

BMJ Open Long-term health conditions in UK working-age adults: a cross-sectional analysis of associations with demographic, socioeconomic, psychosocial and health-related factors in an inner-city population

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ABSTRACT

Objectives To study the overall disease prevalence, and associations between demographic, socioeconomic, psychosocial, and health-related factors, and self-reporting one or more long-term health conditions (LTCs) in a working-age inner-city population.

Design Cross-sectional household-based survey with a follow-up timepoint.

Setting South-East London Community Health survey data.

Participants 893 adults aged 16–64 years living in Lambeth and Southwark, London.

Outcome measures Prevalence estimates of individual and multiple LTCs. Multinomial logistic regression was used to analyse the association of demographic, socioeconomic, psychosocial and health-related indicators with having one and multiple LTCs at two timepoints.

Results More than one third of participants reported at least one LTC, with the most prevalent being musculoskeletal conditions and asthma. The prevalence of one LTC at both timepoints was 20.6% and 21.4%, and of multimorbidity was 14.0% and 16.4%. At both timepoints, the 35–44 age group showed the largest increase in prevalence of one LTC compared with the preceding age group (16–34). After adjusting for age and gender, small social networks and a larger number of stressful life events were associated with increased risk of having both one and multiple LTCs. The risk of multimorbidity was greater than for initial LTCs for small social networks (3.8 (95% CI: 1.8 to 7.8) compared with 2.0 (95% CI: 1.0 to 3.9)), and three to five stressful life events (3.0 (95% CI: 1.7 to 5.3) compared with 1.5 (95% CI 1.0 to 2.2)).

Conclusions In this study, the prevalence of multimorbidity increased more than the prevalence of one LTC between the two timepoints, indicating a progression of the overall disease prevalence over time. The 35–44 age group showed the greatest increase in the number of initial LTCs which support health-promotion interventions targeting younger age groups. Focusing on increasing social support networks and treating the psychological impact of stressful life events may also be of benefit.

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ By including all self-reported long-term health conditions (LTCs) without any exclusions, this study gives a comprehensive indication of the prevalence of individual and multiple long-term conditions and most common conditions in this inner city working-age population.
- ⇒ Including a follow-up timepoint enables the short-term changes in prevalence estimates, and associations between risk factors and morbidity status to be explored.
- ⇒ Using self-reported LTCs has benefits and limitations, and while health perceptions and indicators of health-related quality of life can be directly assessed in line with morbidity status, conditions with the most impact may be reported and those with little or no impact, may not be reported.
- ⇒ The cross-sectional nature of the analysis limits the ability to make causal inferences linked to the development and progression of LTCs.

INTRODUCTION

In the UK, a tendency towards unhealthy lifestyles characterised by high-risk health behaviours, including smoking, excess alcohol intake, obesogenic diets and a lack of exercise, has contributed to a rise in the prevalence of long-term health conditions (LTCs) across the lifespan.^{1,2} It is estimated that there are 26 million people in England with at least one LTC, with this number expected to rise.³ LTCs can have a major impact on an individual's quality of life, social integration and the ability to work, and the impact is greater for those living with more than one LTC.⁴ It is well established that having one LTC is the starting point for developing multiple LTCs, and it is not surprising that the prevalence of

multimorbidity is also increasing, placing unprecedented financial pressure on the NHS.⁵

Studies investigating demographic and socioeconomic factors linked to LTCs have shown that people living in deprived areas have a greater incidence of multimorbidity, with young and middle-aged adults living in the most deprived areas showing multimorbidity rates equivalent to adults 10–15 years older living in the least deprived areas.^{6,7} Furthermore, LTCs leading to functional impairments that limit day-to-day activities (disability) are also linked to reduced employment rates, decreased quality of life and well-being.⁸ Since the incidence of LTCs in younger adults is increasing, it is important to explore risk factors for having one or more LTCs in a working-age population.

The majority of studies estimating the prevalence of multimorbidity only use a predetermined list of conditions.^{9,10} However, the South East London Community Health (SELCoH) household survey data have the benefit of using not only a prespecified list, but also a free answer section for self-reporting additional LTCs, which enables an estimate of the overall disease prevalence. In addition, the SELCoH dataset provides a rich source of demographic, socioeconomic, psychosocial and health-related measures which can be assessed in relation to the risk of both one LTC and multimorbidity. The present study used data from the first two waves of the SELCoH survey which were undertaken in 2008–2010 and 2011–2013.

This study aimed to describe the overall disease prevalence, and prevalence of individual conditions, in the working-age adult population who had participated in the SELCoH study at the first and second (follow-up) timepoints. The main objective was to study the distribution of one LTC and multimorbidity according to a range of demographic, socioeconomic, psychosocial and health-related indicators, describe associations between any of these indicators and having one or multiple LTCs and determine if any associations change at follow-up.

METHODS

Study design and population

The SELCoH study is a psychiatric and physical health household survey of adults living in the London boroughs of Lambeth and Southwark. Full details of the SELCoH study design, participants, and procedures have been previously published.^{7,11}

Study procedure and data

Trained interviewers carried out face-to-face interviews in participants' homes and collected demographic, socioeconomic, psychosocial and health-related information including self-reported physical and mental health conditions. For this study, data were used from participants who completed both first and second phases of the SELCoH study, with interviews carried out between 2008–2010 (S1) and 2011–2013 (S2). The household response rate for the first wave was 51.9%, with a response rate of 71.9%

for eligible participants within households.⁷ Of those who completed the first wave, 1052 participants completed both waves of the SELCoH study (a 73% response rate) as previously described.¹¹ Of these, a working-age sample of 893 was selected from those who had lived in Lambeth and Southwark across both timepoints. The minimum age of SELCoH participants was 16 years at S1, and participant data were excluded for those 65 years or more at S2.

Study variables

Long-term health conditions

The presence of LTCs was determined from a checklist of 15 health conditions in a questionnaire enquiring about the presence of long-standing illnesses, disabilities or infirmities currently troubling them, or likely to trouble them, over a period of time. Additional LTCs not listed in the questionnaire were captured in a free answer section so that all self-reported long-term conditions were included.

A final list of conditions, or group of conditions, was constructed after considering the frequencies of each condition. Similar conditions were grouped together where necessary, and conditions that had a frequency of <5 cases and without other similar conditions were combined into a non-specific LTC group so that all conditions were counted in the analysis of the total disease prevalence.

Sociodemographic indicators

Sociodemographic indicators included gender, age, relationship status, ethnicity and migrant status. Age was categorised into the following age groups: 16–34, 35–44, 45–54 and 55–64 years. Due to the low cell counts in younger participants with multiple LTCs, the lowest age band included those aged 16–34. Relationship status was categorised as married/cohabiting (in a relationship), single (not in a relationship) and divorced/separated or widowed (previously in a relationship). Ethnicity was determined using data collected at S2 due to the S2 SELCoH questionnaire being based on standard government categories of ethnicity which enabled the differentiation between white British and non-British white ethnicities. Ethnic groups were then categorised as white British, black Caribbean/black African, Asian and 'other' which included white other, non-white other and mixed ethnicities. Due to low cell counts in the Asian group, this was collapsed into the 'other' category. Migrant status was determined by self-reported place of birth and length of stay in the UK, and categorised as born in the UK, 0–10 years in the UK and 11 or more years in the UK.¹²

Socioeconomic indicators

Socioeconomic indicators included educational attainment, employment status, gross household income, housing tenure and benefit receipt. Highest educational attainment was categorised as university degree level or above, up to A level or equivalent, up to GCSE level or equivalent and no qualifications.⁷ Employment status was

categorised as employed full-time, employed part-time (including casual employment), unemployed, students and two economically inactive categories: not working due to retiring early or being permanently sick or disabled (early work exit group) and 'at home' (looking after the home and/or children). Housing tenure was categorised into three categories: own a property outright or with a mortgage, rent or part rent and rent-free accommodation.⁷ Gross annual household income was categorised into the following income bands: £31 495 or more (the highest income band at S1), £12 098–£31 494, £0–12 097 and 'don't know'. Benefit receipt ('benefit receipt' and 'no benefit receipt') was restricted to non-health-related benefits to avoid inflated exposure–outcome associations between health-related benefits and LTCs.

Psychosocial indicators

Social network size was not recorded at S2, and a limited number of matching questions relating to stressful life events were recorded at S2 compared with S1, so both of these variables are only reported at the S1 timepoint. Size of social network assessed the number of known types of contacts per week either face-to-face or by phone. Contacts included relatives, friends, work colleagues, other acquaintances, helping professionals and members of the same group/club. The cumulative number of types of weekly contacts was then categorised into two-or-less, three to four and five-or-more as previously used with SELCoH data.¹² Stressful life events assessed the number of self-reported stressful life events selected from a list of nine questions relating to stressful childhood events (under 16 years), and 11 questions relating to lifetime stressful events, as previously reported to be relevant to an inner-city population.^{13 14} Stressful events included trauma in childhood, witnessing violent events, being attacked, injured, abused, or threatened, bereavement, divorce and experiencing other traumatic incidents including major illnesses or health events. Four events that could apply to both childhood and lifetime were only counted once if selected from both lists. The cumulative number of stressful life events were categorised into two-or-less, three to five and six-or-more.¹²

Health risk factors

Body mass index (BMI) was ascertained from the anthropometric measures of height and weight which were recorded at the same time as the S1 interviews. BMI was calculated from the weight in kilograms divided by the square of height in metres, and this was used to assess if participants were underweight (≤ 18.4 kg/m²), normal weight (18.5–24.9 kg/m²), overweight (25.0–29.9 kg/m²) or obese (≥ 30.0 kg/m²).¹⁵ Smoking is reported as a binary variable (current smokers/ non-smokers) in response to the question asking, 'Do you smoke at all nowadays?'. Non-smokers therefore included past smokers, whereas current smokers included both regular and sporadic smokers. The level of alcohol consumption was derived from the Alcohol Use Disorders Identification Test

(AUDIT)¹⁶ questionnaire which measures patterns of alcohol use and misuse over the last 12 months across a wide spectrum of associated behaviours including the frequency alcoholic consumption, control over alcohol consumption, intentional behaviour changes after drinking alcohol and other indicators of excessive alcohol consumption. The AUDIT questionnaire has 10 questions, each with a range of scores from 0 to 4, and a summed total score of 40. Scores within the range of 1–7 was taken to indicate moderate alcohol consumption, and scores of 8–40 to indicate hazardous alcohol drinking as used in previous SELCoH studies.^{7 17}

Health perceptions and functional impairment

Self-rated health was measured using a single item on the 12-item short-form questionnaire (SF-12) which indicated current perceived general health as either excellent/very good, good or fair/poor.¹⁸ Two further items on the SF-12 were used to ascertain perceived impairments in the ability to work or carry out regular daily activities in the previous 4 weeks due to either physical or emotional health (feeling depressed or anxious).

Somatic symptom severity was measured using the total scores from the 15-item Patient Health questionnaire¹⁹ covering 15 different types of somatic symptoms (including types of pain, dizziness, fainting, shortness of breath, low energy and trouble sleeping). One question relating to menstrual cramps which only applied to females was excluded. Each symptom was scored as either not bothered at all (0), bothered a little (1) or bothered a lot (2). The cumulative maximum score was therefore 28, and perceived level of severity was divided into low (0–4), medium (5–9) and high (≥ 10) categories.¹²

Statistical analyses

Analyses were performed using Stata/MP V.16.1. Survey commands (svy) were used for prevalence estimates and associations to generate robust standard errors, with weighting applied to consider household clustering, household non-response, attrition, and changes in household composition between the two timepoints. The methodology used to establish the weighting used at S1 and S2 has been reported elsewhere.⁷

Descriptive statistics for all indicators, with and without stratification by LTC status, are reported using unweighted frequency counts and weighed percentages. For categorical data, the Pearson's χ^2 test was conducted with a Rao & Scott correction for survey data. Associations between indicator variables and having one or multiple LTCs at both S1 and S2 were assessed using multinomial logistic regression to calculate relative risk ratios and 95% CIs in an unadjusted model, and a model adjusted by age and gender. All indicator variables had <1% missing data with the exception of BMI which had 2.5% missing data.

Patient and public involvement

An overview of the research plan was presented to the Mind and Body (expert-by-experience) advisory group at

King's College London in April 2019 and their feedback helped refine the research questions for the study. On completion of the study, the results were then presented at a stakeholder engagement forum in 2021, where interactive discussions helped interpret the results and formulate recommendations.

RESULTS

The final sample consisted of 893 participants (aged between 16 and 64 years; mean age at S1 of 36.4 years (SD 12.73)). The average time between assessments at S1 and S2 for this sample was 2.44 years (SD±0.54). Characteristics of the sample at S1 and S2 are presented in [table 1](#).

All self-reported conditions with a prevalence of ≥5 cases were categorised into 20 LTCs/LTC groups which are described in [table 2](#).

A total of 34.6% and 37.9% of participants reported one or more LTCs at S1 and S2, respectively. About 20.6% reported having one LTC and 14.0% having multiple LTCs at S1, compared with 21.4% having one LTC and 16.4% having multiple LTCs at S2. The total number of conditions reported by each participant at S1 and S2 are summarised in [table 3](#).

The maximum number of self-reported multiple LTCs at S1 and S2 was seven at both timepoints.

The most prevalent conditions in those with one LTC at S1 were musculoskeletal conditions (4.1%), asthma (2.7%), gastrointestinal conditions (1.9%) and gynaecological conditions (1.9%), and these were the most prevalent individual conditions also at S2. However, the most prevalent conditions comprising the overall disease prevalence (one-or-more LTCs) at both S1 and S2 were musculoskeletal conditions (10.2% and 10.5%, respectively), asthma (7.7%, 8.9%), depression (6.7%, 8.5%) and high blood pressure (6.3%, 7.8%) ([table 2](#)).

Age was significantly associated with the overall LTC prevalence, and the risk of both one LTC and multiple LTCs increased with age at both timepoints ([tables 4 and 5](#)).

However, compared with younger age categories, the age range showing the largest increase in the number of participants reporting one LTC at both S1 and S2 was the 35–44 age category years, whereas the largest increase in the number of participants reporting multiple LTCs at both S1 and S2 was the 55–64 age category (see online supplemental tables 1 and 2).

Associations between all risk factors and disease prevalence for both one and multiple LTCs are shown in [tables 4 and 5](#). At S1, migrants who had resided in the UK for less than 10 years were associated with a decreased risk of one LTC that was not observed at S2. However, at S2 there was then a decreased risk of multiple LTCs in this group. Significant socioeconomic associations with disease prevalence included the lowest annual household income (£0–£12 098), benefit receipt and renting accommodation, which were all associated with an increased likelihood of multimorbidity at both timepoints. Higher

Table 1 Demographic, socioeconomic, psychosocial and health-related characteristics of the SELCoH sample at S1 and S2

	S1 N (%)	S2 N (%)
Demographic indicators		
Gender		
Female	528 (54.9)	
Male	365 (45.1)	
Age (years)		
16–34	407 (47.8)	359 (48.1)
35–44	208 (22.9)	199 (21.1)
45–54	181 (19.2)	195 (18.4)
55–64	97 (10.1)	140 (12.4)
Age (mean/SD)	37.0 (12.7)	39.5 (12.8)
Marital status		
Married/cohabiting	436 (48.2)	481 (50.5)
Single	352 (40.8)	319 (40.8)
Divorced/separated/widowed	105 (10.9)	93 (8.8)
Ethnicity		
White British		433 (47.7)
Black Caribbean and black African		196 (22.6)
Other		263 (29.7)
Migrant status		
Born in UK	574 (64.8)	574 (65.6)
0–10 years in the UK	158 (17.8)	121 (13.9)
11 or more years in the UK	160 (17.4)	197 (20.5)
Socioeconomic indicators		
Housing tenure		
Own/mortgage	312 (34.6)	344 (36.4)
Rent/part rent	512 (57.4)	505 (58.0)
Rent free	68 (8.0)	41 (5.6)
Education (highest level attained)		
Degree level or above	410 (46.0)	467 (51.3)
Up to A-Level	235 (26.7)	240 (28.2)
Up to GCSE	167 (18.9)	131 (14.8)
No qualifications	78 (8.5)	55 (5.7)
Household Income (gross, annual)		
£31 495 or more	440 (49.7)	489 (54.8)
£12 098–31 494	196 (21.8)	184 (20.2)
£0–12 097	148 (16.4)	138 (15.4)
Do not know	104 (12.1)	75 (9.6)
Employment		
Employed full time	407 (45.7)	431 (47.6)
Employed part time	151 (16.4)	161 (16.5)
Student	138 (16.6)	82 (11.8)
Unemployed	86 (9.6)	90 (10.7)
Early work exit	66 (7.0)	78 (8.2)

Continued

Table 1 Continued

	S1	S2
	N (%)	N (%)
At home	45 (4.7)	51 (5.2)
Benefit receipt (current)		
Yes	189 (20.6)	163 (18.4)
Psychosocial indicators		
Size of social network		
≥5	606 (68.1)	
3–4	226 (25.2)	
≤2	60 (6.7)	
Stressful life events		
≤2	306 (34.4)	
3–5	401 (45.0)	
≥6	185 (20.6)	
Health risk factors		
Body mass index (kg/m ²)		
Normal weight	404 (46.8)	
Underweight	19 (2.4)	
Overweight	287 (33.0)	
Obese	161 (17.9)	
Smoking status		
Non-smoker	666 (74.4)	640 (70.4)
Current smoker	226 (25.6)	253 (29.6)
Alcohol use		
Non-drinkers (AUDIT score 0)	176 (19.5)	168 (17.9)
Moderate drinkers (1–7)	521 (57.9)	525 (57.3)
Hazardous alcohol use (8–40)	195 (22.6)	200 (24.8)
Health-related quality of life		
Self-rated health		
Excellent/very good	438 (49.3)	487 (55.4)
Good	309 (34.8)	255 (28.7)
Fair/poor	145 (15.9)	151 (16.0)
Functional impairment due to physical health		
Yes	136 (14.6)	192 (20.5)
Functional impairment due to emotional health		
Yes	153 (16.8)	213 (24.0)
Somatic symptoms		
Somatic symptom severity		
Low (0/4)	533 (60.5)	507 (57.5)
Medium (5/9)	239 (26.2)	249 (27.6)
High (≥10)	120 (12.9)	137 (14.9)

S1 and S2 represent the two SELCoH sample surveys at timepoints 1 and 2, respectively. Weighted percentages account for survey design. Frequencies are unweighted and numbers may not add up to the total sample (n=893) due to missing data. AUDIT, Alcohol Use Disorders Identification Test; SELCoH, South East London Community Health household survey.

Table 2 Frequency and prevalence of long-term conditions at S1 and S2

	S1	S2
	n (%)	n (%)
Musculoskeletal conditions	95 (10.2)	106 (10.5)
Asthma	69 (7.7)	82 (8.9)
Depression	63 (6.7)	79 (8.5)
High blood pressure	60 (6.3)	81 (7.8)
Gastrointestinal conditions	43 (4.6)	38 (4.3)
Migraine	32 (3.5)	34 (3.8)
Diabetes	25 (2.6)	30 (2.8)
Gynaecological conditions	24 (2.5)	26 (2.8)
Skin conditions	20 (2.3)	13 (1.6)
Thyroid conditions	15 (1.5)	20 (1.8)
Heart conditions	14 (1.5)	16 (1.5)
Other cardiovascular conditions	14 (1.5)	20 (2.1)
Sensory conditions	9 (1.0)	11 (1.1)
Respiratory conditions	9 (1.0)	11 (1.1)
Cancer	8 (0.9)	10 (0.9)
Liver conditions	8 (0.9)	7 (0.6)
Renal and urinary conditions	7 (0.7)	9 (1.0)
HIV	6 (0.7)	9 (1.0)
Epilepsy	6 (0.7)	7 (0.8)
Serious mental illnesses	6 (0.7)	12 (1.2)
Non-specific other LTCs	25 (2.8)	24 (2.7)

S1 and S2 represent the two SELCoH sample surveys at timepoints 1 and 2, respectively. Total number in sample, N=893. n=number of participants with the condition. Frequencies reported for ≥5 conditions. Musculoskeletal conditions include musculoskeletal pain; other cardiovascular conditions include stroke and blood-related conditions; sensory conditions include eye/vision and ear/hearing conditions; serious mental illnesses include chronic fatigue, obsessive compulsive disorder, post-traumatic stress disorder, myalgic encephalomyelitis, eating disorders, bipolar, psychosis and schizophrenia; *Non-specific other physical LTCs* account for all other conditions with a frequency of <5 cases. Conditions may co-occur with other conditions. Frequencies are unweighted and weighted percentages account for survey design. LTCs, long-term health conditions; SELCoH, South East London Community Health household survey.

educational attainment (degree level or above) decreased the risk of multimorbidity at both timepoints, whereas there was a graded increased risk of one LTC associated with lower levels of education between S1 and S2. Employment status was also associated with disease prevalence. There was a significantly increased risk of both one and multiple LTCs in the unemployed group at S2, whereas the early work exit group was associated with an increased risk of multimorbidity at both timepoints and also an increased risk of 1 LTC at S1.

Social network size and stressful life events were both associated with the disease prevalence, with smaller social

**Table 3** The overall disease prevalence shown as the number and frequency of long-term conditions reported by participants at S1 and S2

	S1	S2
	n (%)	n (%)
No LTC	576 (65.4)	531 (62.1)
1 LTC	185 (20.6)	203 (21.4)
2 LTCs	76 (8.2)	87 (9.0)
3 LTCs	28 (3.0)	43 (4.4)
4 LTCs	14 (1.4)	13 (1.3)
≥ 5 LTCs	14 (1.4)	16 (1.7)

Frequencies are unweighted and weighted percentages account for survey design. Percentage prevalence is shown in parentheses. N_{total}=893.
LTCs, long-term health conditions.

networks and a larger number of stressful life events both being associated with an increased risk of multimorbidity. BMI scores showed that obesity was associated with an increased risk of multiple LTCs. Smoking was associated with an increased risk of multimorbidity at both timepoints, with a greater risk at S2 compared with S1, and an increased risk of one LTC at S1.

DISCUSSION

This study showed that in a diverse inner-city population, over a relatively short period of time, the overall disease prevalence increased. The prevalence of multimorbidity increased more than the prevalence of one LTC. This pattern supports the view that one LTC is the start of a progressive course to multimorbidity and highlights the importance of interventions that stop this journey at the earliest of stages, before an individual acquires a first LTC. With the largest increase in frequency of having one LTC being seen in the 35–44 age group, preventative interventions should focus on early adulthood. Increased risk of having multiple LTCs (but not single LTCs) for those who are in the lowest income band, receiving benefits, renting accommodation and not educated to degree level supports the argument that poorer health outcomes are linked to those who are socioeconomically disadvantaged.⁷

Comparison of prevalence estimates showed that more than one in three people in our working-age sample reported at least one LTC, with musculoskeletal conditions (including musculoskeletal pain), asthma, depression and high blood pressure being the most prevalent. These findings are in keeping with national data which show that musculoskeletal and mental health conditions are the most common health conditions in the working-age population, and particularly in unemployed disabled people.^{8 20} Our results also corroborate with other studies analysing medical records of adults in Lambeth in which common mental

disorders (anxiety and depression), asthma, high blood pressure and diabetes were the most prevalent conditions, and chronic pain and osteoarthritis also being highly prevalent.²¹ The association between the health risk factors of obesity and being a current smoker has also been shown from medical records in Lambeth.²²

A strength of the current study is the scope of the SELCoH data which enabled both the inclusion of all self-reported long-term conditions, and a wide range of potential risk factors, so that a comprehensive assessment of associations between the disease prevalence and these factors could be carried out. The available data also enabled more in-depth analysis. For example, while studies investigating the association between multimorbidity and socioeconomic status (SES) are often based on the use of deprivation indices to indicate SES, the present study applied a range of socioeconomic factors also used by Aschan *et al* in the SELCoH population (education, benefit receipt, housing tenure and employment).²³ This approach to SES provided a more detailed analysis of associations which may be of benefit when designing risk analyses and interventions in similar populations. While the prevalence of long-term conditions was based on self-report and not medical records, this method may provide a better indication of conditions with greater impact to individuals. The strong associations between multiple LTCs and both fair/poor self-rated health and high somatic symptom severity support this view.

The pattern of increased risk at S1 for both one and multiple LTCs altering at S2 to just multiple LTCs was observed in the group that had made an early work exit. The lack of an increased risk for one LTC at S2 may reflect the progressive course to multimorbidity in this group, and is investigated further in a second study to be reported separately. In contrast, the unemployed group showed an increased risk for one and multiple LTCs only at S2. By investigating the progression of LTC status between the two timepoints in the second study, it will be established whether those who are unemployed also fall into a progressively worsening LTC status, with the S2 timepoint indicating a stage equivalent to the first timepoint for those who have retired early.

The only group that had a lower risk of having one LTC were migrants who had lived in the UK for less than 10 years, but not for those who had lived in the UK for longer. This is likely to reflect the 'healthy immigrant effect' whereby recent immigrants tend to be healthier than the native population.²⁴ Furthermore, it has previously been reported that the largest group of migrants in the SELCoH population sample were those migrating for economic/education reason (56% of migrants), rather than for asylum/political reasons or to join family.²⁵ This group of migrants (including overseas students/*education immigrants*) tend to be younger and healthier, and may have influenced this

Table 4 Unadjusted and adjusted* associations between demographic, socioeconomic, psychosocial and health-related indicators and having one or multiple LTCs at S1† compared with having no LTCs

	Unadjusted		Adjusted	
	1 LTC	MLTCs	1 LTC	MLTCs
	RRR (95% CI), p value	RRR (95% CI), p value	RRR (95% CI), p value	RRR (95% CI), p value
Demographic indicators				
Gender				
Female	1.00	1.00		
Male	0.96 (0.68 to 1.35), 0.818	0.64 (0.43 to 0.95), 0.027		
Age (years)				
16–34	1.00	1.00		
35–44	2.05 (1.33 to 3.16), 0.001	3.13 (1.73 to 5.67), <0.001		
45–54	2.50 (1.61 to 3.89), <0.001	6.14 (3.49 to 10.80), <0.001		
55–64	4.16 (2.34 to 7.41), <0.001	17.10 (9.11 to 32.11), <0.001		
Marital status				
Married/cohabiting	1.00	1.00	1.00	1.00
Single	0.85 (0.59 to 1.23), 0.387	0.92 (0.59 to 1.44), 0.708	1.42 (0.94 to 2.14), 0.094	2.57 (1.53 to 4.32), <0.001
Divorced/separated/widowed	1.50 (0.86 to 2.60), 0.151	4.06 (2.40 to 6.88), p<0.001	1.17 (0.67 to 2.06), 0.576	2.34 (1.35 to 4.05), 0.003
Ethnicity				
White British	1.00	1.00	1.00	1.00
Black Caribbean and black African	0.55 (0.34 to 0.89), 0.014	0.88 (0.55 to 1.42), 0.600	0.63 (0.39 to 1.02), 0.060	1.23 (0.74 to 2.05), 0.428
Other	1.18 (0.80 to 1.74), 0.398	0.80 (0.50 to 1.26), 0.333	1.29 (0.87 to 1.91), 0.208	1.01 (0.61 to 1.66), 0.972
Migrant status				
Born in UK	1.00	1.00	1.00	1.00
0–10 years in the UK	0.54 (0.33 to 0.89), 0.015	0.48 (0.26 to 0.90), 0.023	0.60 (0.37 to 0.98), 0.041	0.68 (0.35 to 1.30), 0.243
11 or more years in the UK	1.17 (0.76 to 1.81), 0.479	1.89 (1.20 to 2.98), 0.006	0.94 (0.59 to 1.45), 0.772	1.19 (0.75 to 1.91), 0.460
Socioeconomic indicators				
Housing tenure				
Own/mortgage	1.00	1.00	1.00	1.00
Rent/part rent	0.62 (0.43 to 0.87), 0.006	1.71 (1.09 to 2.69), 0.019	0.74 (0.52 to 1.06), 0.105	2.79 (1.74 to 4.46), <0.001
Rent free	0.45 (0.20 to 1.00), 0.051	0.49 (0.17 to 1.40), 0.182	0.74 (0.32 to 1.75), 0.497	2.00 (0.57 to 6.97), 0.276
Education (highest level attained)				
Degree level or above	1.00	1.00	1.00	1.00
Up to A-Level	0.98 (0.65 to 1.48), 0.921	2.04 (1.23 to 3.39), 0.006	1.15 (0.76 to 1.74), 0.501	2.66 (1.57 to 4.48), <0.001
Up to GCSE	1.42 (0.92 to 2.20), 0.112	2.55 (1.49 to 4.34), <0.001	1.65 (1.05 to 2.57), 0.029	2.91 (1.65 to 5.16), <0.001
No qualifications	1.39 (0.76 to 2.55), 0.290	5.24 (2.88 to 9.52), <0.001	1.16 (0.60 to 2.24), 0.658	3.40 (1.74 to 6.62), <0.001

Continued

Table 4 Continued

	Unadjusted		Adjusted	
	1 LTC		1 LTC	
	MLTCs	MLTCs	MLTCs	MLTCs
	RRR (95% CI), p value	RRR (95% CI), p value	RRR (95% CI), p value	RRR (95% CI), p value
Household Income (gross, annual)				
£31 495 or more	1.00	1.00	1.00	1.00
£12 098–31 494	1.18 (0.78 to 1.77), 0.429	1.87 (1.12 to 3.11), 0.016	1.14 (0.75 to 1.73), 0.547	1.60 (0.94 to 2.72), 0.082
£0–12 097	1.12 (0.69 to 1.84), 0.643	3.81 (2.33 to 6.22), <0.001	1.18 (0.71 to 1.96), 0.514	3.91 (2.27 to 6.74), <0.001
Do not know	1.24 (0.72 to 2.13), 0.435	1.49 (0.74 to 3.01), 0.263	1.65 (0.94 to 2.88), 0.080	2.50 (1.17 to 5.34), 0.018
Employment				
Employed full time	1.00	1.00	1.00	1.00
Employed part time	1.08 (0.69 to 1.71), 0.731	1.06 (0.57 to 1.95), 0.860	1.04 (0.66 to 1.67), 0.854	0.89 (0.48 to 1.66), 0.712
Student	0.95 (0.57 to 1.58), 0.849	0.31 (0.12 to 0.81), 0.017	1.82 (1.03 to 3.22), 0.039	0.94 (0.34 to 2.59), 0.904
Unemployed	1.34 (0.76 to 2.36), 0.308	1.66 (0.84 to 3.26), 0.142	1.41 (0.79 to 2.52), 0.249	1.69 (0.85 to 3.36), 0.135
Early work exit	5.77 (2.47 to 13.52), <0.001	29.94 (13.74 to 65.21), <0.001	3.60 (1.45 to 8.94), 0.006	14.97 (6.43 to 34.83), <0.001
At home	1.02 (0.44 to 2.33), 0.971	2.48 (1.12 to 5.50), 0.025	1.05 (0.46 to 2.41), 0.907	2.18 (0.93 to 5.08), 0.072
Benefit receipt				
No benefits	1.00	1.00	1.00	1.00
Benefits	1.17 (0.77 to 1.77), 0.465	2.65 (1.74 to 4.01), <0.001	1.11 (0.72 to 1.71), 0.624	2.43 (1.56 to 3.79), <0.001
Psychosocial indicators				
Size of social network				
≥5	1.00	1.00	1.00	1.00
3–4	1.08 (0.71 to 1.63), 0.718	2.91 (1.89 to 4.48), <0.001	1.17 (0.77 to 1.78), 0.459	3.41 (2.14 to 5.43), <0.001
≤2	2.17 (1.15 to 4.10), 0.017	4.26 (2.18 to 8.31), <0.001	1.99 (1.01 to 3.89), 0.045	3.77 (1.82 to 7.80), <0.001
Stressful life events				
≤2	1.00	1.00	1.00	1.00
3–5	1.56 (1.06 to 2.29), 0.024	3.35 (1.94 to 5.80), <0.001	1.50 (1.02 to 2.23), 0.042	3.01 (1.71 to 5.32), <0.001
≥6	1.89 (1.20 to 2.97), 0.006	6.78 (3.76 to 12.25), <0.001	1.59 (1.00 to 2.55), 0.051	4.89 (2.62 to 9.12), <0.001
Health risk factors				
Body mass index				
Normal weight	1.00	1.00	1.00	1.00
Underweight	1.15 (0.36 to 3.63), 0.813	0.49 (0.06 to 3.87), 0.498	1.29 (0.40 to 4.22), 0.669	0.57 (0.07 to 4.52), 0.593
Overweight	1.29 (0.89 to 1.87), 0.171	1.91 (1.16 to 3.14), 0.011	1.12 (0.78 to 1.65), 0.517	1.42 (0.84 to 2.41), 0.196
Obese	1.61 (1.02 to 2.56), 0.041	4.03 (2.40 to 6.74), <0.001	1.33 (0.81 to 2.13), 0.265	2.44 (1.40 to 4.13), 0.002
Smoking status				
Non-smoker	1.00	1.00	1.00	1.00

Continued

Table 4 Continued

	Unadjusted		Adjusted	
	1 LTC	MLTCs	1 LTC	MLTCs
	RRR (95% CI), p value	RRR (95% CI), p value	RRR (95% CI), p value	RRR (95% CI), p value
Current smoker	1.16 (0.79 to 1.71), 0.436	1.62 (1.08 to 2.42), 0.020	1.17 (0.79 to 1.72), 0.435	1.66 (1.06 to 2.59), 0.026
Alcohol use				
Non-drinkers	1.00	1.00	1.00	1.00
Moderate drinkers	1.48 (0.91 to 2.42), 0.117	0.34 (0.22 to 0.55), <0.001	1.39 (0.84 to 2.29), 0.197	0.30 (0.18 to 0.50), <0.001
Hazardous alcohol use	1.49 (0.84 to 2.66), 0.171	0.69 (0.41 to 1.16), 0.159	1.59 (0.88 to 2.87), 0.125	0.94 (0.53 to 1.68), 0.835
Health-related quality of life				
Self-rated health				
Excellent/very good	1.00	1.00	1.00	1.00
Good	1.91 (1.32 to 2.78), <0.001	2.03 (1.20 to 3.46), 0.001	2.00 (1.37 to 2.91), <0.001	2.25 (0.28 to 3.96), 0.005
Fair/poor	4.66 (2.78 to 7.82), <0.001	15.75 (9.07 to 27.33), <0.001	4.66 (2.76 to 7.87), <0.001	14.72 (8.28 to 26.17), <0.001
Functional impairment due to physical health				
No	1.00	1.00	1.00	1.00
Yes	2.51 (1.54 to 4.09), <0.001	8.84 (5.59 to 13.98), <0.001	2.32 (1.41 to 3.80), <0.001	6.81 (4.25 to 10.94), <0.001
Functional impairment due to emotional health				
No	1.00	1.00	1.00	1.00
Yes	1.40 (0.88 to 2.22), 0.156	4.36 (2.79 to 6.79), <0.001	1.48 (0.92 to 2.39), 0.109	4.71 (2.87 to 7.73), <0.001
Somatic symptoms				
Somatic symptom severity (n=892)				
Low (0/4)	1.00	1.00	1.00	1.00
Medium (5/9)	2.26 (1.56 to 3.26), <0.001	2.53 (1.50 to 4.27), <0.001	2.28 (1.56 to 3.33), <0.001	2.47 (1.44 to 4.24), 0.001
High (≥10)	2.62 (1.52 to 4.52), <0.001	14.54 (8.56 to 24.69), <0.001	2.98 (1.70 to 5.20), <0.001	18.01 (9.85 to 32.93), <0.001

RRR is weighted to account for survey design. 'No reported LTC' represents the reference category in the multinomial logistic regression.
 *RRR adjusted for gender and age (continuous).
 †All indicator variables are measured at the S1 timepoint except ethnicity which was established using S2 data.
 LTCs, long-term health conditions; MLTC's, multiple LTCs (≥2 LTCs); RRR, relative risk ratio.

Table 5 Unadjusted and adjusted* associations between demographic, socioeconomic, psychosocial and health-related indicators and having one or multiple LTCs at S2 compared with having no LTCs

	Unadjusted		Adjusted	
	1 LTC	MLTCs	1 LTC	MLTCs
	RRR (95% CI), p value	RRR (95% CI), p value	RRR (95% CI), p value	RRR (95% CI), p value
Demographic indicators				
Gender				
Female	1.00	1.00		
Male	0.79 (0.56 to 1.11), 0.174	0.67 (0.46 to 0.96), 0.031		
Age (years)				
16–34	1.00	1.00		
35–44	2.20 (1.41 to 3.44), 0.001	1.99 (1.11 to 3.59), 0.022		
45–54	2.63 (1.68 to 4.13), <0.001	5.14 (3.04 to 8.69), <0.001		
55–64	5.93 (3.49 to 10.05), <0.001	16.13 (8.87 to 29.33), <0.001		
Marital status				
Married/cohabiting	1.00	1.00	1.00	1.00
Single	0.74 (0.51 to 1.07), 0.105	0.90 (0.59 to 1.38), 0.637	1.28 (0.85 to 1.92), 0.235	2.31 (1.43 to 3.72), <0.001
Divorced/separated/widowed	2.28 (1.28 to 4.05), 0.005	4.79 (2.71 to 8.47), <0.001	1.49 (0.84 to 2.67), 0.175	2.41 (1.35 to 4.30), 0.003
Ethnicity				
White British	1.00	1.00	1.00	1.00
Black Caribbean and black African	0.70 (0.45 to 1.09), 0.115	0.68 (0.42 to 1.08), 0.102	0.82 (0.52 to 1.31), 0.407	0.91 (0.55 to 1.51), 0.714
Other	1.06 (0.71 to 1.56), 0.782	0.98 (0.63 to 1.52), 0.927	1.18 (0.78 to 1.78), 0.438	1.22 (0.76 to 1.96), 0.400
Migrant status				
Born in UK	1.00	1.00	1.00	1.00
0–10 years in the UK	0.79 (0.49 to 1.27), 0.341	0.23 (0.10 to 0.52), <0.001	0.86 (0.53 to 1.39), 0.537	0.29 (0.13 to 0.63), 0.002
11 or more years in the UK	1.08 (0.71 to 1.62), 0.705	1.50 (0.99 to 0.52), 0.057	0.84 (0.56 to 1.28), 0.424	1.04 (0.66 to 1.62), 0.873
Socioeconomic indicators				
Housing tenure				
Own/mortgage	1.00	1.00	1.00	1.00
Rent/part rent	0.92 (0.65 to 1.31), 0.636	1.37 (0.92 to 2.04), 0.126	1.12 (0.77 to 1.64), 0.549	1.94 (1.27 to 2.98), 0.002
Rent free	0.48 (0.18 to 1.26), 0.135	0.20 (0.05 to 0.85), 0.030	0.90 (0.32 to 2.51), 0.839	0.59 (0.14 to 2.45), 0.470
Education (highest level attained)				
Degree level or above	1.00	1.00	1.00	1.00
Up to A-Level	1.45 (0.98 to 2.15), 0.064	1.92 (1.22 to 3.00), 0.005	1.77 (1.18 to 2.65), 0.006	2.50 (1.56 to 3.99), <0.001
Up to GCSE	1.72 (1.07 to 2.75), 0.025	2.49 (1.50 to 4.13), 0.001	1.73 (1.06 to 2.82), 0.028	2.32 (1.38 to 3.92), 0.002

Continued

Table 5 Continued

	Unadjusted		Adjusted	
	1 LTC	MLTCs	1 LTC	MLTCs
	RRR (95% CI), p value	RRR (95% CI), p value	RRR (95% CI), p value	RRR (95% CI), p value
No qualifications	2.26 (1.14 to 4.52), 0.020	6.18 (2.99 to 12.77), <0.001	1.46 (0.70 to 3.03), 0.316	3.06 (1.42 to 6.60), 0.004
Household income (gross, annual)				
£31 495 or more	1.00	1.00	1.00	1.00
£12 098–31 494	1.17 (0.77 to 1.76), 0.463	1.72 (1.06 to 2.81), 0.029	1.05 (0.70 to 1.59), 0.800	1.42 (0.87 to 2.31), 0.160
£0–12 097	1.12 (0.67 to 1.88), 0.666	4.32 (2.69 to 6.96), <0.001	1.03 (0.61 to 1.74), 0.922	3.64 (2.22 to 5.97), <0.001
Do not know	0.47 (0.22 to 1.00), 0.050	1.25 (0.59 to 2.63), 0.562	0.62 (0.28 to 1.37), 0.240	1.94 (0.87 to 4.34), 0.107
Employment				
Employed full time	1.00	1.00	1.00	1.00
Employed part time	0.99 (0.63 to 1.57), 0.980	1.91 (1.08 to 3.37), 0.026	0.85 (0.53 to 1.36), 0.491	1.53 (0.84 to 2.79), 0.168
Student	1.18 (0.65 to 2.16), 0.587	1.08 (0.46 to 2.52), 0.857	2.83 (1.43 to 5.62), 0.003	2.79 (1.10 to 7.11), 0.031
Unemployed	1.65 (0.97 to 2.83), 0.067	3.14 (1.69 to 5.81), <0.001	1.93 (1.10 to 3.36), 0.021	3.66 (1.99 to 6.73), <0.001
Early work exit	3.97 (1.70 to 9.27), 0.002	41.71 (19.39 (89.73), <0.001	1.92 (0.74 to 4.97), 0.180	19.09 (8.20 to 44.42), <0.001
At home	0.92 (0.43 to 1.97), 0.831	1.34 (0.54 to 3.29), 0.527	0.86 (0.39 to 1.91), 0.715	1.15 (0.46 to 2.86), 0.768
Benefit receipt				
No benefits	1.00	1.00	1.00	1.00
Benefits	1.24 (0.80 to 1.91), 0.334	1.87 (1.21 to 2.89), 0.005	1.23 (0.79 to 1.92), 0.351	1.94 (1.22 to 3.09), 0.005
Health risk factors				
Smoking status				
Non-smoker	1.00	1.00	1.00	1.00
Current smoker	1.53 (1.07 to 2.17), 0.019	1.74 (1.19–.57), 0.005	1.71 (1.18 to 2.48), 0.004	2.10 (1.36 to 3.24), 0.001
Alcohol use				
Non-drinkers	1.00	1.00	1.00	1.00
Moderate drinkers	0.94 (0.60 to 1.48), 0.797	0.46 (0.29 to 0.74), 0.001	1.00 (0.63 to 1.59), 0.998	0.51 (0.31 to 0.83), 0.006
Hazardous alcohol use	0.98 (0.57 to 1.67), 0.938	0.66 (0.38 to 1.14), 0.138	1.30 (0.74 to 2.27), 0.361	1.10 (0.60 to 2.01), 0.757
Health-related quality of life				
Self-rated health				
Excellent/very good	1.00	1.00	1.00	1.00
Good	2.14 (1.45 to 3.15), <0.001	4.63 (2.74 to 7.83), <0.001	2.14 (1.43 to 3.21), <0.001	4.55 (2.62 to 7.92), <0.001
Fair/poor	7.75 (4.39 to 13.69), <0.001	50.96 (27.29 to 95.16), <0.001	6.69 (3.79 to 11.82), <0.001	39.49 (21.13 to 73.81), <0.001
Functional impairment due to physical health				
No	1.00	1.00	1.00	1.00

Continued



Table 5 Continued

	Unadjusted		Adjusted	
	1 LTC	MLTCs	1 LTC	MLTCs
	RRR (95% CI), p value	RRR (95% CI), p value	RRR (95% CI), p value	RRR (95% CI), p value
Yes	2.69 (1.77 to 4.10), <0.001	8.35 (5.47 to 12.74), <0.001	2.38 (1.55 to 3.66), <0.001	6.76 (4.31 to 10.61), <0.001
Functional impairment due to emotional health				
No	1.00	1.00	1.00	1.00
Yes	1.54 (1.04 to 2.29), 0.033	4.01 (2.70 to 5.94), <0.001	1.65 (1.10 to 2.48), 0.016	4.53 (2.95 to 6.96), <0.001
Somatic symptoms				
Somatic symptom severity				
Low (0/4)	1.00	1.00	1.00	1.00
Medium (5/9)	1.64 (1.14 to 2.37), 0.008	2.81 (1.76 to 4.48), <0.001	1.70 (1.16 to 2.45-8), 0.007	3.00 (1.82 to 4.94), <0.001
High (≥10)	3.27 (1.93 to 5.53), <0.001	15.65 (9.09 to 26.94), <0.001	3.55 (2.04 to 6.18), <0.001	18.03 (9.76 to 33.32), <0.001

RRR is weighted to account for survey design. 'No reported LTC' represents the reference category in the multinomial logistic regression. All indicator variables are measured at the S2 timepoint.
 *RRR adjusted for gender and age (continuous).
 †RRR adjusted for gender and age (continuous).
 ‡RRR, relative risk ratio.
 §MLTCs, multiple LTCs (≥2 LTCs).

result. However, a more in-depth analysis of the LTC status of migrants was outside the scope of this study.

An increased frequency of stressful life events was strongly associated with multimorbidity, although less so with one LTC. This finding is supported by Chai *et al*²⁶ who reported a positive relationship between an index of life events (where the impact of individual events were taken into consideration), and increased risk of a range of chronic physical health conditions. There is also evidence that negative life stresses increase the risk of onset of chronic health conditions over time.²⁷ While in this study, the number of stressful life events was only reported at the first timepoint, the second associated study focusing on progression of LTCs will consider the role of stressful life events as a potential predictor of LTC initiation and progression. A limitation of the present study is that stressors relate to historical stressful experiences, rather than current daily, ongoing stressors.

A key finding of this study was that smaller social network size was associated with an increased risk of both one LTC and multiple LTCs, with the association being stronger for multiple LTCs. While we are unable to ascertain the direction of this relationship, it has been postulated elsewhere that social networks play a role in providing support and resources for the self-management for long-term conditions in addition to emotional support linked to physical and mental well-being.²⁸ Interventions that focus on building relationship networks providing specific avenues for receiving and giving help within a social context (including social prescribing) have the potential to not only increase quality of life, health perceptions, mental well-being and the ability to self-manage health conditions, but also may have an additional economic benefit by reducing health service costs.²⁹

While this study cannot be applied to the general population as it is a very select inner-city sample, it may provide important insights into the health of other inner-city populations with a similar household profile. Despite SELCoH data now being over a decade old, the increased prevalence of multimorbidity continues to be reported, supporting the validity of the findings. For example, electronic health records from patients registered at GP practices in Lambeth showed an increase in multimorbidity more recently (2016–2020 compared with both 2005–2010 and 2011–2015).²¹ It is also notable that multimorbidity occurred at an earlier age in the most recent cohort. Future research should identify risk factors for developing primary LTCs in younger adults living in higher-risk urban environments, leading to targeted interventions for the most prevalent initial LTCs in this age group. Research focusing on the intersection between having one and multiple LTCs should focus on the socioeconomically disadvantaged with low incomes, receiving benefits and non-tertiary educational attainment. Using the transactional model of

stress proposed by Steptoe and Ayers³⁰, future studies could investigate further the relationships between the risk of developing multiple LTCs and stressful life events, poor health behaviours, coping skills and social support networks.

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Patient and public involvement Patients and/or the public were involved in the design, or conduct, or reporting or dissemination plans of this research. Refer to the Methods section for further details.

Patient consent for publication Not applicable.

Ethics approval This study involves human participants and was approved by Phase 1: King's College London research ethics committee, reference number: CREC/07/08-152 and Phase 2: King's College London Psychiatry Nursing and Midwifery Research Ethics Committee, reference number: PNM/10/11-106. Participants gave informed consent to participate in the study before taking part.

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