A comparison of demographic, medical, social, and lifestyle behaviour correlates between cancer and non-cancer populations: a secondary analysis of the English Longitudinal Study of Aging cohort

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Research Article

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Abstract

Purpose

This secondary analysis of the English Longitudinal Study of Aging (ELSA) dataset aims to explore differences in sociodemographic, medical, psychosocial, and behavioural characteristics between cancer and non-cancer populations.

Methods

Data was collected in waves via computer-assisted interviewing, self-led questionnaires, and nurse-led physical measurements. Datasets were arranged according to variables of interest. IBM SPSS Statistics v27.0 software was used to perform parallel cross-sectional analyses. Chi-squares determined differences in categorical variables and Analyses of Variance (ANOVAs) determined differences in continuous variables.

Results

Cancer groups were more likely to report poor or fair general health than those without cancer (p < .001 in Waves 2, 6, 9 and COVID Wave 2; p = .016 in COVID Wave 1). They were also more likely to report often being troubled by pain (Wave 2 p = .037, Wave 6 p = .036, Wave 9 p = .006) and a difficulty with one or more activities of daily living (ADLs) and mobility (p < .001 in Waves 2, 6 and 9). In Waves 6, 9 and COVID Wave 2, cancer groups were less likely to report being current smokers (p < .001) and more likely to report being ex-smokers having smoked regularly in the past (p < .001). Cancer groups reported less frequent engagement in mild, moderate or vigorous physical activity in Wave 2 (p < .001, p = .005, p = .008) and Wave 9 (p = .003, p < .001, p < .001). Those with cancer were more likely to experience depression (p = .026) in Wave 6.

Conclusion

These findings indicate pain management may be a useful therapeutic aim in combination with targeted physical activity advice and psychosocial interventions for cancer populations.

Introduction

Research has shown healthy nutrition and regular activity improve physical function, quality of life and health outcomes among cancer populations [1, 2]. More research into how characteristics of people living with and beyond cancer compare to non-cancer populations is needed to inform how we give lifestyle advice and encourage engagement in beneficial health behaviours.

The English Longitudinal Study of Aging (ELSA), which has been collecting data from more than 18,000 participants across England since 2002, allows investigation of health characteristics in the maturing population [3]. Understanding the current lifestyle characteristics of the population with cancer informs how and what lifestyle and behavioural interventions we recommend to this patient group. While research has shown that exercise programs benefit health-related quality of life for cancer survivors across all cancer types, an understanding of current activity levels among people living with and beyond cancer allows improved targeting of interventions and guidelines [11].

The variety of information collected by the ELSA allows us to look at the needs of this population holistically, including important psychosocial factors. The psychosocial impact of cancer diagnosis and treatment lends itself to the development of a range of mood complications and psychiatric disorders, including depression and anxiety [13–15]. To develop a truly holistic approach to patients living with or beyond cancer an understanding of the burden of these
psychosocial consequences must inform future recommendations and interventions, as mental health can impact treatment, recovery, quality of life and survival [16].

This hypothesis generating secondary analysis of the ELSA dataset aims to explore differences in sociodemographic, medical, psychosocial, and behavioural characteristics between cancer and non-cancer populations.

**Methods**

**Design**

This study is a series of cross-sectional analyses of ELSA datasets. The ELSA is an ongoing panel study of a representative cohort of men and women aged fifty years or older living in England. Subjects were recruited from respondents to the Health Survey for England (HSE). Detailed descriptions of the study and its cohorts, recruited in waves, have been published previously [3]. The ELSA aims to provide a source of information on the health, social, wellbeing, and economic circumstances in the older English population to record changing characteristics and be a resource for retrospective cohort studies. The ELSA data used in this study was collected in waves (Wave 2 2002/03, Wave 6 2012/13, Wave 9 2018/19, COVID Wave 1 July 2020, COVID Wave 2 November 2020) via computer-assisted interviewing and self-led questionnaires. In Waves 2 and 6, nurse-led physical measurements were also completed. Samples varied (Wave 2 n = 9,432; Wave 6 n = 10,601; Wave 9 n = 8,736; COVID Wave 1 n = 9,392; COVID Wave 2 n = 6,794). Some participants in each wave were repeat participants while others were new recruits. We did not perform direct wave-to-wave comparisons. Therefore, we did not track which participants were follow-ups, lost to follow-up, or new recruits.

**Statistical analyses**

The datasets were arranged according to variables of interest, which are detailed below. Measures varied between waves. Full details of the measures and data collected from each wave is available in the supplementary table (Online Resource 1). IBM SPSS Statistics v27.0 software was used to perform parallel cross-sectional analyses. Chi-squares determined differences in categorical variables and Analyses of Variance (ANOVAs) determined differences in continuous variables within each wave.

We combined the variables informing of a new diagnosis of cancer and of a cancer diagnosis fed forward from a previous wave to make a summary variable containing all patients in the ‘cancer group’ for each wave. This variable was used in statistical analyses for comparison of the ‘cancer group’ to the remainder of the population, who we term the ‘non-cancer group’.

**Measures**

**Sociodemographic variables**

Self-reported sociodemographic data included age, sex, marital status, ethnicity, income, and employment status. Ethnicity was reported as ‘white’ or ‘non-white’ in Waves 2, 6 and 9, and ‘BAME’ or ‘non-BAME’ in COVID Waves 1 and 2. Current income level compared to before the coronavirus outbreak was reported in COVID Wave 1 and financial situation compared to before the coronavirus outbreak was reported in COVID Wave 2. ELSA measured and summarised income at the benefit unit (BU) level. A benefit unit is defined as a single adult or a married/cohabiting couple and any dependent children [3]. Total income equals the sum of income from: employment, self-employment, private pensions, state pension, benefits, assets and any ‘other’ reported income. See supplementary table (Online Resource 1) for income adjusted (‘equivalised’) for benefit unit size and unadjusted (‘unequivalised’) in Waves 2, 6 and 9.

**Health behaviours**
Self-reported health behaviours included smoking status, alcohol consumption, and physical activity (PA). Self-reported PA in Wave 2 was categorised as ‘sedentary’, ‘low’, ‘moderate’ or ‘high’. Waves 2, 6 and 9 reported engagement in mild, moderate and vigorous activities separately. Responses included ‘more than once a week’, ‘once a week’, ‘one to three times a month’ and ‘hardly ever or never’. Smoking status and weekly hours worked were assessed in both COVID waves. COVID Wave 1 included measures of current alcohol consumption, frequency of and changes in internet use compared to before the coronavirus outbreak COVID Wave 1 also assessed the following behaviours: physical activity, sitting, eating, sleeping, and watching TV. Wave 6 only measured average hours of sleep.

**General health and physical measures**

Self-reported general health was measured on a 5-point Likert scale (5 = excellent to 1 = poor). Self-reported difficulty with activities of daily living (ADLs) or mobility were reported as the level of difficulty in performing the following: walking 100 yards, sitting 2 hours, getting up from a chair after sitting for long periods, climbing several flights of stairs without resting, stooping, kneeling, crouching, reaching or extending arms above shoulder level, pulling or pushing large objects, lifting or carrying weights over 10 pounds, and picking up a 5p coin from a table. Experience of pain was also measured.

Nurse-led physical measures included observed mobility status, grip strength, whether the respondent was able to hold a side-by-side stand (for less 10 seconds, more than 10 seconds, or not at all), mean gait speed in metres per second, and body mass index (BMI). In Wave 2, additional variables of cognitive index and stress (cortisol area under the curve for one complete day) are reported. Cognitive index combines scores of objective memory and executive function tests to produce a score ranging from 0–60. Self-reported quality of sleep over the past month was measured in Wave 6 and COVID Wave 1.

**Psychosocial measures**

Self-reported psychosocial measures included feelings of depression, loneliness, isolation from others, and satisfaction with life, as well as whether the respondent reported having friends. Psychosocial measures collected in COVID Wave 1 included ‘how happy, overall, did you feel yesterday?’, ‘how anxious, overall, did you feel yesterday?’, ‘how satisfied are you with your life nowadays?’, and ‘Extent [to which you] feel things you do in your life are worthwhile’ (scale of 0 to 10).

**Results**

Summary of results available in the Supplementary Table (Online Resources 1).

**Differences in Sociodemographic Characteristics by Cancer Status**

The sociodemographic characteristics of sex, age and ethnicity in cancer and non-cancer groups differed between waves and are reported fully in Supplementary Table 1 (Online Resource 1). There was no statistically significant difference in these characteristics between groups. The study population across all waves was mostly female and white. ANOVAs revealed that the mean age of participants with cancer was higher than those without cancer in all waves. People in the cancer group were more likely to report ‘not working’ in Waves 2, 6 and 9 (p < .001) than those without cancer (p < .001). There was no difference in both unequivalised and equivalised total net income between the cancer and non-cancer groups apart from in Wave 9, where the cancer group had a lower unequivalised total net income than those in the non-cancer group (p = .023). In COVID Wave 2 those in the cancer group were less likely to report being ‘much worse off’ compared to those in the non-cancer group and more likely to report being ‘about the same’ or ‘a little better off’ financially than before the SARS-CoV-2 outbreak (p = .039).

**Differences in Self-Reported General Health by Cancer Status**

Those reporting cancer were more likely to report ‘poor’ or ‘fair’ general health than non-cancer groups, and less likely to report ‘good’, ‘very good’ or ‘excellent’ general health (p < .001 in Waves 2, 6, 9 and COVID Wave 2; p = .016 in COVID Wave 1). Cancer groups were more likely to report often being troubled by pain (Wave 2 p = .037, Wave 6 p = .036, Wave 9 p
= .006), and difficulty with one or more ADLs (p < .001 Waves 2, 6, 9) and mobility (p < .001 Waves 2, 6, 9). The cancer group was more likely to report ‘very bad’ or ‘fairly bad’ sleep quality (Wave 6, p = .047). See the Supplementary Table (Online Resource 1) for detailed results.

**Differences in Health Behaviour by Cancer Status**

Smoking behaviour did not differ by cancer status in Wave 2 and COVID Wave 1. However, participants with a history of cancer were less likely to report being current smokers than those without cancer Waves 6, 9, and COVID Wave 2 (all p < .001). Those with cancer were also more likely to report being ex-smokers ‘having smoked regularly in the past’ in Wave 6 and 9 (both p < .001). Participants with cancer were less likely to report having ‘never smoked’ than those without cancer in Wave 6 and 9 (both p < .001). Differences in smoking behaviour is represented in Figs. 1a and 1b. There was no difference in frequency of alcohol consumption between groups across Waves 2, 6 and 9.

Those with a history of cancer were more likely to report ‘hardly ever or never’ engaging in mild, moderate, or vigorous sports or physical activities in both Wave 2 (p < .001, p = .005, p = .008) and Wave 9 (p = .003, p < .001, p < .001). This difference was only statistically significant in relation to moderate and vigorous activities for Wave 6 (p < .001 for both). Physical activity differences across all intensities in Wave 2 is demonstrated in Fig. 2. Further detailed data for Waves 6 and 9 can be found in the supplementary table (Online Resource 1).

**Impact of the Coronavirus Pandemic on Health Behaviours**

In COVID Wave 1 there was no difference between cancer and non-cancer groups regarding change in frequency of internet use, physical activity, time spent sitting, time spent sleeping, eating behaviour, time spent watching TV, or hours worked per week during the coronavirus outbreak.

**Nurse-led Physical Measures by Cancer Status**

Mean gait speed was lower among those with a history of cancer compared to non-cancer groups (0.8m/s ± 0.3 vs. 0.9m/s ± 0.2, p = .021 in Wave 2). There were no differences in BMI between groups (Waves 2 and 6). Those with cancer had a lower mean cognitive index (28.1 ± 6.9 vs. 28.8 ± 6.7, p = .014 in Wave 2).

**Differences in Psychosocial Measures by Cancer Status**

No difference in reported depression in the past week was found between cancer and non-cancer groups in Wave 2. However, in Wave 6 those with cancer were more likely to respond that they had experienced feeling depressed in the past week (p = .026). There was no difference in feelings of loneliness (Wave 2), satisfaction with life (Waves 2, 6 and 9), or isolation from others (Waves 2, 6 and 9). In COVID Wave 1 there was no difference between groups in ratings of happiness, anxiety, satisfaction with life, and feeling that the activities the respondents engaged in were worthwhile.

**Discussion**

The aim of this study was to explore any differences in demographic, medical, social, and behavioural characteristics between cancer and non-cancer populations in the ELSA cohort. A number of differences were found, including cancer groups being more likely to report poorer general health, less frequent engagement in physical activity, and identifying as an ex-smoker than non-cancer groups. The cancer groups were also more likely to report often being troubled by pain. These findings indicate there is a need to consider individual characteristics and have tailored, relevant feedback in order to improve wellbeing, and that are unique characteristics to consider among the cancer population.

In terms of sociodemographic measures, while patients in the cancer group were more likely to report ‘not working’ in Waves 2, 6 and 9, the equivalised and unequivalised BU total net income generally did not differ between cancer and non-cancer groups. Additional forms of non-employment related income received by cancer groups including state and private
pensions and benefits may have prevented a statistically significant difference in total net income between the groups despite patients with cancer being less likely to work full time.

In COVID Wave 2 those with cancer were less likely to report being ‘much worse off’ than those without cancer when considering their current financial situation compared to before the pandemic (p = .039). It was reported in Waves 2, 6 and 9 prior to the pandemic that those in the non-cancer groups were more likely to be working. In contrast, those in the cancer group were more less likely to be working prior to the pandemic. Cancer groups were therefore were less likely to experience a loss of employment-related income during this time.

Current literature confirms that those living with and beyond cancer are more likely to be retired than those without cancer of the same age [17]. Early retirement and non-employment after cancer diagnosis are associated with lower physical quality of life, mental quality of life and pain [18]. Understanding the employment status of the population living with and beyond cancer in the context of other health behaviours of this group, including less frequent engagement in PA and more frequent experience of pain than non-cancer populations, points to the need for tailored guidance regarding remaining active around the home and guidance for employers about supporting those with a cancer diagnosis in returning to work.

In terms of health behaviours, patients with cancer were less likely than those without cancer to engage in physical activity. There are several factors that could contribute to this including mobility, pain, mood, attitude towards and anticipated benefits of exercise or access to local facilities and exercise groups [19, 20]. Results show that cancer groups were more likely to report often being troubled by pain and were more likely to report a difficulty with one or more ADLs and mobility. In particular, it was found that cancer groups were more likely to report a difficulty with mobility (gross and fine motor skills) than non-cancer groups. This may indicate a need for targeted physiotherapy and occupational therapy for people with cancer who experience this difficulty. Research has shown physical exercise improves the harmful sequelae of treatment in patients with cancer and may even improve survival and reduce rate of recurrence [20–23]. Further research is required to determine the dose-response relationship between physical activity and cancer prevention, prognosis and symptom control [21, 23].

Smoking behaviour also differed between groups across the waves. Smoking cessation after cancer diagnosis is associated with increased survival in lung cancer and head and neck cancers, and reduces risk of recurrence of lung, breast, bladder and gastric cancer, as well as improving quality of life [24, 31]. The importance of smoking cessation for patients with cancer is widely acknowledged. However, previous studies assessing smoking cessation programs for patients with cancer have shown that these programmes often have limited success due to lack of follow-up and patient perceptions of continued smoking [32, 33]. Research based on the US National Health and Nutrition Examination Surveys has shown that two-thirds of cancer survivors continue smoking after cancer diagnosis [12]. While we cannot comment on change in smoking behaviours before and after diagnosis, our analysis shows that despite people in the cancer group having smoked more regularly in the past, they were less likely to be current smokers than their counterparts in the non-cancer group. Current literature shows the time of cancer diagnosis might be an opportune ‘teachable moment’ for smoking cessation education as patients are more receptive to discussions on the subject [34]. More research would be required to understand accurately why, among this population, people with a cancer diagnosis are less likely to be current smokers, and the timing and reasoning of decisions regarding changes to smoking behaviours by individuals.

Psychosocial measures did not differ significantly between groups apart from in Wave 6 where those in the cancer group were more likely to report feeling depressed much of the time during the past week than those without cancer. These results indicate that any psychological support accessed by respondents in our study population was sufficient for their needs at the time of data collection. However, these results do not give an indication of what the specific forms of psychological support, if any, were available to and accessed by participants at the time of responding.

Finally, it is of note that there was no difference between cancer and non-cancer groups in changes of health behaviours during the pandemic. This included internet use, physical activity, time spent sitting, time spent sleeping, amount eaten,
time spent watching TV or hours worked per week during the coronavirus outbreak as recorded in COVID Wave 1. Patients in the cancer group would have been subject to shielding advice at the time of response in July 2020 due to their diagnosis of cancer whereas participants in the non-cancer group may not have been “clinically vulnerable” and therefore not asked to shield. However, this did not appear to impact the lifestyle and behaviours of one group more than another. This may be due to the overall mature age of both groups in the study population and other health issues experienced by participants without cancer leading to shielding advice being given to a large proportion of the non-cancer population. It may also be influenced by the fact that England had been subject to national lockdown from March to May 2020, with social distancing restrictions and local lockdowns still in place at the time the data was collected, which may have restricted the actions of both groups to a similar extent.

**Strengths and Limitations**

The ELSA study is a health cohort study for the maturing population in the UK. The strengths of the current study include the large sample size, the standardised collection of measures by trained nurses and interviewers, and the use of objective nurse-led physical measurements. Limitations of this study include the restriction of the cross-sectional design, which does not allow for inference of causality; the use of self-reported data for the majority of measures, including reporting of cancer diagnosis; the lack of use of validated mental health assessment tools to assess psychological measures; and the potential for selection bias in recruitment methods. Data assessing the full impact of the COVID pandemic may permit further observations as subsequent waves are released. The ELSA population is made up of respondents to the Health Survey for England and is used to inform policies and understanding of the health of the older population. It also requires a large investment of time from participants to complete all aspects of the ELSA questionnaires, interviews and physical measures. Therefore, it is possible the recruited participants are more motivated and generally healthier than the average population of over-50s in England.

**Conclusion**

This study found that cancer populations are less likely than non-cancer populations to engage in physical activity of any intensity and are more likely to experience pain regularly. There was no difference between populations in change in frequency of health behaviours during the early coronavirus pandemic. Cancer populations were more likely to experience depression, however, they were not more likely to experience a difference in loneliness, isolation or satisfaction with life. These findings indicate there are some important differences between cancer and non-cancer populations, such as pain management, that may be provide useful therapeutic aims in combination with targeted physical activity advice and psychosocial interventions for cancer populations. Further research is required to determine trends in demographic, behavioural, psychosocial and medical characteristics over time in cancer and non-cancer populations to allow development of more specific guidelines taking into account a range of intervention moderators. Recognition of the value of individualised care based on circumstantial characteristics would lead to increased efficacy of interventions and improved patient outcomes.

**Declarations**

**Funding:**

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**Competing Interests:**

The authors have no relevant financial or non-financial interests to disclose.

**Ethics Approval:**
Approval was obtained from the ethics committee of Hull York Medical School. The procedures used in this study adhere to the tenets of the Declaration of Helsinki. The authors accessed and processed data in accordance with the UK Data Service guidelines.

Consent to participate and consent to publish:

All individual participants in the original study provided informed written consent. Additional consent for secondary analyses and consent to publish was not required. All data used from the ELSA database was anonymised.

Data availability:

Data for all waves of the English Longitudinal Study of Aging which has been used in this study was accessed via the UK Data Service.

Author contribution statement:

All authors contributed to the study conception and design. Creation and analysis of the dataset were performed by ED and supervised by CF. The first draft of the manuscript was written by ED and all authors edited and approved the final version of the manuscript.

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References


**Figures**
Figure 1

a: Smoking status by cancer across all waves. * Indicates statistically significant values: Wave 6 p<.001; Wave 9 p<.001; COVID Wave 2 p<.001.

### Figure 2

Frequency of physical activity by cancer status and intensity of physical activity in Wave 2.

### Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [onlineresource1supplementarytable.pdf](onlineresource1supplementarytable.pdf)