCS-R and NSAAL subsample, there were no meaningful differences in cancer treatment status or years since first receiving a cancer diagnosis between the older and younger survey respondents with a cancer history. Approximately 70% of older and younger adults reported that they were cured of cancer, with most having initially received a cancer diagnosis more than five years ago. Based on the NCS-R data, cancer type varied by age: older adults were less likely to report cervical cancer and more likely to report breast cancer. Older adults in the NSAL dataset were more likely to report having impairment from their cancer (Table 1).

When stratifying by age, and comparing those with a history of cancer to those without a cancer history, some age group differences emerge (Table 2). In the younger group, people with a cancer history were more likely than those without a cancer history to have a 12-month history of an anxiety and/or depressive disorder, be female, be racially and ethnically homogenous, have married, be in the higher income to need groupings, have chronic illness, and be insured. In the older group, those with a history of cancer were less likely to have a 12-month history of anxiety and depressive disorders, be racially and ethnically diverse, and be uninsured.

Regression Analyses

In the unadjusted logistic regression analyses, a history of cancer in the overall study population was not associated with an increased risk of a 12-month history of anxiety and/or depressive disorders (Table 3). However, after stratifying by age, in the younger group a history of cancer was associated with a 69-105% increased risk of having a 12-month history of an anxiety and/or depressive disorder. In the older group, a history of cancer was associated with a 43-75% decreased risk in having a 12-month history of anxiety and depressive disorders.

In the initial set of multivariable logistic regression analyses that did not account for the interaction between age group and cancer, a history of cancer was not associated with a 12-month history of anxiety and/or depressive disorders. The younger age group, however, was at a 470-528% increased risk for these disorders (Table 4). In logistic regressions accounting for the interaction between age group and cancer, cancer status became associated with a 12-month history of an anxiety and/or depressive disorder. The younger group with a cancer history had a 483-716% increased risk for anxiety and/or depressive disorders, whereas older adults with a cancer history had a 45-77% decreased risk for these disorders (Table 5). In both sets of multivariable analyses, younger age, female gender, non-Latino white race and ethnicity, not being married, being in the lower income to need group, having chronic illness, and not being insured were generally associated with an increased risk for a 12-month history of anxiety and/or depressive disorders (Tables 4 and 5).

CONCLUSIONS

Our hypotheses were partially supported. As expected, among people with a cancer history, younger adults had a greater risk than older adults for having a 12-month history of anxiety and/or depressive disorders. In bivariate analyses of those with a cancer history, when compared to adults aged 60 years and older, younger adults had a 6.4 and 8.4 fold increase in anxiety or depressive disorder prevalence, respectively; in multivariable analyses, the elevated risk for anxiety and depressive disorders persisted. These findings are congruent with other studies also demonstrating increased risk for anxiety, depression, and psychological distress in younger cancer patients and survivors.[5, 6, 19] Additionally, among adults with a cancer history and any 12-month history of anxiety or depressive disorders, our analyses showed that 25.5% of the younger group had comorbid anxiety and depression compared to 12.0% in the older group. Since comorbid anxiety and depression frequently represent more severe disease,[20] it appears that younger adults with a cancer history thereby may also suffer from more severe mental illness than older adults. Analyses of the survey-specific data on cancer treatment status, site, impact, and recency of initial diagnosis, yielded few findings that potentially could explain the age differences in prevalence levels. For instance, cancer treatment status and recency of initial cancer diagnosis were similar between the two age groups, and cancer impacted daily functioning more in older than younger adults. The differences in cancer sites also did not provide a clear explanation for the higher prevalence of anxiety and depressive disorders in the younger age group. Gynecological cancers were more common in younger adults and breast cancers were more common in older adults, with both cancer types having been associated with worse anxiety

and depression.[5] The distribution of covariates associated with increased anxiety and depression risk is likewise not concentrated in one age group: among those with a history of cancer, younger adults were more likely to be female and uninsured, but older adults generally had less education and lower economic status, characteristics which may be associated with an increased risk for mental illness.[7, 13, 19]

For those endorsing a cancer history, there are several possible explanations as to why older adults had lower levels of anxiety and depressive disorders than younger adults. First, Erikson's Psychosocial Stages conceptual model theorizes that middle aged adults are focused on “generativity” (i.e., establishing and guiding the next generation) whereas increasing age obliges older adults to perform a life review and acknowledge their own mortality,[27] with self-acceptance being a key component of successful aging.[28] While distressing at any age, cancer may be especially disruptive to the life-course of younger and middle aged adults, particularly if they were to suffer from functional impairment. Second, older adults as a group may have more resources (e.g., Medicare coverage, more savings) and fewer dependents than younger adults, which could result in less associated stress with a cancer diagnosis. Third, there may be biological differences with regard to age-associated diseases and medications that alter the vulnerability to anxiety and depression.[16, 29, 30] Finally, coping styles may differ by age, and older adults may rely more on internal adjustments to cope with loss (e.g., altering their perception of the situation) because they presumably have fewer opportunities to change their life situation than younger adults.[31] Perhaps due to differing coping styles, as well as a tendency to focus on the positive[32] and having more life experiences to draw upon, older adults were better at adapting to loss than younger adults in a bereavement study.[33]

An unexpected finding that did not support our a priori hypothesis, was that the *direction* of the association of cancer history with a 12-month history of anxiety and depressive disorders varied by age group. In multivariable analyses including those with no cancer history, younger adults with a cancer history had a 584% and 613% increased risk while older adults with a cancer history had a 45% and 55% decreased risk for a 12-month history of anxiety and depressive disorders, respectively. In our multivariable analyses accounting for the interaction between age and cancer status, female gender, non-Latino white ethnicity and race, not married groupings, lower income to needs groupings, and uninsured status were associated with increased risk for 12-month anxiety and depressive disorders, largely consistent with prior research,[7, 13, 15, 19] with multiple chronic illnesses having a particularly strong association with anxiety and depressive disorders.

A possible explanation for the low levels of anxiety and depressive disorders in older adults with a cancer history involves examining how these adults may have responded to and coped with a cancer diagnosis. People experiencing significant adversity can show continued impairment from the adversity, demonstrate resilience (i.e., recovery to baseline functioning), or thrive (i.e., exceeding original level of functioning).[34] Furthermore, according to the coping paradigm of Susan Folkman, people can experience positive psychological states in response to a stressor by relying on techniques such as positive reappraisal and imbuing positive meaning to ordinary events.[35, 36] Building upon Erikson's framework, perhaps older adults are better able than younger adults to attach meaning to

having had a cancer diagnosis and to deal with the potential life-long impact of that diagnosis. While speculative, if older adults are more readily able to utilize coping techniques resulting in positive psychological states, having a lifetime history of cancer may impart some psychological benefits for older adults that are not necessarily accessible to older adults who have not experienced such a life-threatening event. Accordingly, these psychological benefits may have enabled many of the older adults with a cancer history to "thrive".

This study has some limitations. First, due to the variability of the data collected between the three different population-based surveys, we were unable to examine cancer treatment status, cancer site, cancer impact, and recency of initial cancer diagnosis in all the study participants. We therefore broadly dichotomized survey participants into those with and without a history of cancer (similar to a prior study),[37] while recognizing that there would be considerable heterogeneity among those with a cancer history. Extrapolating from the NCS-R and NSAAL data in which 7 in 10 participants with a cancer history reported that they were "cured" and more than 6 in 10 reported that it had been five or more years since the initial diagnosis, most categorized as having a cancer history in our analyses were likely cancer survivors. Second, the classification of cancer history status relied on a single question that may have been inaccurately reported. Third, the association between age grouping and mental illness may be in part due to cohort-specific effects with more recent cohorts endorsing more anxiety and depression.[15] Fourth, the CPES dataset is cross-sectional and we were unable to evaluate causal pathways. Fifth, the multiple comparisons in our analyses increased the risk for Type I Error and we did not adjust our alpha level for multiple comparisons. We primarily relied on consistency of patterns and magnitudes of association to draw inferences. Thus, there is a larger chance that some of the significant findings will not replicate.

In summary, in a nationally representative sample we observed considerable age-dependent variation with regard to the risk for a 12-month history of anxiety and depressive disorders in adults with a cancer history. The increased prevalence of these disorders in younger and middle aged adults with a history of cancer suggests that this group may be an appropriate target population for additional supportive services. Due to the limited cancer-specific information that was not consistently collected across CPES surveys, future research should investigate relationships between cancer type and stage with the subsequent development of anxiety and depression. Also, a more comprehensive understanding of why older adults with a cancer history appear to have less risk for anxiety and depression may provide insight for future prevention and treatment interventions for all adults with a cancer history.

Acknowledgments

Adam Simning was a student in the Medical Scientist Training Program at University of Rochester, which is funded by the National Institutes of Health (NIH) T32 GM007356 grant. The content is solely the responsibility of the authors and does not necessarily reflect the official views of the NIH.

REFERENCES

1. Centers for Disease Control and Prevention. Cancer survivors-United States, 2007. MMWR Morb Mortal Wkly Rep. 2011; 60:269–272. [PubMed: 21389929]

2. Stark DP, House A. Anxiety in cancer patients. Br J Cancer. 2000; 83:1261–1267. [PubMed: 11044347]
3. Mitchell AJ, Chan M, Bhatti H, et al. Prevalence of depression, anxiety, and adjustment disorder in oncological, haematological, and palliative-care settings: A meta-analysis of 94 interview-based studies. Lancet Oncol. 2011; 12:160–174. [PubMed: 21251875]
4. Massie MJ. Prevalence of depression in patients with cancer. J Natl Cancer Inst Monogr. 2004:57–71. [PubMed: 15263042]
5. Linden W, Vodermaier A, Mackenzie R, et al. Anxiety and depression after cancer diagnosis: Prevalence rates by cancer type, gender, and age. J Affect Disord. 2012; 141:343–351. [PubMed: 22727334]
6. van't Spijker A, Trijsburg RW, Duivenvoorden HJ. Psychological sequelae of cancer diagnosis: A meta-analytical review of 58 studies after 1980. Psychosom Med. 1997; 59:280–293. [PubMed: 9178339]
7. Earle CC, Neville BA, Fletcher R. Mental health service utilization among long-term cancer survivors. J Cancer Surviv. 2007; 1:156–160. [PubMed: 18648956]
8. Greer JA, Solis JM, Temel JS, et al. Anxiety disorders in long-term survivors of adult cancers. Psychosomatics. 2011; 52:417–423. [PubMed: 21907059]
9. Alfano CM, Rowland JH. Recovery issues in cancer survivorship: A new challenge for supportive care. Cancer J. 2006; 12:432–443. [PubMed: 17034679]
10. Stein KD, Syrjala KL, Andrykowski MA. Physical and psychological long-term and late effects of cancer. Cancer. 2008; 112:2577–2592. [PubMed: 18428205]
11. Pirl WF, Greer J, Temel JS, et al. Major depressive disorder in long-term cancer survivors: Analysis of the National Comorbidity Survey Replication. J Clin Oncol. 2009; 27:4130–4134. [PubMed: 19636024]
12. Keating NL, Norredam M, Landrum MB, et al. Physical and mental health status of older long-term cancer survivors. J Am Geriatr Soc. 2005; 53:2145–2152. [PubMed: 16398900]
13. Dahl AA, Haaland CF, Mykletun A, et al. Study of anxiety disorder and depression in long-term survivors of testicular cancer. J Clin Oncol. 2005; 23:2389–2395. [PubMed: 15800331]
14. Howlader, N.; Noone, AM.; Krapcho, M., et al. [April 8, 2013] SEER cancer statistics review, 1975-2009 (vintage 2009 populations). 2012. Available at: http://seer.cancer.gov/csr/1975_2009_pops09/.
15. Kessler RC, Berglund P, Demler O, et al. Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the National Comorbidity Survey Replication. Arch Gen Psychiatry. 2005; 62:593–602. [PubMed: 15939837]
16. Fiske A, Wetherell JL, Gatz M. Depression in older adults. Annu Rev Clin Psychol. 2009; 5:363–389. [PubMed: 19327033]
17. Regier DA, Boyd JH, Burke JD Jr. et al. One-month prevalence of mental disorders in the United States. Based on five Epidemiologic Catchment Area sites. Arch Gen Psychiatry. 1988; 45:977–986. [PubMed: 3263101]
18. Hasin DS, Goodwin RD, Stinson FS, et al. Epidemiology of major depressive disorder: Results from the National Epidemiologic Survey on Alcoholism and Related Conditions. Arch Gen Psychiatry. 2005; 62:1097–1106. [PubMed: 16203955]
19. Hoffman KE, McCarthy EP, Recklitis CJ, et al. Psychological distress in long-term survivors of adult-onset cancer: Results from a national survey. Arch Intern Med. 2009; 169:1274–1281. [PubMed: 19636028]
20. Schoevers RA, Beekman AT, Deeg DJ, et al. Comorbidity and risk-patterns of depression, generalised anxiety disorder and mixed anxiety-depression in later life: Results from the AMSTEL study. Int J Geriatr Psychiatry. 2003; 18:994–1001. [PubMed: 14618550]
21. Heeringa SG, Wagner J, Torres M, et al. Sample designs and sampling methods for the Collaborative Psychiatric Epidemiology Studies (CPES). Int J Methods Psychiatr Res. 2004; 13:221–240. [PubMed: 15719530]
22. Jackson JS, Torres M, Caldwell CH, et al. The National Survey of American Life: A study of racial, ethnic and cultural influences on mental disorders and mental health. Int J Methods Psychiatr Res. 2004; 13:196–207. [PubMed: 15719528]

23. Alegria, M.; Jackson, JS.; Kessler, RC., et al. [April 7, 2013] Collaborative Psychiatric Epidemiology Surveys (CPES), 2001-2003. 2013. Available at: http://www.icpsr.umich.edu/icpsrweb/CPES/.
24. Geronimus AT, Hicken M, Keene D, et al. "Weathering" and age patterns of allostatic load scores among blacks and whites in the United States. Am J Public Health. 2006; 96:826–833. [PubMed: 16380565]
25. Murray CJ, Kulkarni SC, Michaud C, et al. Eight Americas: Investigating mortality disparities across races, counties, and race-counties in the United States. PLoS Med. 2006; 3:e260. [PubMed: 16968116]
26. Rao JNK, Scott AJ. The analysis of categorical data from complex sample surveys: Chi-squared tests for goodness of fit and independence in two-way tables. J Am Stat Assoc. 1981; 76:221–230.
27. Erikson, EH. Identity and the Life Cycle. International Universities Press; New York, NY: 1959.
28. Reichstadt J, Sengupta G, Depp CA, et al. Older adults' perspectives on successful aging: Qualitative interviews. Am J Geriatr Psychiatry. 2010; 18:567–575. [PubMed: 20593536]
29. Djernes JK. Prevalence and predictors of depression in populations of elderly: A review. Acta Psychiatr Scand. 2006; 113:372–387. [PubMed: 16603029]
30. McKinney BC, Sibille E. The age-by-disease interaction hypothesis of late-life depression. Am J Geriatr Psychiatry. 2013; 21:418–432. [PubMed: 23570886]
31. Wrosch C, Heckhausen J. Perceived control of life regrets: Good for young and bad for old adults. Psychol Aging. 2002; 17:340–350. [PubMed: 12061416]
32. Lockenhoff CE, Carstensen LL. Socioemotional selectivity theory, aging, and health: The increasingly delicate balance between regulating emotions and making tough choices. J Pers. 2004; 72:1395–1424. [PubMed: 15509287]
33. Torges CM, Stewart AJ, Nolen-Hoeksema S. Regret resolution, aging, and adapting to loss. Psychol Aging. 2008; 23:169–180. [PubMed: 18361664]
34. Carver CS. Resilience and thriving: Issues, models, and linkages. J Soc Issues. 1998; 54:245–266.
35. Folkman S. Positive psychological states and coping with severe stress. Soc Sci Med. 1997; 45:1207–1221. [PubMed: 9381234]
36. Holland J, Poppito S, Nelson C, et al. Reappraisal in the eighth life cycle stage: A theoretical psychoeducational intervention in elderly patients with cancer. Palliat Support Care. 2009; 7:271–279. [PubMed: 19788768]
37. Mohile SG, Xian Y, Dale W, et al. Association of a cancer diagnosis with vulnerability and frailty in older Medicare beneficiaries. J Natl Cancer Inst. 2009; 101:1206–1215. [PubMed: 19638506]

Table 1

Characteristics of Participants with a Cancer Diagnosis History Stratified by Age Grouping

Sample Characteristics	Age 18-59 Years N=356		Age ≥60 Years N=346		p value[a]
	%	SE	%	SE	
12-Month Anxiety Disorder[b]					<0.001
Yes	23.8	2.9	3.7	0.9	
No	76.2	2.9	96.3	0.9	
12-Month Depressive Disorder[b]					<0.001
Yes	16.0	2.7	1.9	0.7	
No	84.0	2.7	98.1	0.7	
Any 12-Month Anxiety or Depressive Disorder[b]					<0.001
Yes	31.8	3.5	5.0	1.2	
No	68.2	3.5	95.0	1.2	
Comorbid 12-Month Anxiety and Depressive Disorder[b]					<0.001
Yes	8.1	1.8	0.6	0.4	
No	91.9	1.8	99.4	0.4	
Gender					0.005
Female	68.5	4.0	54.0	3.3	
Male	31.5	4.0	46.0	3.3	
Race and Ethnicity					0.023
African American	5.6	0.9	4.9	0.8	
Asian	1.2	0.4	0.9	0.4	
Latino	3.8	0.9	3.2	1.0	
non-Latino White	84.8	1.9	89.8	1.7	
Other	4.7	1.2	1.2	0.6	
Education, Years					0.005
0-11	13.4	2.3	24.9	3.4	
12	27.3	3.6	38.4	4.5	
13-15	29.5	3.8	16.4	3.4	
≥16	29.8	4.1	20.4	3.7	
Marital Status					<0.001
Married/Cohabiting	65.1	4.1	63.2	4.1	
Divorced/Separated/Widowed	26.3	3.8	35.6	4.0	
Never Married	8.6	2.0	1.2	0.5	
Income to Needs Ratio					0.003
<25 Percentile	15.0	2.8	22.3	2.9	
25-50 Percentile	27.1	3.5	36.5	5.0	
50-75 Percentile	19.3	3.0	23.3	3.8	
75-100 Percentile	38.6	4.4	17.9	4.3	
Chronic Illness[c]					<0.001

Sample Characteristics	Age 18-59 Years N=356		Age ≥60 Years N=346		p value[a]
	%	SE	%	SE	
0	33.1	3.8	7.0	1.9	
1	35.8	3.9	35.0	5.4	
≥2	31.1	3.0	58.1	5.2	
Insured					<0.001
Yes	90.0	1.7	99.1	0.4	
No	10.0	1.7	0.9	0.4	
Cancer Status (NCS-R, NSAAL)[d]					0.921
In Treatment	12.5	3.2	13.4	2.7	
In Remission	15.7	3.0	17.0	3.8	
Cured	71.7	4.3	69.6	4.6	
Years Since First Cancer Diagnosis (NCS-R, NSAAL)[e]					0.124
<5 Years	36.8	4.3	28.7	3.9	
5 -<10 Years	22.0	3.7	25.4	4.1	
10 -<20 Years	24.8	3.3	18.2	3.0	
≥20 Years	16.5	4.1	27.7	5.0	
Cancer Site (NCS-R)[f]					<0.001
Breast	12.3	2.4	22.8	5.1	
Cervical	18.6	3.9	3.1	1.3	
Prostate	6.0	2.9	10.3	3.0	
Skin/Melanoma	19.5	3.3	20.1	4.3	
Uterine or Ovarian	9.5	2.5	3.6	1.5	
Other	31.3	3.7	32.5	5.6	
≥2 Sites	2.8	0.7	7.6	2.6	
Cancer Impact (NSAL)[g]					0.021
Great Deal	14.7	6.3	13.8	3.2	
Only a Little	5.8	1.8	20.5	4.5	
Not at All	79.5	7.2	65.7	4.5	

Notes: SE: standard error; NCS-R: National Comorbidity Survey-Replication; NLAAS: National Latino and Asian American Study; NSAL: National Survey of American Life.

There are missing data with the number of participants equaling:

[a] p values determined by the Rao-Scott chi-square test; degrees of freedom equal number of categories minus one.

[b] 701

[c] 696

[d] 454

[e] 460

[f] 381

[g] 238

Table 2

Characteristics by Cancer Diagnosis History Stratified by Age Grouping

Sample Characteristics	Adults Aged 18 to 59 Years					Adults Aged ≥60 Years				
	Cancer History N=356		No Cancer History N=13,256		p value[a]	Cancer History N=346		No Cancer History N=2,274		p value[a]
	%	SE	%	SE		%	SE	%	SE	
12-Month Anxiety Disorder[b]					<0.001					0.042
Yes	23.8	2.9	13.9	0.5		3.7	0.9	6.3	0.7	
No	76.2	2.9	86.1	0.5		96.3	0.9	93.7	0.7	
12-Month Depressive Disorder[c]					0.005					0.026
Yes	16.0	2.7	9.5	0.4		1.9	0.7	3.9	0.6	
No	84.0	2.7	90.5	0.4		98.1	0.7	96.1	0.6	
Any 12-Month Anxiety or Depressive Disorder[d]					<0.001					0.061
Yes	31.8	3.5	18.5	0.6		5.0	1.2	7.9	0.8	
No	68.2	3.5	81.5	0.6		95.0	1.2	92.1	0.8	
Comorbid 12-Month Anxiety and Depressive Disorder[c]					0.036					0.029
Yes	8.1	1.8	4.9	0.3		0.6	0.4	2.3	0.4	
No	91.9	1.8	95.1	0.3		99.4	0.4	97.7	0.4	
Gender					<0.001					0.309
Female	68.5	4.0	50.8	0.9		54.0	3.3	57.6	2.0	
Male	31.5	4.0	49.2	0.9		46.0	3.3	42.4	2.0	
Race and Ethnicity					<0.001					<0.001
African American	5.6	0.9	11.1	0.6		4.9	0.8	8.5	0.8	
Asian	1.2	0.4	4.9	0.4		0.9	0.4	3.3	0.6	
Latino	3.8	0.9	13.7	1.1		3.2	1.0	6.5	0.8	
non-Latino White	84.8	1.9	67.7	1.7		89.8	1.7	79.9	1.8	
Other	4.7	1.2	2.6	0.3		1.2	0.6	1.7	0.6	
Education, Years					0.594					0.232
0-11	13.4	2.3	15.3	0.7		24.9	3.4	29.9	2.2	
12	27.3	3.6	30.4	1.3		38.4	4.5	33.1	2.0	

Sample Characteristics	Adults Aged 18 to 59 Years					Adults Aged ≥60 Years				
	Cancer History N=356		No Cancer History N=13,256		p value[a]	Cancer History N=346		No Cancer History N=2,274		p value[a]
	%	SE	%	SE		%	SE	%	SE	
13-15	29.5	3.8	28.6	0.9		16.4	3.4	20.9	1.7	
≥16	29.8	4.1	25.7	1.0		20.4	3.7	16.0	1.6	
Marital Status					<0.001					0.238
Married/Cohabiting	65.1	4.1	58.0	1.1		63.2	4.1	57.5	1.9	
Divorced/Separated/Widowed	26.3	3.8	14.7	0.5		35.6	4.0	40.2	2.0	
Never Married	8.6	2.0	27.4	1.1		1.2	0.5	2.3	0.5	
Income to Needs Ratio					0.010					0.609
<25 Percentile	15.0	2.8	21.3	1.0		22.3	2.9	24.5	1.3	
25-50 Percentile	27.1	3.5	28.4	0.7		36.5	5.0	31.3	1.4	
50-75 Percentile	19.3	3.0	23.4	0.8		23.3	3.8	21.9	1.9	
75-100 Percentile	38.6	4.4	26.9	1.2		17.9	4.3	22.3	2.0	
Chronic Illness[f]					<0.001					0.004
0	33.1	3.8	57.8	0.8		7.0	1.9	19.5	1.6	
1	35.8	3.9	26.1	0.7		35.0	5.4	26.2	1.8	
≥2	31.1	3.0	16.0	0.6		58.1	5.2	54.4	2.4	
Insured[g]					<0.001					0.002
Yes	90.0	1.7	83.3	0.7		99.1	0.4	96.5	0.5	
No	10.0	1.7	16.7	0.7		0.9	0.4	3.5	0.5	

Notes: SE: standard error.

There are missing data with the number of participants equaling:

[a] p values determined by the Rao-Scott chi-square test; degrees of freedom equal number of categories minus one.

[b] 356, 13,247, 345, 2,272

[c] 356, 13,251, 345, 2,273

[d] 356, 13,246, 345, 2,272

[e] 356, 13,252, 345, 2,273

[f] 354, 13,221, 342, 2,254

$g_{356,\ 13,166,\ 346,\ 2,267}$.

Table 3

Unadjusted Logistic Regression Analyses of the Association of a Cancer History with a 12-Month History of Anxiety and Depressive Disorders Stratified by Age Grouping

	Anxiety		Depression		Any Anxiety or Depression		Comorbid Anxiety and Depression	
	Odds Ratio	95% Confidence Interval[a]	Odds Ratio	95% Confidence Interval[a]	Odds Ratio	95% Confidence Interval[a]	Odds Ratio	95% Confidence Interval[a]
History of Cancer,[b] Yes								
All Ages[c]	1.01	0.73-1.38	0.96	0.65-1.40	1.02	0.75-1.39	0.87	0.55-1.38
Adults Aged 18 to 59 Years[d]	1.93[g]	1.37-2.74	1.81[g]	1.19-2.77	2.05[g]	1.45-2.90	1.69[f]	1.03-2.78
Adults Aged ≥60 Years[e]	0.57[f]	0.33-0.99	0.47[f]	0.24-0.92	0.61	0.37-1.02	0.25[f]	0.06-0.98

There are missing data with the number of participants equaling:

[a] Intervals based on 95% Wald confidence limits.

[b] Reference group is no history of cancer.

[c] 16,220, 16,225, 16,219, 16,226

[d] 13,603, 13,607, 13,602, 13,608

[e] 2,617, 2,618, 2,617, 2,618.

[f] $p < 0.05$; p values generated using Wald chi-square tests with one degree of freedom. [g] $p < 0.01$.

Table 4

Multivariable Logistic Regression Analyses of the Association of a Cancer History with a 12-Month History of Anxiety and Depressive Disorders

	Anxiety N=16,062		Depression N=16,067		Any Anxiety or Depression N=16,061		Comorbid Anxiety and Depression N=16,068	
Sample Characteristics[a]	**Adjusted Odds Ratio**	**95% Confidence Interval**[b]	**Adjusted Odds Ratio**	**95% Confidence Interval**[b]	**Adjusted Odds Ratio**	**95% Confidence Interval**[b]	**Adjusted Odds Ratio**	**95% Confidence Interval**[b]
History of Cancer								
Yes	1.11	0.82-1.51	1.09	0.76-1.56	1.19	0.89-1.60	0.88	0.57-1.36
Age Group								
18-59 Years	4.70[d]	3.60-6.13	5.09[d]	3.60-7.20	5.28[d]	4.17-6.68	4.81[d]	3.05-7.59
Gender								
Female	1.62[d]	1.38-1.90	1.57[d]	1.33-1.85	1.70[d]	1.49-1.95	1.43[d]	1.09-1.88
Race and Ethnicity								
African American	0.62[d]	0.53-0.72	0.54[d]	0.45-0.64	0.59[d]	0.51-0.67	0.51[d]	0.39-0.67
Asian	0.46[d]	0.37-0.58	0.62[d]	0.44-0.86	0.51[d]	0.41-0.63	0.52[d]	0.34-0.81
Latino	0.66[d]	0.56-0.79	0.83[c]	0.69-1.00	0.74[d]	0.63-0.86	0.67[d]	0.51-0.88
Other	1.47[d]	1.16-1.87	1.27	0.87-1.86	1.26	0.99-1.60	1.83[c]	1.13-2.96
Education, Years								
0-11	1.17	0.96-1.42	1.18	0.92-1.52	1.12	0.94-1.35	1.36[c]	1.01-1.83
12	0.96	0.79-1.16	0.94	0.74-1.19	0.96	0.80-1.16	0.89	0.63-1.25
13-15	1.04	0.87-1.26	1.03	0.82-1.30	1.02	0.85-1.22	1.12	0.81-1.55
Marital Status								
Divorced/Separated/Widowed	1.77[d]	1.52-2.06	1.87[d]	1.47-2.36	1.82[d]	1.55-2.14	2.01[d]	1.54-2.62
Never Married	1.35[d]	1.15-1.57	1.60[d]	1.32-1.93	1.43[d]	1.25-1.65	1.60[d]	1.24-2.06
Income to Needs Ratio								
<25 Percentile	1.26	0.98-1.62	1.45[d]	1.13-1.86	1.29[c]	1.06-1.58	1.58[c]	1.05-2.38
25-50 Percentile	1.23[c]	1.03-1.46	1.31[c]	1.03-1.67	1.24[d]	1.05-1.46	1.40[c]	1.05-1.86
50-75 Percentile	1.16	0.98-1.38	1.01	0.77-1.32	1.11	0.94-1.30	1.09	0.81-1.48
Chronic Illness								

	Anxiety N=16,062		Depression N=16,067		Any Anxiety or Depression N=16,061		Comorbid Anxiety and Depression N=16,068	
Sample Characteristics[a]	**Adjusted Odds Ratio**	**95% Confidence Interval**[b]	**Adjusted Odds Ratio**	**95% Confidence Interval**[b]	**Adjusted Odds Ratio**	**95% Confidence Interval**[b]	**Adjusted Odds Ratio**	**95% Confidence Interval**[b]
1	1.38[d]	1.14-1.68	1.40[d]	1.12-1.75	1.37[d]	1.17-1.62	1.57[c]	1.06-2.30
≥2	2.49[d]	2.15-2.89	2.58[d]	2.13-3.12	2.52[d]	2.24-2.84	3.11[d]	2.37-4.10
Insured								
No	1.31[d]	1.11-1.55	1.20[c]	1.03-1.41	1.31[d]	1.14-1.51	1.19	0.94-1.51

[a] Reference groups are no cancer history, ≥60 years, male gender, non-Latino white race and ethnicity, ≥16 years of education, married/cohabiting, 75-100 percentile for household income to poverty ratio, no chronic illness, and having insurance.

[b] Intervals based on 95% Wald confidence limits.

[c] p <0.05; p values generated using Wald chi-square tests with one degree of freedom.

[d] p <0.01.

Table 5

Multivariable Logistic Regression Analyses of the Association of a Cancer History with a 12-Month History of Anxiety and Depressive Disorders Accounting for the Interaction of Age and Cancer History

	Anxiety N=16,062		Depression N=16,067		Any Anxiety or Depression N=16,061		Comorbid Anxiety and Depression N=16,068	
Sample Characteristics[a]	**Adjusted Odds Ratio**	**95% Confidence Interval**[b]	**Adjusted Odds Ratio**	**95% Confidence Interval**[b]	**Adjusted Odds Ratio**	**95% Confidence Interval**[b]	**Adjusted Odds Ratio**	**95% Confidence Interval**[b]
History of Cancer								
Cancer Yes in 18-59 Year Age Group	5.84[d]	4.07-8.39	6.13[d]	3.79-9.91	7.16[d]	5.06-10.12	4.83[d]	2.85-8.18
Cancer Yes in ≥60 Year Age Group	0.55[c]	0.31-0.98	0.45[c]	0.22-0.93	0.59	0.34-1.02	0.23[c]	0.06-0.96
Gender								
Female	1.61[d]	1.37-1.89	1.56[d]	1.32-1.84	1.69[d]	1.48-1.94	1.42[c]	1.08-1.87
Race and Ethnicity								
African American	0.62[d]	0.53-0.72	0.54[d]	0.45-0.64	0.59[d]	0.51-0.67	0.51[d]	0.39-0.67
Asian	0.46[d]	0.37-0.58	0.62[d]	0.44-0.86	0.51[d]	0.41-0.64	0.52[d]	0.34-0.81
Latino	0.67[d]	0.56-0.79	0.84	0.70-1.00	0.74[d]	0.64-0.87	0.67[d]	0.51-0.88
Other	1.46[d]	1.15-1.85	1.25	0.86-1.84	1.24	0.98-1.58	1.80[c]	1.10-2.92
Education, Years								
0-11	1.16	0.95-1.42	1.17	0.91-1.51	1.12	0.93-1.34	1.35[c]	1.00-1.82
12	0.96	0.79-1.16	0.94	0.74-1.19	0.97	0.81-1.16	0.89	0.63-1.25
13-15	1.04	0.86-1.26	1.03	0.82-1.30	1.02	0.84-1.22	1.12	0.81-1.55
Marital Status								
Divorced/Separated/Widowed	1.76[d]	1.51-2.05	1.85[d]	1.46-2.35	1.81[d]	1.54-2.13	1.99[d]	1.53-2.60
Never Married	1.35[d]	1.16-1.58	1.60[d]	1.33-1.93	1.44[d]	1.25-1.66	1.60[d]	1.24-2.07
Income to Needs Ratio								
<25 Percentile	1.27	0.99-1.64	1.46[d]	1.14-1.88	1.31[d]	1.07-1.59	1.60[c]	1.06-2.41
25-50 Percentile	1.24[c]	1.04-1.48	1.32[c]	1.04-1.68	1.26[d]	1.07-1.48	1.41[c]	1.06-1.88
50-75 Percentile	1.17	0.99-1.39	1.01	0.78-1.32	1.12	0.95-1.31	1.10	0.81-1.49
Chronic Illness								
1	1.38[d]	1.13-1.68	1.40[d]	1.12-1.75	1.37[d]	1.16-1.62	1.56[c]	1.06-2.30

	Anxiety N=16,062		Depression N=16,067		Any Anxiety or Depression N=16,061		Comorbid Anxiety and Depression N=16,068	
Sample Characteristics[a]	**Adjusted Odds Ratio**	**95% Confidence Interval**[b]	**Adjusted Odds Ratio**	**95% Confidence Interval**[b]	**Adjusted Odds Ratio**	**95% Confidence Interval**[b]	**Adjusted Odds Ratio**	**95% Confidence Interval**[b]
≥2	2.47[d]	2.14-2.86	2.56[d]	2.11-3.10	2.50[d]	2.23-2.82	3.08[d]	2.34-4.05
Insured								
No	1.31[d]	1.11-1.55	1.20[c]	1.03-1.41	1.31[d]	1.14-1.51	1.19	0.94-1.51

[a] Reference groups are no cancer history, ≥60 years, male gender, non-Latino white race and ethnicity, ≥16 years of education, married/cohabiting, 75-100 percentile for household income to poverty ratio, no chronic illness, and having insurance.

[b] Intervals based on 95% Wald confidence limits.

[c] p <0.05; p values generated using Wald chi-square tests with one degree of freedom.

[d] p <0.01.