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Aging of persons with schizophrenia: analysis of a national dataset

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ABSTRACT

Objectives: The number of older adults suffering from schizophrenia is increasing. Despite this, less than 1% of published studies about schizophrenia focus on those older than 65 years. Research indicates these individuals may age differently from the general population due to lifestyle, medication factors, and effects of the disease itself. We aimed to analyze whether schizophrenia was associated with a younger age at first assessment for social care as a proxy measure for accelerated aging.

Design: We analyzed the effect of schizophrenia diagnosis, demographics, mood, comorbidities, falls, cognition, and substance use on age at first assessment for social care using linear regression.

Participants: We used data from 168,780 interRAI Home Care and Long-Term Care Facility (HC; LTCF) assessments completed from July 2013 to June 2020.

Results: When corrected for confounding factors, schizophrenia contributed to age at first assessment being 5.5 years younger ($p = 0.0001$ Cohen's $D = 1.0$) than in people free from schizophrenia. Its effect on age at first assessment was second only to smoking. People suffering from schizophrenia also required a higher level of care (long-term care facility rather than home care). People suffering from schizophrenia had significantly higher rates of diabetes mellitus and chronic obstructive pulmonary disease but otherwise had lower rates of comorbidity than people free from schizophrenia who required care.

Conclusions: Aging with schizophrenia is associated with needing increased social care at a younger age. This has implications for social spending and developing policies to decrease frailty in this population.

Key words: Schizophrenia, disability

Introduction

The numbers of people suffering from schizophrenia who are 65 years or older are increasing with the number of people suffering from schizophrenia over the age of 55 are predicted to double by 2050 (Cohen *et al.*, 2015). This will present an increased demand for both healthcare and social services. However, less than 1% of scientific publications about schizophrenia are devoted to older adult patients (Cohen *et al.*, 2018). Thus, there is a need to study older people suffering from schizophrenia

A major concern is that people suffering from schizophrenia might be aging at an accelerated rate compared to the general population and that suffering from schizophrenia is associated with premature frailty and mortality (Jeste and Maglione, 2013). This accelerated rate of aging is due in part to antipsychotic use and adverse lifestyle factors including increased rates of smoking, sedentary lifestyles, and poor health care (Jeste *et al.*, 2011). People suffering from schizophrenia are at increased risk of comorbid physical health problems (Jeste *et al.*, 2011), partly due to these factors, though some have argued that there is an increased risk of aging inherent in the disease itself (Kirkpatrick and Kennedy, 2018; Kirkpatrick *et al.*, 2008). In a Swedish study comparing men and women suffering from schizophrenia to the general population, their life expectancy was decreased by 12–15 years which is not explained by an increase in unnatural causes of death (Crump *et al.*, 2013). A systematic review of European studies on mortality in people suffering from schizophrenia indicates that standardized mortality rates have not improved over the last 30 years (Piotrowski *et al.*, 2017).

Negative health outcomes for people suffering from schizophrenia are to a large extent driven by

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the high rates of comorbid metabolic syndrome and related diseases (Gatov *et al.*, 2017; Jeste *et al.*, 2011). Jin *et al.* found that the Framingham 10-year risk of coronary heart disease in people with schizophrenia was increased by 79% compared with the risk in the general population (Jin *et al.*, 2011). A large USA study demonstrated patients suffering from schizophrenia have significantly higher rates of congestive heart failure, chronic obstructive pulmonary disease (COPD), diabetes, and hypothyroidism compared to people without schizophrenia (Hendrie *et al.*, 2014). On the other hand, a Danish study comparing physical health in people over 70 years old suffering from schizophrenia to controls found no difference in registered chronic medical illness (Brink *et al.*, 2017). The authors hypothesized that people suffering from schizophrenia who reach the age of 70 are "survivors" and more likely to be healthy than patients suffering from schizophrenia who died at an earlier age. They also reported that patients suffering from schizophrenia were significantly less likely to receive medications for their cardiovascular disease and less likely to be referred for general medical outpatient contacts. This is similar to the findings of Crump *et al.* (Lee *et al.*, 2019) in the Swedish population with an increase in COPD and diabetes diagnoses in people with schizophrenia but not in ischemic heart disease, while patients suffering from schizophrenia who died of ischemic heart disease were less likely to have been diagnosed prior to death than the general population.

In parallel to the increased rate of physical comorbidity is an escalation in health care costs for older people suffering from schizophrenia. Hendrie *et al.* found that patients suffering from schizophrenia were significantly more likely to live in residential homes (Hendrie *et al.*, 2014). They were also significantly more likely to require hospital care and consequently had significantly higher costs of care for both Medicare and Medicaid in a US-based study (Hendrie *et al.*, 2014). Initially after deinstitutionalization, social care for people suffering from schizophrenia was mostly managed by patients' families. However, the number of people with serious mental illnesses living with their families in the last 30 years has declined from 73 to 46%, and there has not been a compensatory increase in access to social care (Lee *et al.*, 2019).

In New Zealand, the International Residential Assessment Instrument (interRAI) is completed for every adult who is considered for community care services or long-term care setting. The data included in the interRAI assessments provide extensive information on the health of older patients suffering from schizophrenia in New Zealand and their social needs. Previously, these data have been used to examine the sociodemographic, social, and diagnostic differences between people suffering from schizophrenia and those free from schizophrenia (Lacey *et al.*, 2019). The aim of the present study is to analyze the interRAI data with a focus on comparing people with schizophrenia to older adults free of schizophrenia in their need of residential care and indices of accelerated aging.

Methods

Participants

Participants in this study were New Zealanders aged 65 years or older who had an interRAI assessment completed during the study period (1st July 2013 to 30th June 2020) and who had been recorded in the interRAI as having a diagnosis of schizophrenia. Controls in this study were any New Zealander aged 65 years or older who had an interRAI assessment completed in the same period and who were recorded to be free from schizophrenia. 118 people were excluded from the analysis as they were reported as having "no discernible consciousness, coma". Patients with missing data were also excluded—less than 0.01% of records.

The interRAI is a 236-item, internationally designed, evidence-based assessment tool. It encompasses over 20 clinical assessment instruments that give a comprehensive picture of participants' physical, psychological, and cognitive function and well-being. Data are collected by a trained health care professional based on a structured interview with the person and their family or carer, observations made by the health professional, and any other available clinical information. The interRAI assessment is mandated in NZ for government-funded community support or for entry into aged residential and nursing homes. This represents any person thought to have an age-related disability affecting their function likely to persist for at least 6 months. Data from both people assessed in the community for home care (interRAI-HC) and in long-term care facilities (interRAI-LTCF) were included in the present analysis. For those patients who had undergone multiple assessments during the study period, only the data from the first assessment was included in the analysis. All data were anonymized. Informed consent for the inclusion of participants' data in research was gained at the time of the interRAI assessment, and the 96% of participants that consented were included (Leitch *et al.*, 2018).

Trained interRAI assessors identified people as suffering from schizophrenia if a diagnosis had been made by a medical professional and was recorded in GP records, specialist letters, or as a listed diagnosis in a discharge summary from a psychiatric or general hospital.

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Measurements

We analyzed 37 items from the interRAI including demographic data (age, gender, and ethnicity), cognition, mood, history of recent falls (defined as within the last 90 days), alcohol and tobacco use, and BMI. Ethnicity was determined as self-identification by the participant or their appointed representative, as a standard practice in New Zealand (Stats New Zealand, 2013). Items asking for the presence of 20 specific comorbidities were included. These comorbidities were active diagnoses and subdivided into "primary diagnosis", "present in active treatment", or "present, monitored but no active treatment". We collated these into diagnosis present or absent for our analysis. Mood was assessed using the Cap Mood score. This is a trigger based on the person's Depression Rating Scale (DRS). The DRS score is then stratified into "high risk" if score is over 3, "medium risk" if the score is 1–2, and "not triggered" if the score is 0 (Gray *et al.*, 2009; Morris *et al.*, 2013).

Statistical analysis

Stata version/IC version 16 (StataCorp., 2017) was used to carry out all analyses. Tests on proportion and distributions are reported individually in the results. Effect sizes are reported to enable interpretation of clinical relevance.

A linear regression analysis was preformed using the regress command using a Huber/White/sandwich estimator for variance (vce(robust)) assuming unclustered data. The analysis dependent (continuous) variable was age at presentation, and independent variables were both categorical: schizophrenia, dementia or bipolar disorder diagnosis, previous stroke, presence of coronary heart disease, presence of congestive heart failure, presence of COPD, presence of diabetes mellitus, presence of pneumonia, UTI, fracture or cancer, Mood as measured on the CAP-Mood score, alcohol intake, gender, ethnicity, whether people were being assessed for in home or long-term care facility care and recent falls, and continuous BMI. To account for large sample size fallacy (Lantz, 2013) factors, effect sizes were counted as significant if they fell into the moderate or large effect size benchmark categories listed for specific tests by B. Lantz (Lantz, 2013).

Ethics

Ethical approval for this study was obtained from the University of Otago Ethics Committee. We consulted the Ngāi Tahu Research Consultation Committee about the study impact on the Maori people (the indigenous people of New Zealand).

Results

Descriptive statistics

During the study period, 606,924 InterRAI assessments were completed with people aged over 65 years, with 168,780 first assessments included. After exclusion, the final analyzed sample consisted of 168,622 assessments. Of these 2103 (1.25%) were people suffering from schizophrenia and 166,519 (98.75%) were people free from schizophrenia.

A summary of participants' demographics is detailed in Table 1.

People suffering from schizophrenia were significantly younger than those without, with a mean age of 74.6 years, compared to 82.3 years, respectively (Students T $p < 0.0001$; Cohen's D effect size 0.9888996; confidence interval 0.9457604–1.032036). Age was normally distributed within the group free from schizophrenia. However, in those suffering from schizophrenia, there was consistent decline in the number of people as age increased (See Figure 1). A two-sample Kolmogorov–Smirnov test for equality of distribution functions was used to test how likely it was that chance explained the difference in distribution of the two groups. With a "p" value of <0.001, there is a one in one thousand probability that the difference in distribution can be explained by chance.

There was a greater proportion of people suffering from schizophrenia without comorbidities than there were people free from schizophrenia without comorbidities. Comorbidities that were more frequent in people suffering from schizophrenia were COPD (17% vs 14.9%) and diabetes mellitus (25.7%% vs 20.0%). Coronary heart disease, congestive heart failure, and stroke were significantly higher in those free from schizophrenia. See Figures 2 and 3 for comparison of comorbidities in those suffering from schizophrenia and those free from schizophrenia. Interestingly at 65 years or older, 34.5% of people suffering from schizophrenia were already being supported in long-term care facilities, compared with only 13.3% in the population free from schizophrenia (Pearson χ^2 $p < 0.001$).

Regression model

The linear regression model used to assess the independent effect of having schizophrenia on the age of requiring support when controlled for comorbidities, gender, ethnicity and mood details can be found in Table 2. All variables were statistically significant. A positive coefficient of 1 would indicate that if that variable is present patients are a year older at first assessment, than if the variable is not present. A negative variable would indicate the opposite. In

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Table 1. Characteristic of the interRAI sample analyzed

CHARACTERISTICS	TOTAL	PEOPLE SUFFERING WITH SCHIZOPHRENIA	PEOPLE FREE FROM SCHIZOPHRENIA
Age, y			
Mean (range; SD)	82.23 (65–105; 0.19)	74.59 (65–102; 0.17)	82.32 (65–110; 0.19)
Gender (%)			
Male	66,957 (39.7)	814 (38.7)	66,143 (39.7)
Female	101,665 (60.3)	1289 (61.3)	100,376 (60.3)
Ethnicity (%)			
European	147,232 (87.3)	1721 (81.8)	145,511(87.4)
Maori	9814 (5.8)	192 (9.1)	9622 (5.8)
Pacifica	6165 (3.7)	92 (4.4)	5073 (3.0)
Other Ethnicity*	6411 (3.8)	98(4.7)	6313 (3.8)
Type of assessment (%)			
Assessment for home care	146,126 (86.7)	1377 (65.5)	144,749 (86.9)
Assessment for long-term care facility	22,496 (13.3)	726 (34.5)	21,770 (13.1)
Smoking status			
Smoker	159,218 (94.4)	430 (20.5)	8970 (5.4)
Non-smoker	9400 (5.6)	1673 (79.6)	157,545 (94.6)
Alcohol- highest number of drinks in a single sitting in the last 14 days			
No alcohol	137,022 (81.3)	1901 (90.4)	135,121 (81.2)
1 drink	20,479 (12.2)	123 (5.9)	20,356 (12.2)
2-4 drinks	9125 (5.4)	58 (2.8)	9067 (5.5)
5 or more drinks	1992 (1.2)	21 (1.0)	1971(1.2)

*Listed in InterRAI as Asian/Middle Eastern/Latin American/African/Other ethnicity.

this model, the association between schizophrenia and age at first interRAI assessment showed a decrease of 5.46 years (95% CI. 5.83–5.09, $p < 0.001$). This was the variable that was most significantly associated with a decrease in age of interRAI assessment second only to smoking (decrease of 5.70). Other factors associated with a large decrease in age at first assessment were ethnicity and high-risk scores on the CAP-Mood score assessment.

Māori ethnicity was associated with the biggest decrease in age at first interRAI assessment of 4.46 years (CI -4.65 to -4.27, $p < 0.001$), followed by Pacific Peoples at -3.53 (CI -3.80 to -3.27, $p < 0.001$) then other ethnicities (including Asian Middle Eastern/Latin American/African, and other) at -2.38 (CI -2.61 to -2.15, $p < 0.001$). The NZ European ethnicity was the "base" comparator as this was the largest group.

Differences within the people suffering with schizophrenia

Of the 2103 people with schizophrenia, 1377 were assessed for home care and 726 for residential care. Those suffering from schizophrenia who were assessed for home care were younger than those assessed for long-term care facility (LTCF) although the effect size of this was only moderate (Pearson χ^2 $p < 0.001$, Cramer V effect size = 0.241). A chi-squared test showed no significant difference in the number of comorbidities of people assessed for HC and LTCF in people suffering from schizophrenia. There was a difference in the number of people with scores reflecting severe impairment on the Cognitive Performance Scale with 13.8% of people being assessed for LTCF demonstrating a severe impairment score and only 4.6% of people being assessed for HC, but the effect size was small (Pearson χ^2 $p < 0.001$, Cramer V effect size = 0.16).

Discussion

The number of older people suffering from schizophrenia is increasing and with this potential impact on health and social care needs. Possible impacts are poorer aging in this population including increased rates of comorbidity, particularly metabolic syndrome, and increased care needs.

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Figure 1. Distribution of age - density = frequency of the proportion of people of a certain age compared to the total number of participants in the graph.

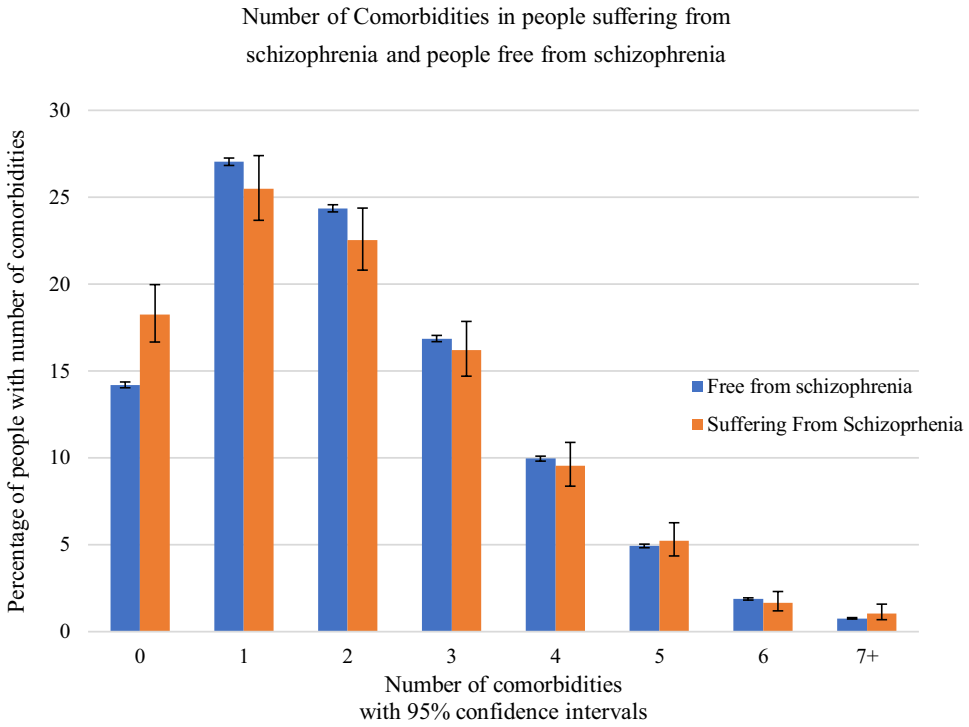

Figure 2. Number of comorbidities in people suffering from schizophrenia and people free from schizophrenia.

Our findings show that people suffering from schizophrenia have a first assessment for social care provision 7.64 years younger than people free from schizophrenia. When corrected for ethnicity, comorbidities and other attributes people suffering from schizophrenia still present 5.5 years younger than people free from schizophrenia for care provision. This indicates an independent effect of schizophrenia on the age at which care is required. At 65 years of age, people with schizophrenia have three

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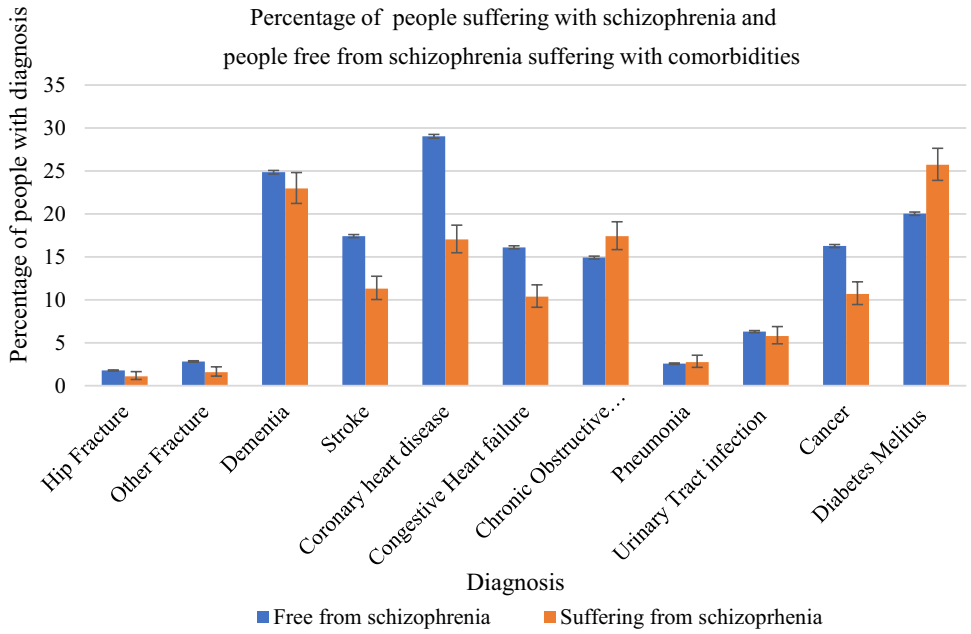

Figure 3. Percentage of people suffering with schizophrenia and people free from schizophrenia suffering with comorbidities.

times more placement in LTCFs. This higher proportion of people suffering from schizophrenia who need a higher level of care (a long-term care facility rather than home care) than in people free from schizophrenia; 34.5% vs. 13.1%, and this is associated with higher costs.

There is also a highly significant difference in distributions of the age at first assessment of people suffering from schizophrenia and those free from schizophrenia. This suggests a large number of people suffering from schizophrenia may be entering care prior to the age of 65 years and that if we had not set a cutoff of 65 years and older for our population, we might have seen a larger difference in the age at first assessment than 5 years. This indicates an increased rate of aging or frailty in this population independent of comorbidities or other confounding factors. There is evidence that patients with schizophrenia die much earlier than the general population (Crump *et al.*, 2013). Our evidence points to them aging younger too. However, other factors which we have not investigated could be contributing including cognitive deficits, behavioral issues, and lack of family support.

Interestingly, there was a significantly larger proportion of people suffering from schizophrenia without comorbidities than people free from schizophrenia. There are several possible explanations for this. Brink *et al.* found no difference in registered chronic medical illnesses in people suffering from schizophrenia and people free from schizophrenia. They explained this with a "survivor" hypothesis in which they described those people suffering from schizophrenia who had made it to an older age as likely to be healthier than the general population of people suffering from schizophrenia in order to have survived. Another possible explanation is that people suffering from schizophrenia are underreported, underdiagnosed, and undertreated for their comorbidities (Brink *et al.*, 2017; Crump *et al.*, 2013). Finally, our results could have been affected by looking specifically at people who required home care or long-term care facility placement. People being assessed for the interRAI have a disability affecting their function that is thought likely to last for at least 6 months. In our population, schizophrenia diagnosis without comorbidity may have conferred the high level of frailty required for social care, for example because of behavioral issues or lack of social support. Therefore, our population of people suffering from schizophrenia would not need other comorbidities to reach a threshold level of frailty requiring care. This could have led to lower levels of comorbidity in this group. In New Zealand, access to social care including home care and old age residential care is based on frailty and need and not specific diagnoses.

We found higher rates of COPD and diabetes in people suffering from schizophrenia. This has been shown in previous studies of older people with schizophrenia (Hendrie *et al.*, 2014). However, unlike previous studies (Hendrie *et al.*, 2014; Jin *et al.*, 2011), we found lower rates of coronary heart disease, congestive heart failure, and stroke in people suffering from schizophrenia. This may

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Table 2. Linear regression model: effect schizophrenia on age of requiring support

VARIABLE	COEFFICIENT[1]	P > |T|[2]	[95% CONFIDENCE INTERVAL]	
Diagnosis (compared to not diagnosed with a condition)				
Schizophrenia	− 5.460926	0.001	− 5.831919	− 5.089933
Stroke	− 0.674659	0.001	− 0.7873059	− 0.5620121
Coronary Heart disease	1.13339	0.001	1.038608	1.228172
Congestive Heart failure	2.259429	0.001	2.142426	2.376431
Chronic Obstructive pulmonary disease	− 1.273152	0.001	− 1.393422	− 1.152882
Pneumonia	0.7330379	0.001	0.4426953	1.023381
Urinary Tract Infection	1.073198	0.001	0.8952044	1.251192
Cancer	− 0.5514269	0.001	− 0.6680883	− 0.4347654
Diabetes Mellitus	− 0.9946306	0.001	− 1.102958	− 0.8863031
Bipolar	− 4.466662	0.001	− 4.808157	− 4.125166
Dementia	− 0.7048627	0.001	− 0.8064901	− 0.6032353
Cap_10 Mood Score Compared to not triggered				
Medium risk	− 1.12872	0.001	− 1.227194	− 1.030247
High Risk	− 2.042059	0.001	− 2.16169	− 1.922429
Smoking status compared to not smoking				
Smokes	− 5.698186	0.001	− 5.887392	− 5.508979
Alcohol Intake (compared to no recent alcohol intake)				
1 in last 14 days	0.6072285	0.001	0.4811634	0.7332936
2-4 drinks in last 14 days	− 0.7311455	0.001	− 0.9154096	− 0.5468813
5 + drinks in last 14 days	− 2.631001	0.001	− 3.023539	− 2.238463
BMI	− 0.3149661	0.001	− 0.3221302	− 0.3078019
Gender (compared to female gender)				
Male	− 1.215099	0.001	− 1.303937	− 1.126261
Ethnicity (compared to European ethnicity)				
Maori	− 4.462003	0.001	− 4.65399	− 4.270016
Other Ethnicity	− 2.381664	0.001	− 2.608453	− 2.154874
Pacific Peoples	− 3.532446	0.001	− 3.798259	− 3.266632
Falls and fractures				
Recent falls	0.775055	0.001	0.6866465	0.8634635
Fractures	1.153647	0.001	0.9304856	1.376808
Assessment type (compared to home care assessment)				
Long term care facility	2.369064	0.001	2.253863	2.484266

[1]The coefficients indicate the increase in the number of years in age per unit of the variable of interest if all other variables remain the same. Reported coefficients are standardized.
[2]P-values are rounded up to the nearest significant place.

be in line with Crump *et al.* (Crump *et al.*, 2013) who found that patients who died from ischemic heart disease were significantly less likely to have been diagnosed prior to their death than those free from schizophrenia.

Our study also found that there was no significant difference in the diagnosis of UTI or pneumonia in the populations suffering from schizophrenia and free from schizophrenia. This is of interest as those suffering from schizophrenia were on average much younger and these two infections would be expected to have a higher prevalence in older populations, suggesting that perhaps those with schizophrenia have a biological age older than their chronological age and are therefore more vulnerable to infection.

Strengths and limitations

The major strength of this study is the large sample size. We captured a sample of 2103 people suffering from schizophrenia and 166,519 people who were free from schizophrenia. Thus, our analysis had high power to show trends in care needs and comorbidities. There was also a low level of missing data in both groups in the variables we chose to analyze reducing the risk of bias.

Unfortunately, we were unable to include data on medication use due to the poor nature of data collected in free form text. As this was a cross-sectional analysis, no assumptions about causation can be made based on the correlations found in this study.

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Conclusions

People suffering from schizophrenia require social care at a younger age. The effect of schizophrenia on age at first assessment for home care or residential care was associated with a very large coefficient. This association is important in informing social care spending as well as in demonstrating the need to structure policy to allow people suffering from schizophrenia to age better.

Conflicts of Interest

No known conflicts of interest.

Source of Funding

No funding received.

Description of authors' roles

Dr Clare Taube is responsible for writing the manuscript, analysis the database, and the statistical analysis.

Dr Charlotte Mentzel is responsible for advising on statistical analysis and editing the manuscript.

Professor Paul Glue is responsible for advising on the research and the manuscript.

Associate Professor Yoram Barak is responsible for supervising the project and editing the manuscript.

Data Statement

The data have not been previously presented orally or by poster at scientific meetings.

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