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RESEARCH ARTICLE

Association of Stair Use With Risk of Major Chronic Diseases

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Introduction: Physical inactivity is associated with a higher risk of chronic diseases. Regular stair use can contribute to increasing physical activity in the population. This study aimed to investigate the association between flights of stairs used daily at home and all-cause mortality and cause-specific incidence and mortality.

Methods: Of the 502,628 UK Biobank participants recruited between 2007 and 2010, 442,027 (mean age, 56±8 years) had available data and were included in the analyses conducted in 2023. Participants were categorized on the basis of flights of stairs climbed daily (1−5, 6−10, 11−15, >15). The disease-specific outcomes were cardiovascular disease, respiratory disease, cancer, type 2 diabetes, and all-cause dementia. Cox proportional hazard models, adjusted for sociodemographic, lifestyle, and health-related confounding factors, were used to analyze the associations between stair use frequency and health outcomes.

Results: Participants were followed up for a median of 10.9 years. Climbing stairs >15 times per day was associated with a lower risk of 8 of the 9 outcomes analyzed than not using stairs. The magnitude of association ranged from 3% (95% CI=0.94, 0.99) lower risk for all-cause cancer to 51% (95% CI=0.39, 0.60) lower risk of chronic obstructive pulmonary disease. Findings were similar for mortality outcomes, with the hazard ratios ranging from 0.82 (95% CI=0.77, 0.87) for all-cause cancer to 0.46 (95% CI=0.23, 0.92) for chronic obstructive pulmonary disease mortality.

Conclusions: Stair use was associated with a lower risk of all-cause mortality and cause-specific incidence and mortality independent of confounding factors, including adiposity and multimorbidity.
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INTRODUCTION

Physical inactivity is a modifiable risk factor for a range of chronic diseases, including cardiovascular and respiratory disease, cancer, and type 2 diabetes (T2D), which are responsible for >3 million premature deaths globally.[1,2] Despite physical activity being known to protect against chronic disease incidence and mortality,[2−6] one in four adults worldwide does not meet the physical activity recommendations of 150 minutes of moderate-to-vigorous intensity activity per week. However, with the latest physical activity guidelines, the focus has shifted to the assumption that every move counts regardless of intensity and duration,[7] highlighting the importance of incidental physical activity.

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Stair use, a common incidental form of physical activity, could be a widely accessible way to increase physical activity.[8] Existing evidence strongly indicates that incorporating at least 1−3 minutes of intermittent stair climbing sessions 3 days a week over a 6-week period leads to significant improvements in cardiorespiratory fitness.[9,10] Enhanced cardiorespiratory fitness is a protective factor against cardiovascular diseases (CVDs), cancer, and all-cause mortality.[11] Furthermore, findings from an intervention study conducted among women have demonstrated that increasing stair use within a home-based setting results in improvements in metabolic syndrome −related risk factors.[12] These improvements include reductions in low-density lipoprotein cholesterol, triglyceride levels, and body weight. Notably, comparable reductions in these metabolic risk factors were also observed in groups assigned to gym-based exercise routines.[12] This suggests that incorporating stair use at home offers a cost effective intervention for reducing disease risk and promoting public health. These findings are in line with those of another observational study where participants who did not engage in home-based stair use reported a 90% higher likelihood of having metabolic syndrome.[13] Moreover, stair use requires lifting body weight, and this may contribute to enhancing lower limb muscle strength,[14] which is associated with a lower risk of mortality.[15,16] Therefore, it may reduce the risk of major chronic diseases.[17]

In contrast to other types of physical activity, the evidence regarding stair use and health outcomes is limited and mainly focused on mortality.[8,17] Previous evidence suggests that regular stair use is associated with a lower risk of all-cause and cause-specific mortality,[8,17] but this is based on small sample sizes and prospective studies of individuals with existing chronic diseases, which could introduce bias owing to reverse causality. The evidence of an association with incident health outcomes is limited to metabolic syndrome and atrial fibrillation,[13,18] with no evidence for other major diseases such as cardiovascular and neurodegenerative diseases and cancer. Therefore, the aim of this prospective study was to investigate the association between stair use and all-cause mortality as well as cause-specific incidence and mortality.

METHODS

Study Population

UK Biobank recruited >500,000 participants from the general population (aged 37−73 years, with a 5.5% response rate) between April 2007 and December 2010.[19] Participants were enrolled through 22 assessment centers across England, Wales, and Scotland. Baseline data collection included physical measurements, biological sampling collection, and a self-completed touch-screen questionnaire. A detailed description of the protocol and baseline assessments is available elsewhere.[20] The UK Biobank study was approved by the Northwest Multi-Centre Research Ethics Committee (Reference 11/NW/0382 on June 17, 2011).

Measures

The exposure variable was stair use, assessed through the following question: *At home, during the last 4 weeks, about how many times a day do you climb a flight of stairs? (Approximately 10 steps).* Possible answers were none, 1−5 times a day, 6−10 times a day, 11−15 times a day, 16−20 times a day, and >20 times a day. Owing to the lower number of people reporting >20 times, authors merged the categories to >15 times a day.

The outcomes were cause-specific incidence and mortality as well as all-cause mortality. The diseases included were myocardial infarction (MI), heart failure, stroke, major CVDs (a composite of the 3), chronic obstructive pulmonary disease (COPD), all-cause cancer, T2D, and all-cause dementia. The ICD-10 codes used for each of the outcomes are listed in Appendix Table 1 (available online). The disparity in the number of participants with available data for each outcome can be attributed to the data source. Hypertension and diabetes data were extracted from primary records, which were exclusively accessible for participants recruited in England. Participants with prevalent CVD, COPD, T2D, and dementia at baseline were excluded from the analysis if this condition was the outcome.

The date of death was obtained through record linkage to death certificates held by the National Health Service Information Centre (England and Wales) and the National Health Service Central Register Scotland (Scotland). The date and cause of hospital admissions were obtained from record linkage to Health Episode Statistics (England and Wales) and the Scottish Morbidity Records 01 (Scotland). Mortality data for the full cohort were available up to June 1, 2020 at the time of analysis, and so authors' analysis of all-cause mortality was censored at this date or date of death if this occurred earlier. Hospital admission data were available until September 2021 in England, July 2021 in Scotland, and March 2016 in Wales. Thus, analyses of disease-specific outcomes were censored at this date or the date of first relevant hospitalization or death if these occurred earlier. Detailed information about the linkage procedure can be found at http://www.ic.nhs.uk/services/medical-research-information-service.

The covariates included sociodemographic (age, sex, ethnic group, deprivation), lifestyle (total sedentary time, BMI, smoking status, alcohol intake), and health (multimorbidity) factors. Ethnic group was self-reported and categorized as White, South Asian, Black, Chinese, and mixed background. Type of accommodation (living in house/bungalow or flat/maisonette/apartment) was self-reported. Area-based socio-economic status was calculated using the Townsend deprivation index.[21] Total physical activity was assessed with the International Physical Activity Questionnaire and scored accordingly.[22] Sedentary time was measured as the total number of hours watching television or using a computer (excluding using a computer at work). BMI was calculated as weight (kg)/height (m^2) and categorized into underweight (<18.5 kg/m^2), healthy weight (18.5−24.9 kg/m^2), overweight (25.0−29.9 kg/m^2), and obese (≥30 kg/m^2), according to the WHO criteria.[23] Smoking status was categorized into never, previous, or current smoker. Alcohol intake was based on self-reported weekly units of alcohol. *Multimorbidity* was defined as 0, 1, or ≥2 of 43 self-reported chronic conditions. People self-reported if they were unable to walk unaided or whether they experienced pain in their chest when walking. Further details of these measurements can be found in the UK Biobank online protocol (http://www.ukbiobank.ac.uk).

Statistical Analysis

Participants were divided into 5 categories on the basis of number of flights of stairs per day. Descriptive statistics are presented as mean and SD for continuous variables and as frequency and percentage for categorical variables.

Associations of daily stair use with mortality and incidence outcomes were investigated using Cox-proportional hazard regression models. All results are reported as hazard ratios (HRs) and 95% CIs. Daily stair use was fit into the model as a categorical variable with 5 levels: none, 1−5 times, 6−10 times, 11−15 times, and ≥15 times. One flight of stairs is equivalent to approximately 10 steps, and people reporting no stair use were used as the reference group.

The associations were adjusted for confounders using 3 sequential models that included an increasing number of covariates. Model 1 (minimally adjusted model) was adjusted for sociodemographic factors only (age, sex, ethnicity, type of accommodation, and deprivation index). Model 2 (lifestyle model) was adjusted for all variables in model 1 plus total sedentary time, total physical activity, smoking status, alcohol intake, and BMI. Model 3 (disease model) was adjusted for all variables in model 2 plus multimorbidity count. Three sensitivity analyses were conducted that minimized the risk of reverse causation (i.e., cases in which undiagnosed disease impacted the ability to use stairs). First, people who reported being unable to walk unaided or those who reported experiencing chest pain when doing exercise were excluded (n= 18,041). In addition, any participant with chronic illness based on 43 self-reported conditions was excluded from the analysis (n=78,944). Second, a 2-year landmark analysis was conducted (n=980).

Schoenfeld residual analysis was performed to assess the assumption of proportionality. Statistical significance was set at $p<0.05$. All analyses were performed between September and December 2023 using the statistical software Stata 17 (StataCorp LP).

RESULTS

Of the 502,628 participants recruited to the UK Biobank, 442,027 people with full data available on exposure and outcomes measures and covariates were included in this study. Details about the number of participants excluded from the study are reported in Appendix Figure 1 (available online). Follow-up time ranged from 10 to 12 years for deaths and 7 to 12 years for incident outcomes. Over the follow-up period, 26,506 (6.0%) participants died; 50,295 (11.4%) developed CVDs; 1,493 (0.3%) developed COPD; 61,308 (13.9%) developed cancer; and 4,369 (0.9%) developed dementia. Detailed information about the follow-up for each outcome is reported in Appendix Tables 2 and 3 (available online).

The general characteristics of the participants by stair use category are shown in Table 1. Briefly, the mean age of the study population was 56 (±8) years, 54.0% were female, 94.7% were White, 66.5% were overweight or obese, and 32.5% had ≥2 morbidities at baseline. Participants who climbed >15 flights a day were younger, had a lower BMI, and had lower total sedentary time than those who did not use any stairs. They were also more likely not to smoke, had a lower weekly alcohol intake, and were less likely to have multimorbidity at baseline.

There was evidence of a dose-response relationship between stairs use and incident CVD (MI, heart failure, and stroke), T2D, and COPD (Figure 1). The magnitude of the associations in the most adjusted models ranged from a 3% lower risk for stroke and MIF to 20% for COPD per every 5 flights of stairs climbed per day (Figure 1). For all-cause dementia, authors found a U-shaped association, with the lowest risk observed among those who reported climbing 6−15 flights of stairs per day (HR=0.78; 95% CI=0.70, 0.87) (Figure 2). The evidence was weaker for an association with all-cause cancer incidence (HR=0.99 per every 5 flights of stair use per day; 95% CI=0.98, 0.99) (Figure 2). When people with multimorbidity, those unable to walk unaided, and

Table 1. Cohort Characteristics of the 442,027 Patients Divided by Categories of Flights of Stairs Climbed Per Day

Variable	None	1–5 times	6–10 times	11–15 times	>15 times	Total
Total, *n*	39,714	89,304	160,866	82,717	69,426	442,027
Sex, women, *n* (%)	21,494 (54.1%)	45,658 (51.1%)	85,225 (53.0%)	46,055 (55.7%)	40,238 (58.0%)	238,670 (54.0%)
Age, years, mean (SD)	59 (8)	56 (8)	57 (8)	56 (8)	56 (8)	56 (8)
Ethnicity, *n* (%)						
White	37,904 (95.4%)	82,251 (92.1%)	153,374 (95.3%)	79,375 (96.0%)	65,699 (94.6%)	418,603 (94.7%)
South Asian	501 (1.3%)	2,756 (3.1%)	2,943 (1.8%)	1,212 (1.5%)	1,334 (1.9%)	8,746 (2.0%)
Black	628 (1.6%)	2,115 (2.4%)	2,168 (1.3%)	944 (1.1%)	1,068 (1.5%)	6,923 (1.6%)
Chinese	82 (0.2%)	355 (0.4%)	458 (0.3%)	222 (0.3%)	252 (0.4%)	1,369 (0.3%)
Mixed background	604 (1.5%)	1,839 (2.1%)	1,932 (1.2%)	969 (1.2%)	1,077 (1.6%)	6,421 (1.5%)
Deprivation index, *n* (%)						
Lower deprivation	12,511 (31.5%)	24,984 (28.0%)	56,887 (35.4%)	30,443 (36.8%)	24,820 (35.7%)	149,645 (33.9%)
Middle deprivation	12,321 (31.0%)	27,069 (30.3%)	55,912 (34.8%)	29,143 (35.2%)	23,712 (34.2%)	148,157 (33.5%)
Higher deprivation	14,887 (37.5%)	37,263 (41.7%)	48,076 (29.9%)	23,136 (28.0%)	20,898 (30.1%)	144,260 (32.6%)
Total SED time, h/day, mean (SD)	5.2 (2.4)	5.2 (2.5)	5.0 (2.2)	4.9 (2.2)	4.9 (2.2)	5.0 (2.3)
BMI categories, *n* (%)						
Underweight	255 (0.6%)	427 (0.5%)	708 (0.4%)	434 (0.5%)	484 (0.7%)	2,308 (0.5%)
Normal	11,263 (28.4%)	24,320 (27.2%)	51,532 (32.0%)	30,466 (36.8%)	28,027 (40.4%)	145,608 (32.9%)
Overweight	16,753 (42.2%)	37,050 (41.5%)	70,143 (43.6%)	35,723 (43.2%)	29,052 (41.8%)	188,721 (42.7%)
Obese	11,448 (28.8%)	27,519 (30.8%)	38,492 (23.9%)	16,099 (19.5%)	11,867 (17.1%)	105,425 (23.8%)
Smoking status, *n* (%)						
Never	19,181 (48.3%)	46,099 (51.6%)	88,376 (54.9%)	46,910 (56.7%)	40,436 (58.2%)	241,002 (54.5%)
Previous	15,307 (38.5%)	31,643 (35.4%)	57,021 (35.4%)	28,691 (34.7%)	22,858 (32.9%)	155,520 (35.2%)
Current	5,231 (13.2%)	11,574 (13.0%)	15,478 (9.6%)	7,121 (8.6%)	6,136 (8.8%)	45,540 (10.3%)
Alcohol, weekly units, mean (SD)	15.7 (20.4)	16.2 (20.2)	16.5 (18.5)	16.4 (17.8)	16.2 (18.1)	16.3 (18.8)
Multimorbidity, *n* (%)						
None	10,274 (25.9%)	28,559 (32.0%)	57,379 (35.7%)	30,532 (36.9%)	26,190 (37.7%)	152,934 (34.6%)
1	12,194 (30.7%)	28,494 (31.9%)	53,571 (33.3%)	27,648 (33.4%)	23,410 (33.7%)	145,317 (32.9%)
≥2	17,251 (43.4%)	32,263 (36.1%)	49,925 (31.0%)	24,542 (29.7%)	19,830 (28.6%)	143,811 (32.5%)

Note: Values are presented as mean (SD) or number (percentage).
SED, sedentary.

those who developed an event within the first 2-years of follow-up were excluded from the analyses, the associations remained unchanged for CVD, heart failure, hypertension, all-cause cancer, COPD, dementia, and T2D but were attenuated for MI and stroke (Appendix Table 4, available online).

For mortality outcomes, there were significant trends whereby the risk of all-cause mortality, CVD, MI, heart failure, and all-cause cancer declined with an increasing number of flights climbed (Figure 3). Among the CVD components, the magnitude of association for the most adjusted model ranged from 5% for MI to 12% for heart failure per every 5 flights of stairs climbed per day. The largest magnitude of association was observed for COPD mortality, where individuals who reported climbing at least 6 flights of stairs a day had approximately 55% lower risk of death (Figure 3). The risk of all-cause cancer was also 6% lower per 5 flights of stairs climbed per day. After excluding people with multimorbidity, those unable to walk unaided, and those who died within the first 2-years of follow-up, the associations remained for all-cause mortality and mortality from CVD, heart failure, and all cancers but were attenuated for MI and stroke (Appendix Table 5, available online).

DISCUSSION

This study provides evidence that stair use is associated with a wide range of health outcomes even beyond those previously studied. Interestingly, there seems to be a threshold for some outcomes, such as incident CVD, where the maximum benefit is associated with climbing at least 6 flights of stairs per day (equivalent to 60 stairs steps), with no additional benefit beyond this. Similar patterns of association were observed for COPD, all-cause dementia, and T2D. However, there was also evidence that some of the associations, for example, with stroke, may be explained by reverse causation because

Incidence outcome	N	Event	HR [95% CI]	p-value
Cardiovascular disease				
None	39 714	6 621	1.00 [Ref.]	
1-5 times a day	89 304	11 704	0.96 [0.93; 0.99]	0.006
6-10 times a day	160 866	17 724	0.88 [0.86; 0.91]	<0.0001
11-15 times a day	82 717	8 209	0.84 [0.82; 0.87]	<0.0001
>15 times a day	69 426	6 667	0.86 [0.83; 0.89]	<0.0001
Trend	442 027	50 925	0.96 [0.95; 0.96]	<0.0001
Myocardial infarction				
None	39 714	1 085	1.00 [Ref.]	
1-5 times a day	89 304	1 971	0.95 [0.88; 1.03]	0.199
6-10 times a day	160 866	3 179	0.94 [0.88; 1.01]	0.081
11-15 times a day	82 717	1 459	0.89 [0.83; 0.97]	0.009
>15 times a day	69 426	1 116	0.87 [0.79; 0.94]	0.001
Trend	442 027	8 809	0.97 [0.95; 0.98]	<0.0001
Heart failure				
None	39 714	1 585	1.00 [Ref.]	
1-5 times a day	89 304	1 971	0.99 [0.94; 1.06]	0.903
6-10 times a day	160 866	3 432	0.82 [0.77; 0.87]	<0.0001
11-15 times a day	82 717	1 566	0.81 [0.75; 0.94]	<0.0001
>15 times a day	69 426	1 195	0.79 [0.73; 0.85]	<0.0001
Trend	442 027	10 499	0.93 [0.91; 0.94]	<0.0001
Stroke				
None	39 714	966	1.00 [Ref.]	
1-5 times a day	89 304	1 699	0.96 [0.89; 1.04]	0.285
6-10 times a day	160 866	2 658	0.89 [0.83; 0.96]	0.002
11-15 times a day	82 717	1 311	0.89 [0.82; 0.97]	0.009
>15 times a day	69 426	1 028	0.87 [0.79; 0.95]	0.002
Trend	442 027	7 662	0.97 [0.95; 0.98]	<0.0001
Hypertension				
None	19 719	5 415	1.00 [Ref.]	
1-5 times a day	41 067	10 157	1.01 [0.96; 1.07]	0.589
6-10 times a day	72 998	16 220	1.02 [0.97; 1.07]	0.381
11-15 times a day	32 272	7 762	0.97 [0.92; 1.03]	0.302
>15 times a day	31 108	6 116	0.96 [0.91; 1.01]	0.124
Trend	202 164	45 670	0.99 [0.97; 0.99]	0.016

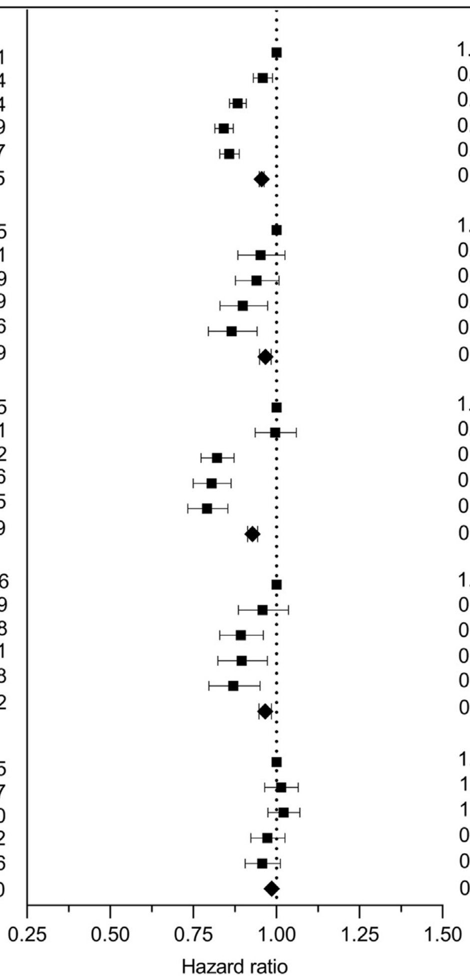

Figure 1. Associations of flights of stairs used per day with incidence of cardiovascular diseases.
Data presented as HR and their 95% CI. The reference group was people reporting no stair use. An HR for trend was estimated and expressed as risk per 1 category increment in stair climbed. Analyses were adjusted for age, sex, ethnicity, deprivation index, type of accommodation, total physical activity, total sedentary time, BMI categories, smoking status, alcohol intake, and multimorbidity.
HR, hazard ratio.

the association was not present in the sensitivity analyses.

With regard to mortality, findings are partially consistent with those of previous studies that report a similar dose-response relationship.[8,17] Among 8,874 U.S. men from the Harvard Alumni Health Study, of whom 4,063 died (1,195 from CVD) over the 12-year follow-up, there was an inverse association between stairs climbed and all-cause mortality but not CVD mortality.[8] Individuals who reported doing >35 floors per week had a 16% lower risk of all-cause mortality (HR=0.84; 95% CI=0.78, 0.91).[8] However, the magnitudes of association observed were smaller than the ones reported in the study. This could be explained by differences in study design, including the use of different units to quantify stair use (floors per week versus flights of stairs per day), inclusion of only men or women, a more conservative adjustment for covariates, and inclusion of individuals with existing chronic illnesses. Another study conducted using the UK Biobank cohort investigated the association of stair climbing with all-cause, CVD, and cancer mortality but did not include nonfatal incident outcomes.[17] Although the previous study conducted in the UK Biobank reported an association with all-cause mortality—consistent with these findings—it did not find an association with CVD and cancer mortality. This may be explained by the smaller sample size included in their study because of the use of propensity score matching:

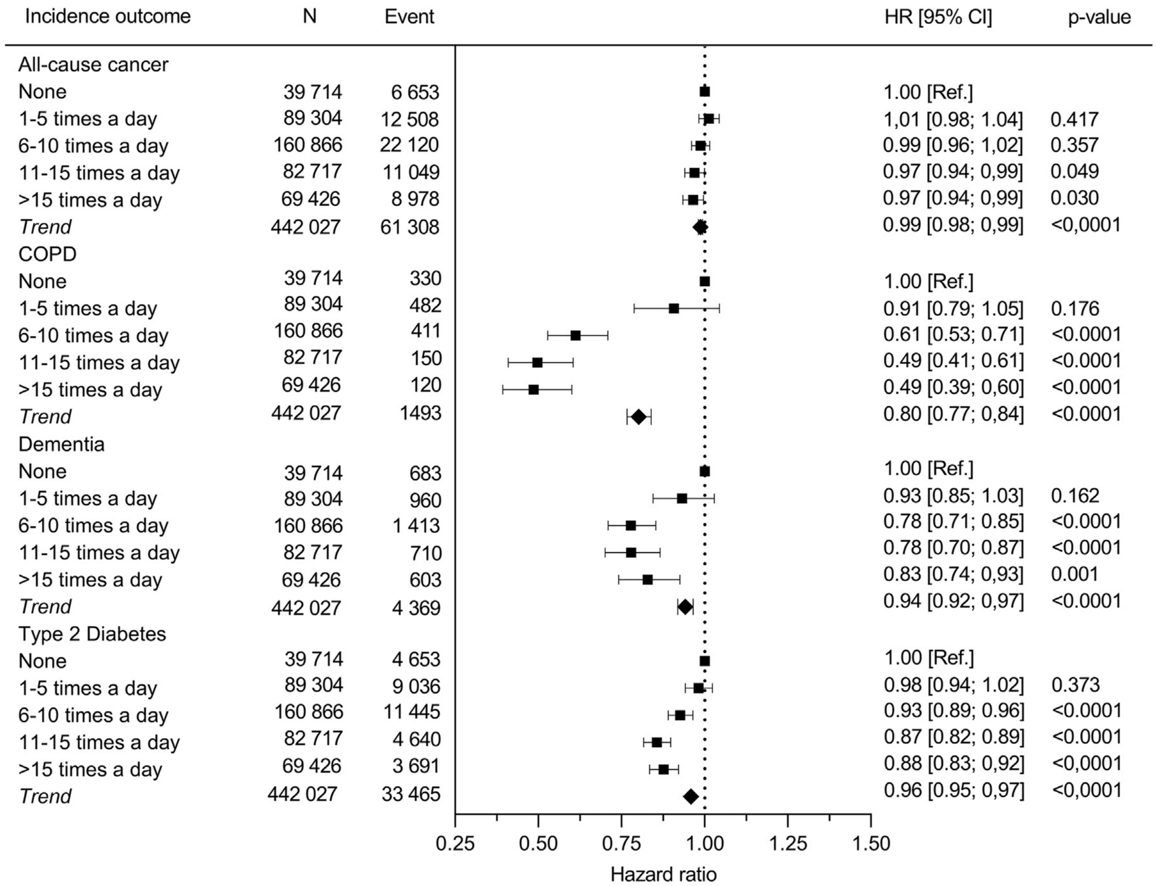

Figure 2. Associations of flights of stairs used per day with incidence of all-cause cancer, type 2 diabetes, and all-cause dementia.
Data presented as HR and their 95% CI. The reference group was people reporting no stair use. A HR for trend was estimated and expressed as risk per 1 category increment in stair climbed. Analyses were adjusted for age, sex, ethnicity, deprivation index, type of accommodation, total physical activity, total sedentary time, BMI categories, smoking status, alcohol intake, and multimorbidity.
COPD, chronic obstructive pulmonary disease; HR, hazard ratio.

280,423 participants and 9,445 deaths compared with 442,027 participants and 26,506 deaths in the current study.[17]

This study provides novel evidence of an association between stair use and incident MI, heart failure, hypertension, COPD, all-cause dementia, and T2D. Interestingly, a threshold on the association between stair use and these outcomes was observed, with benefits up to 6 flights per day but not beyond. This equates to a target that should be achievable for most people.

The importance of introducing brief bursts of moderate-to-vigorous physical activity into everyday life has been recently highlighted by Stamatakis et al., who demonstrated that 4 minutes per day of vigorous intermittent physical activity were associated with a lower risk of all-cause, cancer, and CVD mortality.[24] They concluded that short bouts of vigorous activity daily may be a suitable physical activity target, particularly for those individuals who are unable or unwilling to exercise.[24]

Limitations

To the authors' knowledge, this is the first study to comprehensively investigate the association of stair use with a wide range of fatal and nonfatal health outcomes. However, several limitations should be considered in interpreting the results. First, data on the frequency of stair use were collected through questionnaires, which may be more prone to reporting bias. Second, information about stair use was restricted to home-based activities, excluding stair use in other places, such as public spaces and the workplace.[25,26] There is also no information about the intensity of stair climbing, which should be an important factor when investigating the association between stairs climbing and health outcomes. Third, despite the extensive adjustment for various potential confounders, it is important to acknowledge that residual confounding remains a potential limitation inherent to observational studies. In this investigation, authors observed a substantial association of COPD

Mortality outcome	N	Event	HR [95% CI]	p-value
All-cause				
None	39 714	3 924	1.00 [Ref.]	
1-5 times a day	89 304	6 512	0.94 [0.90; 0.98]	0.004
6-10 times a day	160 866	8 767	0.76 [0.74; 0.89]	<0.0001
11-15 times a day	82 717	4 064	0.72 [0.69; 0.76]	<0.0001
>15 times a day	69 426	3 239	0.72 [0.68; 0.75]	<0.0001
Trend	442 027	26 506	0.91 [0.88; 0.92]	<0.0001
Cardiovascular disease				
None	39 714	1 159	1.00 [Ref.]	
1-5 times a day	89 304	1 817	0.92 [0.85; 0.99]	0.028
6-10 times a day	160 866	2 225	0.75 [0.69; 0.81]	<0.0001
11-15 times a day	82 717	975	0.71 [0.65; 0.77]	<0.0001
>15 times a day	69 426	734	0.67 [0.62; 0.74]	<0.0001
Trend	442 027	6 910	0.89 [0.88; 0.91]	<0.0001
Myocardial infarction				
None	39 714	194	1.00 [Ref.]	
1-5 times a day	89 304	308	0.90 [0.75; 1.08]	0.252
6-10 times a day	160 866	450	0.88 [0.74; 1.05]	0.149
11-15 times a day	82 717	193	0.82 [0.67; 1.00]	0.051
>15 times a day	69 426	146	0.79 [0.64; 0.98]	0.034
Trend	442 027	1 291	0.95 [0.90; 0.99]	0.020
Heart failure				
None	39 714	247	1.00 [Ref.]	
1-5 times a day	89 304	406	0.99 [0.84; 1.16]	0.869
6-10 times a day	160 866	467	0.80 [0.69; 0.84]	0.006
11-15 times a day	82 717	161	0.61 [0.50; 0.65]	<0.0001
>15 times a day	69 426	138	0.68 [0.55; 0.84]	<0.0001
Trend	442 027	1 419	0.88 [0.84; 0.92]	<0.0001
Stroke				
None	39 714	216	1.00 [Ref.]	
1-5 times a day	89 304	367	1.04 [0.87; 1.23]	0.686
6-10 times a day	160 866	461	0.81 [0.69; 0.95]	0.010
11-15 times a day	82 717	241	0.86 [0.72; 1.04]	0.116
>15 times a day	69 426	162	0.72 [0.59; 0.88]	0.002
Trend	442 027	1 447	0.92 [0.87; 0.96]	<0.0001
COPD				
None	39 714	32	1.00 [Ref.]	
1-5 times a day	89 304	44	0.91 [0.58; 1.45]	0.700
6-10 times a day	160 866	28	0.45 [0.27; 0.75]	0.002
11-15 times a day	82 717	13	0.45 [0.24; 0.87]	0.116
>15 times a day	69 426	11	0.46 [0.23; 0.92]	0.002
Trend	442 027	128	0.76 [0.66; 0.89]	0.001
All-cause cancer				
None	39 714	1 958	1.00 [Ref.]	
1-5 times a day	89 304	3 505	1.02 [0.97; 1.08]	0.465
6-10 times a day	160 866	5 057	0.86 [0.82; 0.91]	<0.0001
11-15 times a day	82 717	2 437	0.84 [0.79; 0.89]	<0.0001
>15 times a day	69 426	1 924	0.82 [0.77; 0.87]	<0.0001
Trend	442 027	14 881	0.94 [0.93; 0.95]	<0.0001

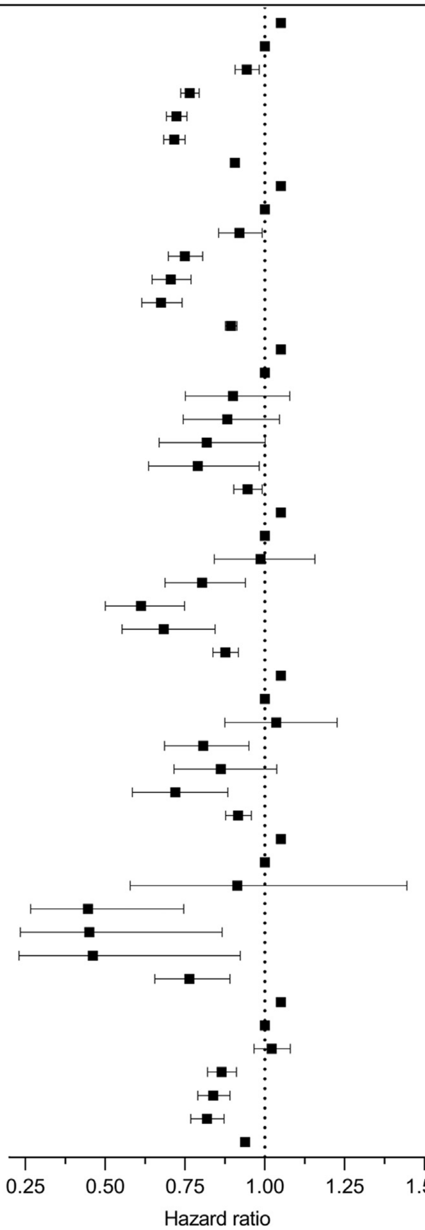

Figure 3. Associations of flights of stairs used per day with all-cause and cause-specific mortality.
Data presented as HR and their 95% CI. The reference group was people reporting no stair use. A HR for trend was estimated and expressed as risk per 1 category increment in stair climbed. Analyses were adjusted for age, sex, ethnicity, deprivation index, type of accommodation, total physical activity, total sedentary time, BMI categories, smoking status, alcohol intake, and multimorbidity.
COPD, chronic obstructive pulmonary disease; HR, hazard ratio.

incidence with stair climbing, even after excluding individuals with multiple comorbidities and employing a 2-year landmark analysis. Consequently, it is plausible that these findings may still be influenced by reverse causation, which warrants further exploration in future studies utilizing Mendelian randomization analysis. Similar analyses are needed to provide robust evidence of the potential causal association between dementia and stairs use. Fourth, UK Biobank achieved only a 5.5% recruitment rate, and the cohort is not representative of the United Kingdom general population in terms of lifestyle and health.[27,28] Finally, several outcomes had a relatively low number of events and thus could influence the results.

CONCLUSIONS

To conclude, this study provided evidence that even a relatively low level of regular stair use (6 flights per day) is associated with a significantly lower risk of a wide range of important health outcomes. These findings support public health recommendations to integrate short bouts of stair use into daily life.

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SUPPLEMENTAL MATERIAL

Supplemental materials associated with this article can be found in the online version at https://doi.org/10.1016/j.amepre.2023.10.007.

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