Supplementary Figure S1. Flow diagram for selection of practices.

Initial cohort n=9,556,452 from 641 practices



Exclude individuals born after latest study index date or dead before earliest study index date

n=9,352,698 from 641 practices



Random sampling of practices (2:1:1)

Development Set: n= 321 practices Validation Set 1: n=160 practices

Validation Set 2: n= 160 practices

A measure of mortality not explained by age (standardised) or sex was computed for each practice (i.e. best linear unbiased predictor from a mixed effects logistic regression with a practice random effect), which was sorted into four bins using mean – sd, mean, mean + sd and then block randomised into three datasets.

Supplementary Figure S2. Flow diagram for selection of individuals.

Number of individuals from included practices

Development Set: n=4,851,788 Validation Set 1: n=2,205707 Validation Set 2: n=2,295,203



Exclude those deceased before index date

Development Set: n=4,739,150 Validation Set 1: n=2,155,034 Validation Set 2: n=2,295,203



Registered on index date

Development Set: n=3,189,883 Validation Set 1: n=1,470,746 Validation Set 2: n=1,458,350



At least one year follow-up on index date

Development Set: n=2,933,128 Validation Set 1: n=1,349,642 Validation Set 2: n=1,331,846



≥16 years old on index date

Development Set: n=2,422,378 Validation Set 1: n=1,117,023 Validation Set 2: n=1,098,802



Random sampling

Development Set: n=300,000 Validation Set 1: 150,000 Validation Set 2: 150,000

Supplementary Table S1. List of the 37 morbidities included in the baseline model (adapted from Payne et al. (2020)).

(adapted from Payne et al. (2020)).	
Morbidities based on SNOMED CT ever reco	orded
Alcohol problems	Heart failure
Anorexia or bulimia	Hypertension
Atrial fibrillation	Inflammatory bowel disease
Blindness and low vision	Learning disability
Bronchiectasis	Multiple sclerosis
Chronic liver disease and viral hepatitis	Parkinsonism
Chronic sinusitis	Peptic ulcer disease
COPD	Peripheral vascular disease
Coronary heart disease	Disorder of prostate
Dementia	Psychoactive substance misuse (not alcohol)
Diabetes	Rheumatoid arthritis
Diverticular disease of intestine	Stroke & transient ischaemic attack
Hearing loss	Thyroid disorders
Morbidities based on prescription in last 12	months
Constipation (currently treated)	≥4 laxative prescriptions
Migraine	≥4 prescription-only medicine anti-migraine
	prescriptions
Morbidities based on combination of SNON	1ED CT ever recorded and/or prescription in
last 12 months	
Epilepsy (currently treated)	SNOMED CT AND ≥1 antiepileptic
	prescription
Asthma (currently treated)	SNOMED CT AND ≥1 asthma prescription
Irritable bowel syndrome	SNOMED CT OR ≥4 antispasmodic
	prescriptions
Psoriasis or eczema	SNOMED CT AND ≥4 related prescriptions
	(excluding simple emollients)
Other morbidities	
Anxiety or depression	SNOMED CT (anxiety or depression) in last
	12 months OR ≥4 anxiolytic/hypnotic
	prescriptions in last 12 months OR ≥4 anti-
	depressant prescriptions (excluding low
	dose tricyclics) in last 12 months
(New) cancer in last 5 years	SNOMED CT (first) recorded in last 5 years
(excluding non-melanoma skin cancer)	
Chronic kidney disease	Highest value of last 2 eGFR readings is <60 ml/min
Painful condition	≥4 prescription-only medicine analgesics in
	last 12 months OR (≥4 specified anti-
	epileptics in last 12 months AND no
	epilepsy SNOMED CT ever recorded)
Schizophrenia or bipolar disorder	SNOMED CT ever recorded OR lithium ever
	prescribed

Supplementary Table S2. Top 20 conditions by prevalence and by effect size in the development dataset.

By prevalence	By absolute effect size
Hypertension	Dementia
Anxiety or depression	Cancer in the last 5 years
Painful condition	Migraine
Hearing loss	Painful condition
Asthma	Chronic kidney disease
Irritable bowel syndrome	COPD
Diabetes	Parkinsonism
Thyroid disorders	Constipation
Coronary heart disease	Atrial fibrillation
Chronic kidney disease	Hypertension
Diverticular disease of intestine	Heart failure
Disorder of prostate	Chronic liver disease and viral hepatitis
Atrial fibrillation	Alcohol problems
Alcohol problems	Inflammatory bowel disease
COPD	Epilepsy
Stroke and transient ischaemic attack	Irritable bowel syndrome
Rheumatoid arthritis	Peripheral vascular disease
Constipation	Hearing loss
Cancer in the last 5 years	Schizophrenia or bipolar disorder
Peptic ulcer disease	Bronchiectasis