



Measuring multimorbidity in research: Delphi consensus study

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ABSTRACT

OBJECTIVE To develop international consensus on the definition and measurement of multimorbidity in research.

DESIGN Delphi consensus study.

SETTING International consensus; data collected in three online rounds from participants between 30 November 2020 and 18 May 2021.

PARTICIPANTS Professionals interested in multimorbidity and people with long term conditions were recruited to professional and public panels.

RESULTS 150 professional and 25 public participants completed the first survey round. Response rates for rounds 2/3 were 83%/92% for professionals and 88%/93% in the public panel, respectively. Across both panels, the consensus was that multimorbidity should be defined as two or more long term conditions. Complex multimorbidity was perceived to be a useful concept, but the panels were unable to agree on how to define it. Both

panels agreed that conditions should be included in a multimorbidity measure if they were one or more of the following: currently active; permanent in their effects; requiring current treatment, care, or therapy; requiring surveillance; or relapsing-remitting conditions requiring ongoing care. Consensus was reached for 24 conditions to always include in multimorbidity measures, and 35 conditions to usually include unless a good reason not to existed. Simple counts were preferred for estimating prevalence and examining clustering or trajectories, and weighted measures were preferred for risk adjustment and outcome prediction.

CONCLUSIONS Previous multimorbidity research is limited by inconsistent definitions and approaches to measuring multimorbidity. This Delphi study identifies professional and public panel consensus guidance to facilitate consistency of definition and measurement, and to improve study comparability and reproducibility.

WHAT IS ALREADY KNOWN ON THIS TOPIC

- ⇒ How multimorbidity is defined and measured in research studies varies widely
- ⇒ Previous consensus studies have focused on choice of conditions to include in multimorbidity measures, and have usually involved only local or regional professional panels

WHAT THIS STUDY ADDS

- ⇒ This study provides guidance on how to define and measure multimorbidity in research studies, based on Delphi consensus in professional and public panels; although consensus was reached that multimorbidity should be defined as two or more long term conditions, none was reached on alternative definitions of complex multimorbidity
- ⇒ Panels agreed on which conditions to always include and which to usually include in multimorbidity measurement
- ⇒ Panels also agreed that simple counts of conditions were preferred or considered acceptable for studies estimating prevalence, identifying and counting disease clusters, and exploring trajectories of multimorbidity over time, and that weighted measures were for assessing severity of disease burden, and risk adjustment or outcome prediction

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE, OR POLICY

- ⇒ The consensus list of conditions to always and usually include in multimorbidity measurement provides a core set for researchers to use to improve comparability and replicability, although researchers can add other conditions relevant to local context and purpose
- ⇒ Consensus about when weighted measures or simple counts were preferred depending on the purpose of an analysis provides a guide to inform researchers choice of methods
- ⇒ Further research is needed to better define and demonstrate the value of concepts such as complex multimorbidity

Introduction

In many regions of the world, a growing proportion of adults has multiple long term conditions or multimorbidity.^{1–3} Multimorbidity is defined as the coexistence of two or more long term conditions.⁴ Multimorbidity prevalence increases substantially with age, and is the norm in people aged 65 years or older.^{5–7} Prevalence is also higher in less affluent and less well educated groups,^{6,7} with multimorbidity also occurring at younger ages in these groups.^{1,5} About 30–40% of people with multimorbidity have both a physical and a mental health condition,^{5,6} with multimorbidity involving a combination of physical and mental health being more common in women, and less affluent and less well educated individuals.^{5,6}

Despite broad agreement that multimorbidity should be defined as the presence of two or more chronic conditions, no international consensus exists on how to operationalise this broad definition in measures used in research. Multimorbidity measures vary widely in terms of the number, labelling, type, and severity of included conditions or groups of conditions.⁴ Without common definitions, many different tools have been developed and used to measure multimorbidity. The tools commonly used in research and clinical practice include: simple (unweighted) disease counts, weighted disease counts, and weighted medication counts.⁸ In

addition, many different weighting schemes have been applied to serve different purposes.

Consequently, comparing and reproducing studies is difficult, with for example, large variation in estimates of the prevalence of multimorbidity in different studies, ranging from 3.5% to 100%.⁹ The high level of heterogeneity in multimorbidity prevalence has been found to be mainly attributed to age and inconsistent multimorbidity measurement.¹⁰ The estimated pooled prevalence was 68.7% for an oldest population (aged ≥ 74 years), 26.3% for a younger population (aged >55 years), 29.3% for a measure including fewer than nine conditions, and 87.6% for a measure including 44 or more conditions.¹⁰

Previous studies have synthesised existing evidence on multimorbidity measures,^{8,11,12} compared the performance of different measures in predicting selected outcomes,^{13,14} and adapted existing measures to meet the professionally perceived needs of specific regions or populations.^{15,16} These studies have identified heterogeneity in the definition and measurement of multimorbidity as a key issue or limitation, and demonstrate the need for shared approaches to definition to improve comparability and reproducibility. In addition, little attention has been given to directly involving patients and the public in the discussion of multimorbidity definition and measurement. Therefore, this study aimed to explore views and develop consensus on how to measure multimorbidity using a modified Delphi study with an international panel of professionals and the public.

Methods

The overall study design was a modified Delphi method with two international panels of professionals and of members of the public.¹⁷ We used this method as a group consensus strategy to systematically and iteratively explore opinions of professionals and public contributors, and develop consensus on methods of defining and measuring multimorbidity. The study protocol is provided in online supplemental appendix 1.

Data collection methods

Data were collected in three rounds of online questionnaires sent to each individual member of the panels between 30 November 2020 and 18 May 2021. Core questions were the same for both panels, but some more technical questions were only asked of one panel (eg, questions about the acceptability of simple counts or weighted measures for different research purposes were only asked of the professional panel). In the second and third rounds, participants were fed back a summary of all responses to inform their judgments.^{17,18}

Round 1 questions were informed by the findings of a recent systematic review,¹⁹ which identified the

characteristics of multimorbidity measures used in research in relation to the study purposes. Each questionnaire included both closed (Likert scaled) questions and open ended questions. Depending on the question, participants were asked to rate (from strongly agree to strongly disagree) or rank (the importance of statements on a scale of 1-5) items or statements using Likert scales.¹⁷ The open ended responses were triangulated with close ended responses, and the results were used to develop new items in the following rounds. Second and third round items were a mix of those scored in the previous round that did not achieve consensus, and new items based on open ended responses in previous rounds. The interactive and repetitive survey rounds, as part of standard Delphi methods, were to improve the framing of the statements for panellists, attest their responses through the iterative process, and achieve consensus. All questionnaires are provided in online supplemental appendix 2.

To conceptualise multimorbidity, eight aspects were explored in the Delphi surveys (online supplemental appendices 2 and 3): the cut-off number of conditions for defining multimorbidity (and complex multimorbidity), duration of a condition for it to be defined as long term, types of conditions to include (eg, medical diagnoses, risk factors, and health behaviours), categorisation of conditions, choice of conditions based on their impact, data sources, which conditions to include (eg, name of individual conditions), and choice of simple counts versus weighted measures for different purposes.

Participants

Participants recruited to the professional panel were clinicians with experience of caring for patients with multiple long term conditions; and researchers and policy makers with an interest in multimorbidity. Participants recruited to the public panel were members of the public with multiple long term conditions or an interest in multimorbidity.

We identified participants using a range of methods: publicly available information including published work, publicly available websites, reports, and policy documents (to identify healthcare professionals, policy makers, or public participants for example, in guideline development). For the public panel, we asked conveners of patient and public involvement groups to forward the invite to their members, and asked participants (and potential participants) to forward study information to others who might meet the criteria, directly or via social media (snowball sampling). No direction on the number of participants is required for a Delphi survey.¹⁷ To provide representative information, some studies have involved more than 60 experts, while others involved as few as 15.¹⁸ In this Delphi study, we aimed to recruit a minimum number of experts and public contributors of 25-30, but we had no maximum limit.

Minimising bias and data analysis

We used several techniques to minimise sampling and non-response bias.²⁰ These techniques included sampling expert panellists with different study interests in the field of multimorbidity, using multiple survey distribution methods to increase response rates, highlighting the match between the survey and participant interests, identifying any differences in personal characteristics of those who did or did not complete the surveys, collecting multiple waves of data, and ensuring anonymity among panellists to facilitate open and truthful discussion about their views.

Descriptive statistics were used to describe participants' personal characteristics and responses to statements in three rounds of surveys (including frequency, percentage, median, and interquartile range). Before any data collection, we prespecified consensus as $\geq 70\%$ of panellists providing the same response.^{17 21}

For items relating to multimorbidity definition, any statements that reached consensus (to "strongly agree," "strongly disagree," "very important," and "not important at all"; rated on a scale of 1-5) in the initial round would not be asked again in the next rounds. If no consensus was reached, then questions were asked again in the following rounds. If statements did not reach consensus in all rounds, we examined for any consensus in terms of "agree" (the sum of strongly agree and agree), "disagree" (the sum of strongly disagree and disagree), "sufficiently important" (the sum of very important and sufficiently important), or "not important" (the sum of not important at all and slightly important) in the final round (online supplemental figure S1). "Don't know" responses were excluded from the denominator when calculating percentages.

For questions related to the choice of conditions to include in multimorbidity measures, we first identified whether consensus was reached to always include a condition ($\geq 70\%$ agreeing) in multimorbidity measurement. If no consensus was reached, we identified any agreement ($\geq 70\%$) to usually include unless a good reason to exclude in a particular context (referred to here as "usually include"), defined as the sum of responses to "always include" and "usually include."

For the choice of conditions to include in measures, we included all conditions as "always include" if either panel rated it as "always" and the other rated it as "usually." If one panel rated a condition as "usually include" and the other did not, we used the Rasch dichotomised model as a sensitivity analysis to examine items (conditions) being endorsed (rated always or usually include) and unendorsed (not rated always or usually include) by all participants (online supplemental box 1; this analysis was not prespecified).²² The level of endorsement was estimated on the basis of the item difficulty

parameter in the Rasch model, with negative values representing more frequently endorsed and positive values representing less frequently endorsed.²³ Conditional maximum likelihood estimation in the Rasch analysis was used to produce consistent item parameter estimates without assuming a specific population distribution for the latent trait.²⁴ In the face of disagreement between panels (ie, one panel saying "usually include," the other not), we rated conditions as "usually include" if the item difficulty parameter was ≤ 0.5 .²⁵ All statistical analyses were conducted using R version 4.0.4.

Patient and public involvement

A member of our research team (SS) organised an online meeting with a public reference group in September 2020 to discuss the development and design of the first Delphi questionnaires. Feedback provided by the public reference group included use of simple terms to describe medical diagnosis, and clarity about the difference between multimorbidity and comorbidity and questions relating to weighting. Based on the feedback, we therefore incorporated a short description explaining each medical diagnosis and inserted a two page document introducing the study topic in the online questionnaires. With the support of Health Data Research UK and our colleagues, several members of the public took part in the Delphi study to provide their views on how multimorbidity should be defined and measured. Subsequent round questionnaires were modified in response to comments and suggestions from all panellists including the public. All participants were sent a summary of the findings after completion of data analysis.

Results

In round 1, 150 professional panellists and 25 public panellists took part in the survey (figure 1). Owing to the use of multiple sampling strategies, the response rate in round 1 could not be estimated. The response rates for rounds 2 and 3 in the professional panel were 83% (112/135) and 92% (97/105), respectively, and 86% (n=31/36) and 93% (25/27) in the public panel, respectively. The number of participants in round 2 increased because of snowballing sampling (figure 1). Characteristics of respondents and non-respondents were similar across the three rounds in the professional panel and the public panel (table 1 and online supplemental table S1).

In the professional panel in round 1 (table 1), 53.3% of panellists were from Europe and 20.7% from North America with smaller proportions from Australasia (8.7%), Asia (13.3%), South America (3.3%), and Africa (0.6%). Most professional panellists were interested in multimorbidity in the general population or in middle aged or older adults, but only 12.7% were interested in multimorbidity in children.

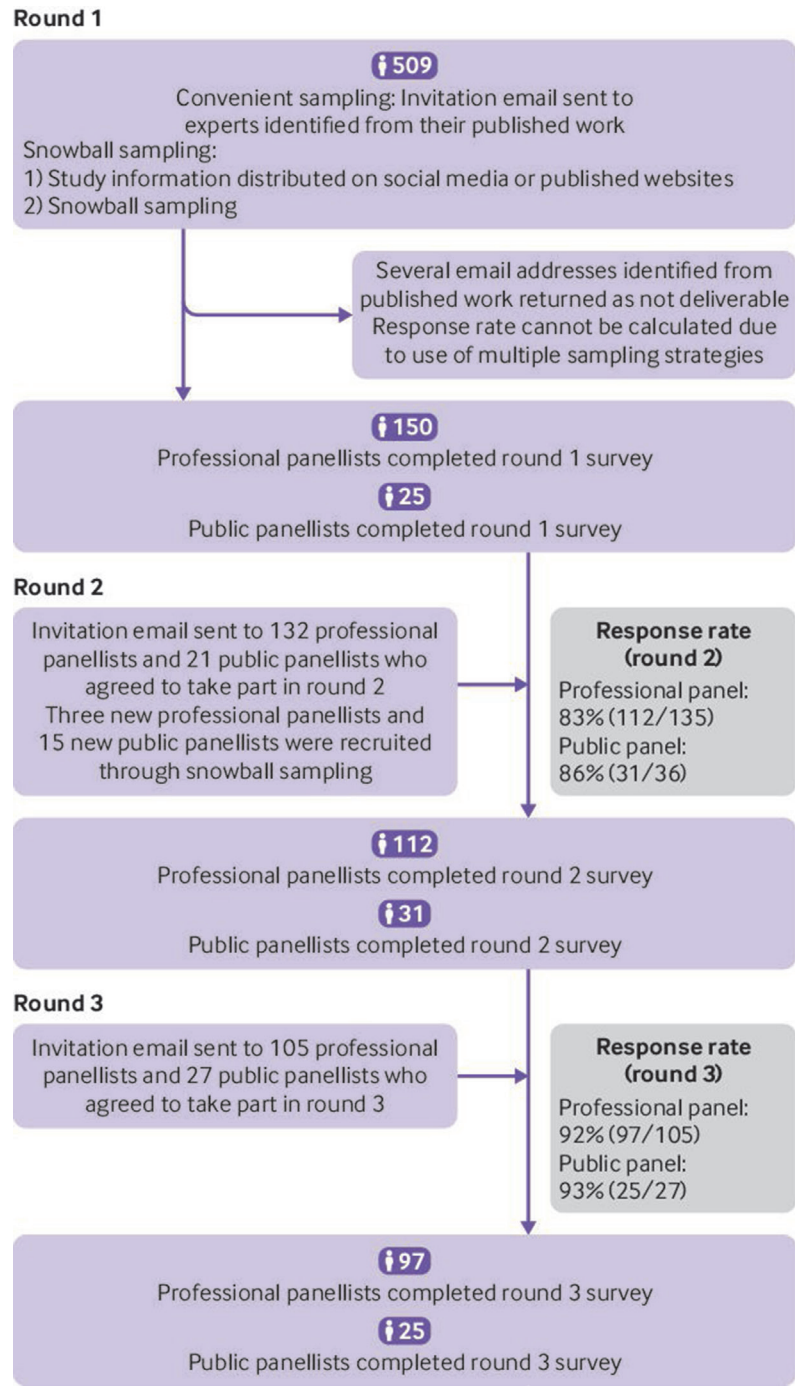


Figure 1 | Process of participant recruitment

More than half of professional panellists were interested in multimorbidity in socially deprived populations (56.7%), and 38.0% in multimorbidity in ethnic minority and indigenous groups. In the public panel, most panellists were from Europe, with fewer than 4% from Asia, North America, or South America. Just over half of public panellists were women (56.0%), and 48.0% of the public panellists were aged 65 years and older. The proportions of participant characteristics were similar across rounds.

Both panels agreed that multimorbidity should be defined as the co-occurrence of two or more long term

conditions. Defining complex multimorbidity was considered useful by more than 80% of both panels, with consensus in the public panel that complex multimorbidity could be defined as the co-occurrence of three or more long term conditions. However, no consensus in the professional panel was reached on how to define complex multimorbidity with variation in whether three or more conditions had to come from any, at least two, or at least three body systems. Neither panel agreed on the value of any other patterns of complex multimorbidity, with physical-mental comorbidity chosen by 33% of professional

Table 1 | Personal characteristics of participants who responded to Delphi surveys on multimorbidity measurement

Characteristics	Professional panellists			Public panellists		
	Round 1 (n=150)	Round 2 (n=112)	Round 3 (n=97)	Round 1 (n=25)	Round 2 (n=31)	Round 3 (n=25)
Continent						
Europe	80 (53.3)	59 (52.7)	50 (51.5)	21 (84.0)	30 (96.8)	24 (96.0)
North America	31 (20.7)	24 (21.4)	22 (22.7)	1 (4.0)	0	0
Australasia	13 (8.7)	12 (10.7)	10 (10.3)	0	0	0
Asia	20 (13.3)	12 (10.7)	11 (11.3)	1 (4.0)	0	0
South America	5 (3.3)	4 (3.6)	4 (4.1)	1 (4.0)	1 (3.2)	1 (4.0)
Africa	1 (0.6)	1 (0.9)	0	0	0	0
Not stated	0	0	0	1 (4.0)	0	0
Country income						
High income	139 (92.7)	103 (92.0)	89 (91.8)	22 (88.0)	30 (96.8)	24 (96.0)
Low and middle income	11 (7.3)	9 (8.0)	8 (8.2)	2 (8.0)	1 (3.2)	1 (4.0)
Not stated	0	0	0	1 (4.0)	0	0
Multimorbidity of participant						
Yes	17 (11.3)	16 (14.3)	13 (13.4)	13 (52.0)	19 (61.3)	17 (68.0)
No	133 (88.7)	95 (84.8)	83 (85.6)	12 (48.0)	12 (38.7)	8 (32.0)
Not stated	0	1 (0.9)	1 (1.0)	0	0	0
Multimorbidity of participant's family or friends						
Yes	104 (69.3)	76 (67.9)	66 (68.0)	17 (68.0)	24 (77.4)	20 (80.0)
No	46 (30.7)	35 (31.2)	30 (30.9)	8 (32.0)	7 (22.6)	5 (20.0)
Not stated	0	1 (0.9)	1 (1.0)	0	0	0
Area of work*						
Research	123 (82.0)	94 (83.9)	81 (83.5)	—	—	—
Public policy	13 (8.7)	9 (8.0)	7 (7.2)	—	—	—
Clinical practice	58 (38.7)	43 (38.4)	39 (40.2)	—	—	—
Teaching	4 (2.7)	3 (2.7)	4 (4.1)	—	—	—
Main work setting						
Government	10 (6.7)	6 (5.4)	6 (6.2)	—	—	—
Academia	95 (63.3)	70 (65.5)	57 (58.8)	—	—	—
Hospital	18 (12.0)	16 (14.3)	16 (16.5)	—	—	—
Primary care	25 (16.7)	16 (14.3)	14 (14.4)	—	—	—
Other	2 (13.3)	4 (3.6)	4 (4.1)	—	—	—
Populations of interest*						
General population	100 (66.7)	80 (71.4)	69 (71.1)	—	—	—
Older people	98 (65.3)	67 (59.8)	60 (61.9)	—	—	—
Middle aged and older	89 (59.3)	59 (52.7)	53 (54.6)	—	—	—
Socially deprived	85 (56.7)	62 (55.4)	56 (57.7)	—	—	—
Women†	37 (24.7)	33 (29.5)	31 (32.0)	—	—	—
Men†	33 (22.0)	27 (24.1)	26 (26.8)	—	—	—
Children	19 (12.7)	17 (15.2)	16 (16.5)	—	—	—
Ethnic group/indigenous	—	43 (38.4)	40 (41.2)	—	—	—
People with disability	—	46 (41.2)	44 (45.4)	—	—	—
Age group (years)						
18-34	—	—	—	2 (8.0)	1 (3.2)	1 (4.0)
35-54	—	—	—	6 (24.0)	7 (22.6)	5 (20.0)
55-64	—	—	—	5 (20.0)	7 (22.6)	6 (24.0)
≥65	—	—	—	12 (48.0)	16 (51.6)	13 (52.0)
Sex						
Female†	—	—	—	14 (56.0)	19 (61.3)	14 (56.0)
Male†	—	—	—	11 (44.0)	12 (38.7)	11 (44.0)

Data are number (%) of participants.

*Participants could choose more than one response so percentages can sum to >100%.

†Female and male refers to the sex of the public panellists; women and men refer to the populations that the professional panellists have research interests in.

panellists and 44% of public panellists, physical functional limitations by 30.9% of professional panellists and 32% of public panellists, difficulties

in managing illness due to social factors by 26.8% of professional panellists and 28% of public panellists, and frailty by 25.8% of professional panellists and

12% of public panellists (online supplemental table S2).

Conditions were considered to be long term if they persisted for six months or more in the professional panel (70.5%); conditions were considered long term if they lasted 12 months or more in the public panel (76.0%). More than 95% of panellists from both panels would include formal medical diagnoses in multimorbidity measurement. While the public panel agreed that clinical risk factors were important for multimorbidity measurement (74.2%) (online supplemental table S2), the professional panel did not reach a consensus. Symptoms, health behaviour, health impacts, social deprivation, and consequences of treatment did not reach consensus in both panels as conditions to include for measurement. Both panels agreed that conditions should be included in a multimorbidity measure if they were any of the following: currently active; permanent in their effects; requiring current treatment, care, or therapy; requiring surveillance (including treated cancers that require surveillance); or relapsing-remitting conditions that require ongoing treatment, care, or therapy (online supplemental table S3). On the other hand, no consensus was reached on the conditions that might recur or remit but happen rarely and that usually require treatment or therapy at some point in the future even if not currently treated. Both panels reached consensus that studies should count individual conditions rather than categories defined by body system, and that disease complications should be counted separately from diseases (eg, peripheral neuropathy and diabetes). The public panel (but not the professional panel) agreed that individual cancers should be counted separately (table 2 and online supplemental table S2).

In respect to criteria for selecting conditions based on impact, more than 70% of both panels agreed that conditions were appropriate to include in multimorbidity measurement if they were any of the following: significantly reduce quality of life, significantly worsen mental health, significantly increase risk of death, cause frailty, cause physical disability, or significantly increase treatment burden. The professional panel (but not the public panel) reached consensus on including conditions that significantly worsen self-perceived health status. The public panel (but not the professional panel) reached consensus on including conditions that are affected by social deprivation and poverty (table 2 and online supplemental table S4). Both panels agreed that conditions included for measurement should be similar in self-report, administrative databases, and medical records.

Technical questions about the use of simple counts versus weighted measures based on study purposes were only asked in the professional panel. In round 1, no consensus was reached on whether simple counts or weighted measures were

generally preferable (online supplemental table S5). In rounds 2 and 3, for a range of different purposes, professionals were asked if they preferred simple counts or weighted measures or if either was acceptable. There was no consensus that one or other type of measure was preferred for any of the purposes asked, but for all but one purpose, there was clear consensus that one type of measure was preferred or acceptable (table 2 and online supplemental table S6). Simple counts were preferred or acceptable for estimating the prevalence of multimorbidity, identifying and counting disease clusters, and exploring trajectories of multimorbidity. Weighted measures were preferred or acceptable for assessing the severity of disease burden, risk adjustment, and outcome prediction (in general) and for every specific outcome asked about (online supplemental table S7). No consensus was reached on the best type of measure for exploring or identifying predictors of multimorbidity. In round 2, 21.7% (n=20) of panellists preferred to use weighted indices, 46.7% (n=43) preferred to empirically derive weights based on the individual impact of diseases on outcome (eg, regression models to calculate weights), and 26.1% (n=24) preferred to set rules based on level of severity to grade each condition (eg, having presence of a condition=1 point, treatment=additional 1 points, functional limitation=additional 1 point). In both professional and public panels, mortality, healthcare use, health related quality of life, physical disability, and frailty were rated as sufficiently important or very important to weight against by $\geq 70\%$ panellists if weighted measures were preferred.

Of the 107 individual conditions asked about in the Delphi questionnaires (online supplemental file 2), 24 were rated as "always include" in multimorbidity measurement (the 107 conditions were defined on the basis of results of a recent systematic review¹⁹ and panellists' suggestions in initial rounds). This "always include" list consisted of 16 conditions (table 3) that reached consensus in both professional and public panels (end stage kidney disease, heart failure, dementia, chronic liver disease, chronic kidney disease, stroke, solid organ cancers, metastatic cancers, haematological cancers, multiple sclerosis, Parkinson's disease, coronary artery disease, cystic fibrosis, epilepsy, diabetes, and HIV/AIDS), seven conditions reaching consensus in the professional (but not public) panel (chronic obstructive pulmonary disease, inflammatory bowel disease, connective tissue disease, paralysis, schizophrenia, peripheral artery disease, and asthma), and one condition reaching consensus in the public (but not professional) panel (Addison's disease; online supplemental tables S8 and S9).

Table 2 | Responses to questions relevant to definitions of multimorbidity and complex multimorbidity. Data are percentage of panellists agreeing (and Delphi survey round (R))

Question or statement	Professional panellists	Public panellists
Definition of multimorbidity		
Multimorbidity is two or more long term conditions	84.8 (R2)	88.0 (R1)
Complex multimorbidity is a useful idea	87.5 (R2)	84.0 (R2)
Complex multimorbidity is three or more long term conditions	No consensus	76.0 (R3)
Types of conditions to include		
Long term means present for six months or more	70.5 (R2)	No consensus
Long term means present for 12 months or more	No consensus	76.0 (R1)
Medical diagnoses	99.1 (R2)	96.8 (R1)
Clinical risk factors	No consensus	74.2 (R2)
Currently active	98.7 (R1)	93.5 (R2)
Permanent in their effects	98.6 (R1)	96.0 (R1)
Requiring current treatment, care, or therapy	100.0 (R2)	96.8 (R2)
Requiring surveillance	74.7 (R3)	88.0 (R3)
Remitting-relapsing conditions requiring ongoing treatment or care	93.8 (R3)	92.0 (R3)
Counting or categorisation		
Count individual conditions not broad disease categories	72.0 (R1)	88.0 (R1)
Count individual cancers separately	No consensus	76.0 (R1)
Criteria for selecting conditions relating to impact		
Significantly increase risk of death	94.6 (R2)	100 (R1)
Significantly reduce quality of life	96.6 (R1)	93.5 (R2)
Cause frailty	89.9 (R2)	90.3 (R2)
Cause physical disability	93.3 (R1)	96.8 (R2)
Significantly worsen mental health	92.6 (R1)	87.1 (R2)
Significantly worsen self-perceived health status	77.4 (R2)	No consensus
Significantly increase treatment burden	87.4 (R2)	87.1 (R2)
Impacted by social deprivation and poverty	No consensus	74.2 (R2)
Data source		
Conditions should be the same/similar in both self-report and clinical/administrative database studies	71.8 (R2)	96.0 (R2)
Purposes where a simple count preferred or acceptable*		
Estimating prevalence	83.7 (R3)	Not asked
Identifying and counting disease clusters	80.2 (R3)	Not asked
Exploring trajectories of multimorbidity	72.7 (R3)	Not asked
Purposes where weighted measure preferred or acceptable*		
Assessing severity of disease burden	94.5 (R3)	Not asked
Risk adjustment or outcome prediction	91.2 (R3)	Not asked
Outcomes important to weight against		
Death	92.8 (R1)	96.8 (R2)
Healthcare use	83.7 (R1)	90.3 (R2)
Health related quality of life	92.3 (R1)	90.3 (R2)
Physical disability	87.8 (R1)	86.7 (R2)
Frailty	86.3 (R1)	76.7 (R2)

Absolute numbers for percentage data are as follows: professional panel, round 1 n=150, round 2 n=112, round 3 n=97; public panel, round 1 n=25, round 2 n=31, round 3 n=25.

*Panellists could either state that they preferred a simple or weighted measure for the listed options, or that a simple or weighted measure were both acceptable; values are the sum of "preferred" or "acceptable."

Of 37 conditions rated to usually include unless a good reason to exclude in a particular context, 34 reached consensus in both panels (table 3, online supplemental tables S10 and S11). Of the 22 conditions that reached consensus to usually include in only one panel, three conditions (treated hypertension, gout, and anxiety) had an estimated difficulty parameter ≤ 0.5 , and were therefore considered to be in the "usually include"

list (online supplemental table S12). Twenty seven conditions did not reach consensus to include in either panel, but no condition was rated as "usually exclude" or "always exclude" (online supplemental table S12).

Endorsement did not vary by participant characteristics apart from attention deficit hyperactivity disorder, which did not reach consensus in both panels, but was substantially more endorsed by

Table 3 | Conditions with consensus to always include and usually include unless there is a specific reason not to in a multimorbidity measure, by panel, based on Delphi surveys. Data are percentage of panellists agreeing (and Delphi survey round (R)) unless stated otherwise

Condition	Always include condition		Usually include condition*		Difficulty parameter estimate in both panels (logit)†
	Professional panellists	Public panellists	Professional panellists	Public panellists	
Heart failure	90.0 (R1)	83.9 (R2)	—	—	-3.1
Chronic liver disease	88.5 (R1)	80.6 (R2)	—	—	-3.5
Diabetes	87.3 (R1)	71.0 (R2)	—	—	-3.5
Parkinson's disease	86.6 (R1)	77.4 (R2)	—	—	-2.8
End stage kidney disease	86.4 (R1)	90.3 (R2)	—	—	-2.0
Coronary artery disease	82.7 (R1)	74.2 (R2)	—	—	-2.6
Dementia	82.6 (R1)	83.3 (R2)	—	—	-2.3
Multiple sclerosis	80.7 (R1)	77.4 (R2)	—	—	-1.9
Stroke	80.0 (R1)	80.6 (R2)	—	—	-2.6
Chronic kidney disease	79.3 (R1)	80.6 (R2)	—	—	-2.8
HIV/AIDS	78.5 (R1)	71.0 (R2)	—	—	-1.5
Metastatic cancers	77.4 (R1)	70.8 (R1)	—	—	-1.3
Haematological cancers	77.2 (R1)	70.8 (R1)	—	—	-1.9
Solid organ cancers	76.5 (R1)	70.8 (R1)	—	—	-2.0
Cystic fibrosis	75.8 (R1)	74.2 (R2)	—	—	-1.3
Epilepsy	73.0 (R1)	71.0 (R2)	—	—	-2.2
Chronic obstructive pulmonary disease	85.9 (R1)	No consensus	—	96.8 (R2)	-3.1
Inflammatory bowel disease	82.6 (R1)	No consensus	—	100 (R2)	-1.9
Connective tissue disease	79.7 (R1)	No consensus	—	93.3 (R2)	-2.3
Paralysis (other than stroke)	76.0 (R1)	No consensus	—	93.3 (R2)	-0.9
Schizophrenia	75.2 (R1)	No consensus	—	93.5 (R2)	-1.6
Peripheral arterial disease	71.1 (R1)	No consensus	—	96.8 (R2)	-1.6
Asthma	70.7 (R1)	No consensus	—	80.6 (R2)	-1.1
Addison's disease	No consensus	70.8 (R2)	86.9 (R2)	—	-0.8
Depression	—	—	92.9 (R2)	77.4 (R2)	-0.9
Heart valve disorders	—	—	92.0 (R2)	100 (R2)	-1.6
Bipolar disorder	—	—	90.0 (R2)	93.5 (R2)	-1.1
Melanoma	—	—	88.2 (R2)	100 (R2)	-1.1
Bronchiectasis	—	—	86.7 (R3)	88.0 (R3)	-0.7
Osteoarthritis	—	—	84.7 (R2)	87.1 (R2)	-0.5
Pancreatic disease	—	—	84.4 (R2)	96.7 (R2)	-0.7
Arrhythmia	—	—	83.9 (R2)	85.7 (R2)	-0.4
Thyroid disorders	—	—	82.7 (R2)	87.1 (R2)	-0.3
Venous thrombotic disease	—	—	82.4 (R2)	96.8 (R2)	-0.5
Drug or alcohol misuse	—	—	81.8 (R2)	74.2 (R2)	-0.02
Anaemia	—	—	81.7 (R2)	96.7 (R2)	-0.4
Chronic Lyme disease	—	—	81.3 (R3)	79.2 (R3)	-0.03
Transient ischaemic attack	—	—	80.4 (R2)	96.8 (R2)	-0.4
Treated cancer requiring surveillance	—	—	79.3 (R3)	80.0 (R3)	0.01
Eating disorders	—	—	79.1 (R2)	74.2 (R2)	0.2
Vision impairment that cannot be corrected	—	—	78.6 (R2)	74.2 (R2)	0.1
Long term musculoskeletal problems due to injury	—	—	78.4 (R3)	70.8 (R3)	0.2
Tuberculosis	—	—	82.4 (R2)	90.3 (R2)	0.07
Endometriosis	—	—	75.7 (R2)	89.3 (R2)	0.1
Chronic primary pain	—	—	75.3 (R3)	80.0 (R3)	0.2
Hearing impairment that cannot be corrected	—	—	73.9 (R2)	74.2 (R2)	0.4

Continued

Table 3 Continued

Condition	Always include condition		Usually include condition*		Difficulty parameter estimate in both panels (logit)†
	Professional panellists	Public panellists	Professional panellists	Public panellists	
Peptic ulcer	—	—	73.9 (R2)	83.9 (R2)	0.3
Post-traumatic stress disorder	—	—	73.4 (R2)	74.2 (R2)	0.5
Post-acute covid-19	—	—	73.4 (R3)	92.0 (R3)	0.2
Benign cerebral tumours	—	—	73.3 (R3)	76.0 (R3)	0.4
Peripheral neuropathy	—	—	73.1 (R2)	96.7 (R2)	0.1
Hypertension (untreated)	—	—	73.0 (R2)	71.0 (R2)	0.4
Congenital disease and chromosomal abnormalities	—	—	72.6 (R2)	90.0 (R2)	0.2
Chronic urinary tract infection	—	—	71.8 (R2)	86.7 (R2)	0.3
Aneurysm	—	—	71.6 (R3)	96.8 (R2)	0.5
Meniere's disease	—	—	71.3 (R2)	71.0 (R2)	0.5
Osteoporosis	—	—	70.3 (R2)	80.6 (R2)	0.5
Autism	—	—	70.1 (R2)	87.1 (R2)	0.5
Hypertension (treated)	—	—	80.4 (R2)	No consensus	0.3
Anxiety	—	—	80.0 (R2)	No consensus	0.4
Gout	—	—	76.1 (R2)	No consensus	0.4

*Consensus of conditions to usually include is defined as more than 70% of panellists rated conditions as always include or usually include.
†Used to examine endorsement (see also online supplemental table S14).

professional panellists interested in multimorbidity in children than those who were not (online supplemental table S13).

Discussion

Principal findings

Figure 2 and figure 3 summarise the research and reporting recommendations, and table 4 lists the conditions recommended for inclusion in multimorbidity measures. This consensus study found that more than 70% of professional and public panellists defined multimorbidity as the co-occurrence of two or more long term conditions. Despite consensus that complex multimorbidity was a useful concept in addition to this, no consensus was reached on how best to define it. Twenty four conditions were rated as ones to "always include," and 37 to "usually include (unless a good reason to exclude in a particular context)." Of the 37 conditions to usually include, untreated and treated hypertension were combined, and conditions that require surveillance has been generally agreed to be included for multimorbidity measurement (criteria for types of conditions to include) and thus treated cancer requiring surveillance was not particularly included in the recommended list of conditions, leading to 35 conditions recommended to usually include in multimorbidity measurement (table 4).

No conditions were rated by either panel to always exclude or usually exclude, consistent with allowing researchers to choose to additionally include other conditions of particular importance in their context.

General criteria reaching consensus in both panels on reasons to select and include conditions in multimorbidity measurement (which could inform such choices) were that a condition was one or more of the following: medical diagnosis; conditions that are currently active; conditions that require current treatment, care, or therapy; conditions that require surveillance; and remitting-relapsing conditions that require ongoing treatment or care.

Professional and public panels disagreed on how long a condition should persist to be defined as long term, with consensus in the professional panel on ≥ 6 months versus consensus in the public panel on ≥ 12 months. Our judgment was to recommend the 12 month cut-off period, but the discrepancy means that other researchers might decide to use a six month cut-off period. Health impacts agreed by both panels as important consideration in the choice of conditions included risk of death, quality of life, frailty, mental health, and treatment burden. As data could be collected from different sources, the consensus was that a consistent approach to multimorbidity measurement should be adopted, irrespective of whether the study used routine data (from patient records or insurance claims databases) or patient self-report. In this study, we found that panellists chose the type of multimorbidity measures depending on study purposes.

Simple counts of conditions were preferred or considered acceptable for estimating prevalence, identifying disease clusters, and exploring

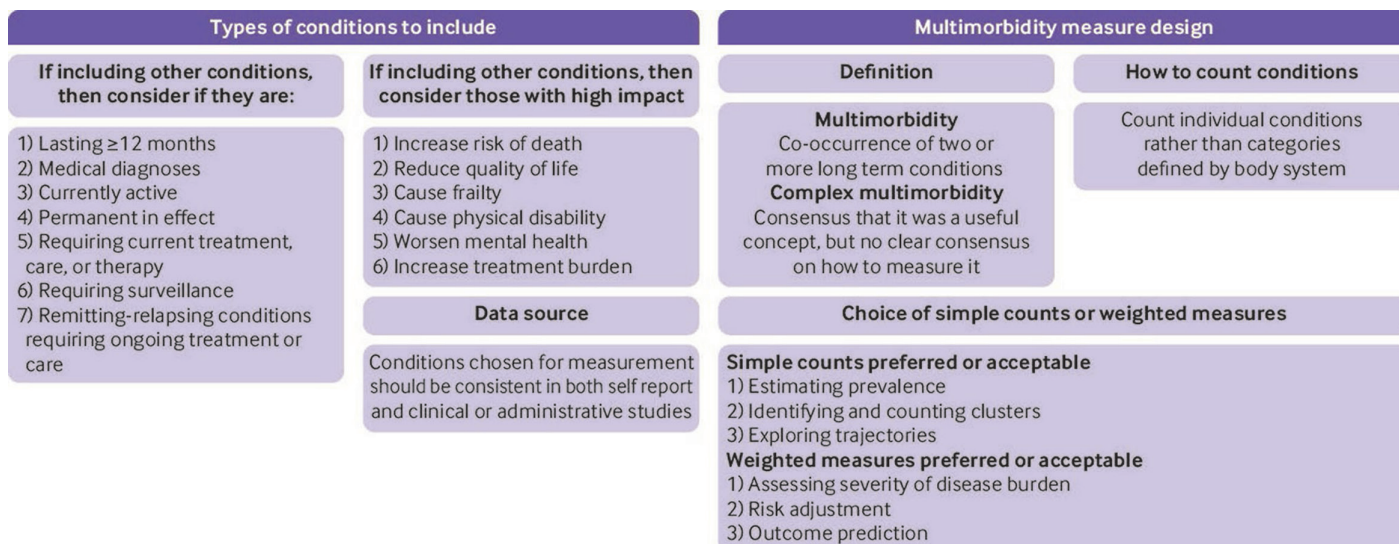


Figure 2 | Summary of findings and recommendations on multimorbidity definition. Professional panel consensus was >6 months; patient panel consensus was >12 months

trajectories of multimorbidity, whereas weighted measures were preferred or considered acceptable for assessing disease severity and predicting outcomes. No consensus was reached on how to weight measures, consistent with this depending on study purpose, but researchers should therefore explicitly state and justify their choice of how to weight (eg, in relation to severity of disease or in relation to a particular outcome). Stirland et al²⁶ provide guidance on which weighted measures to use for a particular purpose for those researchers who judge that a weighted measure is appropriate.²⁶

Strengths and limitations of the study

Strengths of this study include that the surveys were designed on the basis of results of a systematic review and in response to panellists' input, and that participants were recruited to both professional and public panels with good retention. Limitations include that less than 20% of panellists were from low or middle income countries, meaning that long term conditions prevalent in low or middle income countries might not have been prioritised. The professional panel was also larger than the public panel, meaning that where panels disagreed in which conditions to include, analysis could have favoured the professional perspective. An implication is that the conditions recommended for inclusion are probably best seen as a core list, and that researchers should carefully consider any additional conditions in their context to be included, and ensure public and patient involvement in their choice. However, if reporting prevalence of multimorbidity, then reporting the prevalence using the core list is recommended to improve comparability as well as reporting prevalence using the study specific set of conditions.

Secondly, owing to the difficulty of navigating experts in this relatively new research specialty

of multimorbidity, the study results might have differed if those interested in multimorbidity but never involved in multimorbidity research had been included. Finally, the professional and public panels disagreed on a small number of areas, meaning that findings should be interpreted with caution. Future studies could explore these areas of disagreement in more depth than is possible in a Delphi study. More in-depth studies could also explore more technical questions that were not asked of the public panel in this study (eg, relating to the construction of weighted measures).

Comparison of results with previous studies

Several previous consensus studies and group developed position papers have focused on the definition of multimorbidity, but these typically do not consider how to apply these definitions in measurement.^{27 28} Other studies have highlighted variable measurement of multimorbidity, with large variation in the number and nature of conditions included in measures.^{19 29 30} Prior consensus studies have examined which conditions to include. N'Goran et al³¹ used a modified RAND consensus method with a Swiss family practitioner panel to identify 75 International Classification of Primary Care diagnoses pertinent to the clinical consideration of people with multimorbidity. The main differences with this study were their inclusion of a more heterogeneous set of conditions in the psychological domain (including tobacco abuse and memory disturbance that is not dementia).³¹

Hafezparast et al³² aimed to identify local consensus on the choice of conditions to include in a measure relevant to inner city London.³² Unspecified participants were asked to rate 86 conditions identified in a scoping review, considering them in terms of their prevalence, impact, preventability and

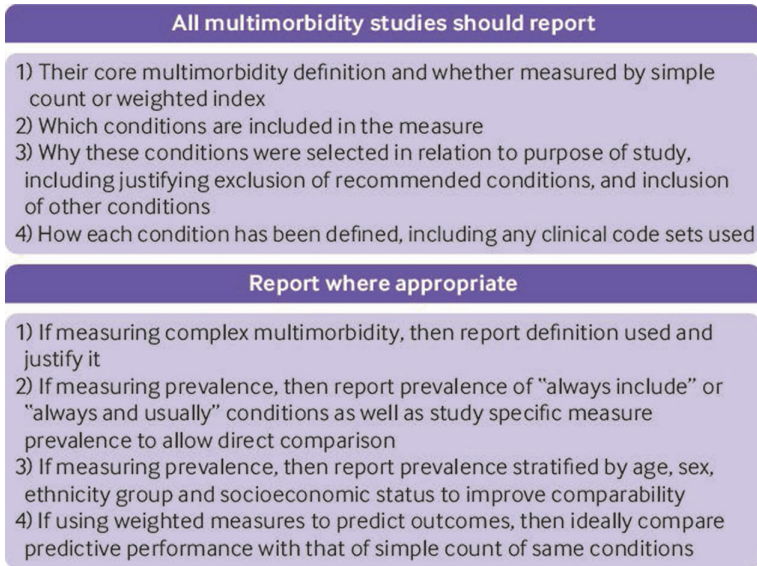


Figure 3 | Reporting recommendations on multimorbidity

modifiability, treatment burden, disease progression, and data quality. Thirty two conditions were rated as locally important to include in multimorbidity measurement, of which only two were not rated as always or usually include in our study (learning difficulties and morbid obesity). In addition, a qualitative study by Drye et al³³ identified 10 chronic conditions for quality care measurement (based on their adverse

effects on health status, function, and quality of life), all of which were included in the core list of this study. However, several conditions rated as "always or usually include" in our study were not in Drye's recommendations, such as cancers, schizophrenia, and chronic liver disease.³³

As previous review has shown that more than half of existing studies did not include mental health conditions in measurement,¹⁹ the nine mental health conditions rated as "always or usually include" could provide more comprehensive quality measurement for individuals with multimorbidity. Others have noted that the exact choice of conditions is likely to vary by study purpose, that episodic conditions should be included, and that there might be patient characteristics which are very important in clinical care (eg, smoking or socioeconomic status).^{29 30} In line with previous studies, we found consensus on the inclusion of episodic conditions only if they are active, permanent in their effects, or require ongoing treatment or surveillance; but we found no consensus on patient characteristics and social factors in both panels.

Implications of results

This study has several implications. Firstly, while we recognise that the choice of conditions to include in measurement should be sensitive to purpose and local context,³⁰ research in the field would be

Table 4 | Conditions reaching consensus to always or usually include in a multimorbidity measure, based on Delphi surveys

Body system (based on ICD-10 chapters)	Always include (n=24)	Usually include (unless a good reason not to in a particular context) (n=35)*
Cardiovascular disease	Stroke, coronary artery disease, heart failure, peripheral artery disease	Heart valve disorders, arrhythmia, venous thromboembolic disease, aneurysm, hypertension (treated and untreated)
Metabolic and endocrine disease	Diabetes, Addison's disease, cystic fibrosis	Thyroid disorders
Respiratory disease	Chronic obstructive pulmonary disease, asthma	Bronchiectasis
Neurological disease	Parkinson's disease, epilepsy, multiple sclerosis, paralysis	Transient ischaemic attack, peripheral neuropathy, chronic primary pain
Cancer	Solid organ cancers, haematological cancers, metastatic cancers	Melanoma, benign cerebral tumours that can cause disability
Mental and behavioural disorder	Dementia, schizophrenia	Depression, anxiety, bipolar disorder, drug or alcohol misuse, eating disorder, autism, post-traumatic stress disorder
Musculoskeletal disease	Connective tissue disease	Osteoarthritis, long term musculoskeletal problems due to injury, osteoporosis, gout
Digestive disease	Chronic liver disease, inflammatory bowel disease	Chronic pancreatic disease, peptic ulcer
Urogenital disorder	Chronic kidney disease, end stage kidney disease	Endometriosis, chronic urinary tract infection
Haematological disorder	—	Anaemia (including pernicious anaemia, sickle cell anaemia)
Eye disease	—	Vision impairment that cannot be corrected
Ear disease	—	Hearing impairment that cannot be corrected, Meniere's disease
Infectious disease	HIV/AIDS	Chronic Lyme disease, tuberculosis, post-acute covid-19
Congenital disease	—	Congenital disease and chromosomal abnormalities

ICD-10=international classification of diseases, 10th revision.
 *Untreated and treated hypertension were combined. Conditions that require surveillance (including cancers) were agreed to be included by both sets of panellists, and thus "cancers that require surveillance" was not stated separately in the list.

improved if researchers used a common set of conditions as core, which is provided in the list of conditions to always and usually include be identified in this study (table 4). For studies of prevalence, we recommend that researchers also report age and sex stratified prevalence based on the "always include" and "always or usually include" lists to improve comparability of studies.¹⁰ More generally, although not the focus of this study, multimorbidity measures are often poorly reported, and clarity about choices made and their rationale is critical (figure 3).¹⁹ We recommend that selection of other long term conditions in measures should take account of the criteria agreed as important by panellists in this study (figure 2), and that researchers explicitly report why and how they make decisions on condition and measurement choice (figure 3).

Secondly, this study has identified a need for consistent use of validated clinical code lists, but did not seek to identify them. Others have published lists of such codes for use in this context,³⁴ and with several initiatives set up to standardise identification of conditions in healthcare data (eg, the Health Data Research UK Phenotype Library³⁵).

Thirdly, although others have said that weighted measures are generally preferred over simple counts,³⁶ this study provides professional consensus about the particular purposes where simple counts or weighted measures were preferred or considered acceptable (figure 2). However, we need research that considers the relative performance of simple counts and weighted measures (eg, in predicting outcomes), and for wider public discussion about the relevance of weighted measures to patients (eg, in relation to which outcomes measures are weighted against).

Finally, our study found consensus that complex multimorbidity was a useful concept but no clear consensus on how to define it. Researchers who adopt definitions of multimorbidity beyond two or more conditions should therefore clearly justify their choice (figure 3). Research is needed to better understand the experience of complex multimorbidity from a patient perspective, and to examine whether different definitions of complex multimorbidity have better predictive performance than existing measures. We recommend that complex multimorbidity definitions should be co-developed with patients to ensure that these are relevant to their illness experience.

In conclusion, existing measurement of multimorbidity is highly inconsistent. The findings of this Delphi study provide guidance on multimorbidity measurement that will help bring greater consistency to the field, facilitating replication, comparison between studies, and evidence synthesis.

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REFERENCES

- Afshar S, Roderick PJ, Kowal P, *et al.* Multimorbidity and the inequalities of global ageing: a cross-sectional study of 28 countries using the world health surveys. *BMC Public Health* 2015;15:1–10. doi:10.1186/s12889-015-2008-7
- Garin N, Koyanagi A, Chatterji S, *et al.* Global multimorbidity patterns: a cross-sectional, population-based, multi-country study. *J Gerontol A Biol Sci Med Sci* 2016;71:205–14. doi:10.1093/geronol/glv128
- Violan C, Foguet-Boreu Q, Flores-Mateo G, *et al.* Prevalence, determinants and patterns of multimorbidity in primary care: a systematic review of observational studies. *PLoS One* 2014;9:e02149–9. doi:10.1371/journal.pone.0102149
- Willadsen TG, Bebe A, Køster-Rasmussen R, *et al.* The role of diseases, risk factors and symptoms in the definition of multimorbidity - a systematic review. *Scand J Prim Health Care* 2016;34:112–21. doi:10.3109/02813432.2016.1153242
- Barnett K, Mercer SW, Norbury M, *et al.* Epidemiology of multimorbidity and implications for health care, research, and medical education: a cross-sectional study. *Lancet* 2012;380:37–43. doi:10.1016/S0140-6736(12)60240-2
- Schiøtz ML, Stockmarr A, Høst D, *et al.* Social disparities in the prevalence of multimorbidity – a register-based population study. *BMC Public Health* 2017;17:1–11. doi:10.1186/s12889-017-4314-8
- Sakib MN, Shooshtari S, St. John P, *et al.* The prevalence of multimorbidity and associations with lifestyle factors among middle-aged Canadians: an analysis of Canadian longitudinal study on aging data. *BMC Public Health* 2019;19:1–13. doi:10.1186/s12889-019-6567-x
- Huntley AL, Johnson R, Purdy S, *et al.* Measures of multimorbidity and morbidity burden for use in primary care and community settings: a systematic review and guide. *Ann Fam Med* 2012;10:134–41. doi:10.1370/afm.1363
- Xu X, Mishra GD, Jones M. Evidence on multimorbidity from definition to intervention: an overview of systematic reviews. *Ageing Res Rev* 2017;37:53–68. doi:10.1016/j.arr.2017.05.003
- Ho IS-S, Azcoaga-Lorenzo A, Akbari A, *et al.* Variation in the estimated prevalence of multimorbidity: systematic review and meta-analysis of 193 international studies. *BMJ Open* 2022;12:e057017. doi:10.1136/bmjopen-2021-057017
- Diederichs C, Berger K, Bartels DB. The Measurement of Multiple Chronic Diseases--A Systematic Review on Existing Multimorbidity Indices. *J Gerontol A Biol Sci Med Sci* 2011;66A:301–11. doi:10.1093/geronol/glq208
- de Groot V, Beckerman H, Lankhorst GJ, *et al.* How to measure comorbidity. A critical review of available methods. *J Clin Epidemiol* 2003;56:221–9. doi:10.1016/s0895-4356(02)00585-1
- Brilleman SL, Salisbury C. Comparing measures of multimorbidity to predict outcomes in primary care: a cross sectional study. *Fam Pract* 2013;30:172–8. doi:10.1093/fampra/cms060
- Aubert CE, Schnipper JL, Roumet M, *et al.* Best definitions of multimorbidity to identify patients with high health care resource utilization. *Mayo Clin Proc Innov Qual Outcomes* 2020;4:40–9. doi:10.1016/j.mayocpiqo.2019.09.002
- Calderón-Larrañaga A *et al.* Assessing and measuring chronic multimorbidity in the older population: a proposal for its Operationalization. *The Journals of Gerontology* 2016;72:1417–23.
- Wister A, Lear S, Schuurman N, *et al.* Development and validation of a multi-domain multimorbidity resilience index for an older population: results from the baseline Canadian longitudinal study on aging. *BMC Geriatr* 2018;18:1–13. doi:10.1186/s12877-018-0851-y
- Keeney S, McKenna H, Hasson F. *The Delphi technique in nursing and health research*. Oxford: John Wiley & Sons, 2011.
- Hasson F, Keeney S, McKenna H. Research guidelines for the Delphi survey technique. *J Adv Nurs* 2000;32:1008–15.
- Ho IS-S, Azcoaga-Lorenzo A, Akbari A, *et al.* Examining variation in the measurement of multimorbidity in research: a systematic review of 566 studies. *Lancet Public Health* 2021;6:E587–97. doi:10.1016/S2468-2667(21)00107-9
- Halbesleben JRB, Whitman MV. Evaluating survey quality in health services research: a decision framework for assessing nonresponse bias. *Health Serv Res* 2013;48:913–30. doi:10.1111/1475-6773.12002
- von der Gracht HA. Consensus measurement in Delphi studies: review and implications for future quality assurance. *Technological Forecasting & Social Change* 2012;79:1525–36.
- Mair P. Package ‘eRm’, 2021. Available: <https://cran.r-project.org/web/packages/eRm/eRm.pdf> [Accessed 22 May 2021].
- Salkind NJ, Parameter b. in *Encyclopedia of Research Design*. Thousand Oaks, California: SAGE Publications, 2010.
- Ptukhin Y, Sheng Y. Comparing two maximum likelihood algorithms for mixture Rasch models. *Behaviormetrika* 2019;46:101–19. doi:10.1007/s41237-019-00076-6
- Hays RD, Morales LS, Reise SP. Item response theory and health outcomes measurement in the 21st century. *Med Care* 2000;38:11–28. doi:10.1097/00005650-200009002-00007
- Stirling LE, González-Saavedra L, Mullin DS, *et al.* Measuring multimorbidity beyond counting diseases: systematic review of community and population studies and guide to index choice. *BMJ* 2020;12:m160–12. doi:10.1136/bmj.m160
- Le Reste JY, Nabbe P, Rivet C, *et al.* The European general practice research network presents the translations of its comprehensive definition of multimorbidity in family medicine in ten European languages. *PLoS One* 2015;10:e0115796–13. doi:10.1371/journal.pone.0115796
- The Academy of Medical Sciences. *Multimorbidity: a priority for global health research*. London, UK: Academy of Medical Sciences, 2018.
- Suls J, Bayliss EA, Berry J, *et al.* Measuring multimorbidity: selecting the right instrument for the purpose and the data source. *Med Care* 2021;59:743–56. doi:10.1097/MLR.0000000000001566
- Griffith LE, Gruneir A, Fisher KA, *et al.* Key factors to consider when measuring multimorbidity: results from an expert panel and online survey. *J Comorb* 2018;8:2235042X18795306. doi:10.1177/2235042X18795306
- N’Goran AA, Blaser J, Deruaz-Luyet A, *et al.* From chronic conditions to relevance in multimorbidity: a four-step study in family medicine. *Fam Pract* 2016;33:439–44. doi:10.1093/fampra/cmw030
- Hafezparast N, Turner EB, Dunbar-Rees R, *et al.* Adapting the definition of multimorbidity – development of a locality-based consensus for selecting included long term conditions. *BMC Fam Pract* 2021;22:1–11. doi:10.1186/s12875-021-01477-x
- Drye EE, Altaf FK, Lipska KJ, *et al.* Defining multiple chronic conditions for quality measurement. *Med Care* 2018;56:193–201. doi:10.1097/MLR.0000000000000853
- Tonelli M, Wiebe N, Fortin M, *et al.* Methods for identifying 30 chronic conditions: application to administrative data. *BMC Med Inform Decis Mak* 2015;15:31. doi:10.1186/s12911-015-0155-5
- Health Data Research UK. HDRUK phenotype library, 2022. Available: <https://phenotypes.healthdatagateway.org/> [Accessed 21 Apr 2022].
- Johnston MC, Crilly M, Black C, *et al.* Defining and measuring multimorbidity: a systematic review of systematic reviews. *Eur J Public Health* 2019;29:182–9. doi:10.1093/eurpub/cky098

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Measuring multimorbidity in research: a Delphi consensus study

Appendix 1: Study protocol

Multimorbidity definition and measures
Version 1: 24/February/2020



Academic and Clinical Central Office for Research and Development



Non-CTIMP Study Protocol

A Delphi study to explore an international consensus on the definition and measurement of multimorbidity

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Protocol authors	Iris Ho and Bruce Guthrie
Funder	Health Data Research UK (HDRUK)
Funding Reference Number	CFC 0110
Chief Investigator	Professor Bruce Guthrie
Sponsor number	CFC 0110
REC Number	
Project registration	If applicable trials should be registered on a publically accessible database. ACCORD can provide log-in credentials for clinicaltrials.gov. Please email resgov@accord.scot to arrange
Version Number and Date	Version 1: 24/02/2020

Multimorbidity definition and measures
Version 1: 24/February/2020



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CONTENTS

1	INTRODUCTION	5
1.1	BACKGROUND	5
1.2	RATIONALE FOR STUDY	6
2	STUDY OBJECTIVES	6
2.1	OBJECTIVES	6
3	STUDY DESIGN	6
3.1	PHASE ONE: A SYSTEMATIC SCOPING REVIEW	6
3.1.1	Search strategy	7
3.1.2	Study screening	7
3.1.3	Data extraction	7
3.1.4	Data analysis	8
3.2	PHASE TWO: DELPHI STUDY	9
3.2.1	Study population	9
	<u>Inclusion criteria</u>	9
3.2.2	Number of participants	10
3.2.3	Identifying participants	10
3.2.4	Consenting participants	10
3.2.5	Withdrawal of Study Participants	10
4	DATA COLLECTION	10
4.1	DEFINING CONSENSUS OR STABILITY	11
4.1.1	Round 1	11
4.1.2	Round 2	11
4.1.3	Round 3	11
4.2	SOURCE DATA DOCUMENTATION	11
4.3	CASE REPORT FORMS	12
5	DATA MANAGEMENT	12
5.1	PERSONAL DATA	12
5.2	DATA INFORMATION FLOW	12
5.3	TRANSFER OF DATA	12
5.4	DATA CONTROLLER	12
5.5	DATA BREACHES	13
6	STATISTICS AND DATA ANALYSIS	13
6.1	SAMPLE SIZE CALCULATION	13
6.2	PROPOSED ANALYSES	13
7	ADVERSE EVENTS	13
8	GOOD CLINICAL PRACTICE	14
8.1	ETHICAL CONDUCT	14
	Before the study commence, all required approvals will be obtained and any conditions of approvals will be met..... Error! Bookmark not defined.	
8.2	INVESTIGATOR RESPONSIBILITIES	14
8.2.1	Informed Consent	14
8.2.2	Study Site Staff	14
8.2.3	Data Recording	14

Multimorbidity definition and measures
Version 1: 24/February/2020



Academic and Clinical Central Office for Research and Development



8.2.4	Investigator Documentation.....	14
8.2.5	GCP Training	14
8.2.6	Confidentiality	15
8.2.7	Data Protection	15
9	STUDY CONDUCT RESPONSIBILITIES	15
9.1	PROTOCOL AMENDMENTS.....	15
9.2	MANAGEMENT OF PROTOCOL NON COMPLIANCE	15
9.3	SERIOUS BREACH REQUIREMENTS	15
9.4	STUDY RECORD RETENTION.....	15
9.5	END OF STUDY	16
10	REPORTING, PUBLICATIONS AND NOTIFICATION OF RESULTS	16
10.1	AUTHORSHIP POLICY	16
11	REFERENCES	16
12	APPENDICES	18
	APPENDIX 1 – SEARCH STRATEGY.....	18
	APPENDIX 2 – DATA EXTRACTION FORMS FOR THE SCOPING REVIEW	20
	APPENDIX 3 – INVITATION EMAIL.....	21
	Survey: Building an international consensus on multimorbidity definition and measures: A Delphi study	21
	APPENDIX 4 – FOLLOW-UP EMAIL REMINDER.....	22
	Survey reminder: Building an international consensus on multimorbidity definition and measures: A Delphi study	22
	APPENDIX 5 – PARTICIPANT INFORMATION SHEET AND INFORMED CONSENT	23
	APPENDIX 6 – SOCIO-DEMOGRAPHIC INFORMATION .. Error! Bookmark not defined.	

Multimorbidity definition and measures
Version 1: 24/February/2020



LIST OF ABBREVIATIONS

ACCORD	Academic and Clinical Central Office for Research & Development - Joint office for The University of Edinburgh and Lothian Health Board
CI	Chief Investigator
CRF	Case Report Form
GCP	Good Clinical Practice
ICH	International Conference on Harmonisation
PI	Principal Investigator
QA	Quality Assurance
REC	Research Ethics Committee
SOP	Standard Operating Procedure
CoCoPop	Condition, Context, Population
BOS	Bristol Online Survey

1 INTRODUCTION

1.1 BACKGROUND

In many regions of the world, a growing proportion of the adult population is affected by more than one chronic condition [1-3]. Evidence from several studies indicates that the prevalence of multimorbidity increases substantially with age, and commonly occurs in people aged 65 or older [4-6]. Prevalence is also inversely related to socio-economic status and educational attainment [5, 6]. People living in deprived areas and with lower education tend to be multimorbid at a younger age [1, 4]. Of the population with multimorbidity, approximately 30% to 40% have both a physical and a mental health condition [4, 5]. Women and people with lower education and living in deprived areas are more likely to have physical and mental comorbidity [4, 5].

Multimorbidity is defined as the co-existence of multiple chronic conditions [7]. Unlike comorbidity that focuses on the effects of additional conditions in reference to an index chronic condition, multimorbidity addresses the total effects of chronic conditions without giving priority to any one of the co-existing conditions [8]. In reference to their difference in definition, multimorbidity has, therefore, been placed as a separate Medical Subject Heading (MeSH) since January 2018, distinct from comorbidity [8]. Notwithstanding some agreement on the broad definition of multimorbidity, there remains no international consensus on its

Multimorbidity definition and measures
Version 1: 24/February/2020



operational definition regarding how to measure it, with the measures varying widely in terms of the number, labelling, type, and severity of included conditions [7].

Without a clear and agreed guide, many measurement tools have been developed and used to measure multimorbidity. The measurement tools used in research and practice include: unweighted disease counts; weighted disease counts; weighted medication counts [9]. In addition, different weighting schemes have been applied to serve different purposes. Consequently, there is a wide discrepancy in prevalence estimates, ranging from 12.9%-95.1% in the general population [3].

Existing research recognises the importance of establishing an agreed approach to the definition and measurement of multimorbidity. Several attempts have been made to synthesise existing evidence on multimorbidity measures [9-11], to compare different measures of multimorbidity to predict certain outcomes [12], and to adapt existing measures to meet the needs of specific regions or populations [13, 14]. Due to the heterogeneity of current approaches, continued efforts are needed to develop an agreed approach as to what constitutes multimorbidity, what should be included in multimorbidity measures, and how to measure it. The aim of this study is to use the Delphi technique to explore international experts' views on the definition and measurement of multimorbidity, and to further provide a comprehensive guide on the use of multimorbidity measures to meet different purposes.

1.2 RATIONALE FOR STUDY

The Delphi technique is an iterative and participatory method to explore experts' opinions, discuss issues and build consensus through a structured group communication process [15]. In the current evidence base, this method has been used in health research for needs assessment [16], policy determination [17], and guideline development [18]. Given the wide range of applications of multimorbidity definition and measures, the Delphi method is considered as a suitable method for this study to collaboratively engage international experts to address the complex issues and support decision-making on how to measure multimorbidity.

2 STUDY OBJECTIVES

2.1 OBJECTIVES

- Objective 1: To identify and summarise published multimorbidity definitions and measures used in the existing literature, and to explore how these vary by the stated purpose of each study through a systematic scoping review
- Objective 2: To develop consensus construction to provide a comprehensive guidance on multimorbidity definition and measurement

3 STUDY DESIGN

This study involves two phases. The first phase is a systematic scoping review to address objective 1, and the second phase is a Delphi study to address objective 2.

3.1 PHASE ONE: A SYSTEMATIC SCOPING REVIEW

We will use a systematic scoping review to examine the broad area of multimorbidity to map key concepts and identify gaps in the evidence [19]. In this review, we will follow the

Multimorbidity definition and measures
Version 1: 24/February/2020



CoCoPop framework (Condition, Context and Population) to define eligibility criteria and conduct searches. This framework was developed by Munn et al. (2015) for systematic reviews of observational studies [20]. “Condition” is referred to as the variable of interest, which is multimorbidity in this review. In terms of context and population, we will look at studies conducted in hospitals, primary care and community that a population sample of people is being studied. Please see table 1 for the inclusion and exclusion criteria.

Table 1. Inclusion and exclusion criteria

Inclusion criteria:

- Quantitative studies that measured multimorbidity in a defined population
- In any setting, including hospitals, primary care, community
- Studies reported in English

Exclusion criteria:

- Studies that used measures with the presence of an index disease integral to the measures
- Conference proceedings or articles that do not provide full text
- Qualitative research and case series

3.1.1 Search strategy

The search strategy for this review will be developed in collaboration with a medical librarian (Appendix 1). Two sets of key terms (multimorbidity and measure) will be combined to search relevant literature by a means of Boolean logic. Medical subject headings will be used to capture concepts and to see if it yields additional studies in comparison with the results from keyword search. Searches will be conducted in Ovid interface (PsycINFO, Embase, Global Health, Medline), Scopus, Web of Science, Cochrane Library, EBSCO interface (CINAHL Plus), and ProQuest Dissertations & Theses Global, from inception to 21 January, 2020. Following the database searches, reference lists of retrieved articles will be hand-searched and citations will be tracked using Scopus/Google Scholar to ensure the inclusion of all relevant literature.

Conference proceedings and literature that did not provide full text will not be included in the review due to the limited information available for data extraction and analysis.

3.1.2 Study screening

References identified by the search strategy will be exported to EndNote X9 bibliographic software and Excel for deduplication, and then will be imported to Covidence for screening. Titles, abstracts, and full-texts of retrieved articles will be screened against the eligibility criteria by two reviewers (SH and PH). The first reviewer is from a nursing background and trained in systematic review methods and with experience of conducting reviews. The second reviewer is a clinician with experience of providing care for people with multimorbidity. Throughout the review process, any disagreement that arises will be resolved through discussion between the two reviewers or the chief investigator’s arbitration.

3.1.3 Data extraction

Pre-designed data extraction tables will be created to organise data (Appendix 2). Where any relevant or important data that do not fit in the tables, the tables will be revised to

Multimorbidity definition and measures
Version 1: 24/February/2020



facilitate data organisation and capture the holistic picture of the study topic. The types of data that will be extracted include:

- author's name
- year of publication
- study title
- purpose
- methodology (cross sectional/prospective)
- country
- study participants
- number of participants
- reference definition of multimorbidity
- tool used to measure multimorbidity (disease counts, weighted indices, medication-based measures)
- data collection method/data source (self-reports: survey or interview; administrative data, clinical routine data, research data)
- conditions, severity and other elements (e.g. age, gender, sociodemographic information) included in each measure
- rationale for selecting the items
- weighting scheme
- testing of reliability or validity
- prevalence of multimorbidity in the whole population and by sub-groups
- outcome variable
- follow-up years
- results
- confounding factors.

These data will be entered into Microsoft Excel 2016 and will be checked for completeness by SH, PH and BG.

3.1.4 Data analysis

Narrative synthesis will be used to synthesise the evidence. Data will be categorised by collapsing those that are similar and dissimilar into broader and higher order of categories. The relationships and interactions between and within data, categories and observations will be explored (including patterns and processes). Data visualisation tools will be used during data analysis to help make sense of the data. Thereafter, a questionnaire for the Delphi survey will be developed based on review findings and gaps identified from the review.

Multimorbidity definition and measures
Version 1: 24/February/2020



3.2 PHASE TWO: DELPHI STUDY

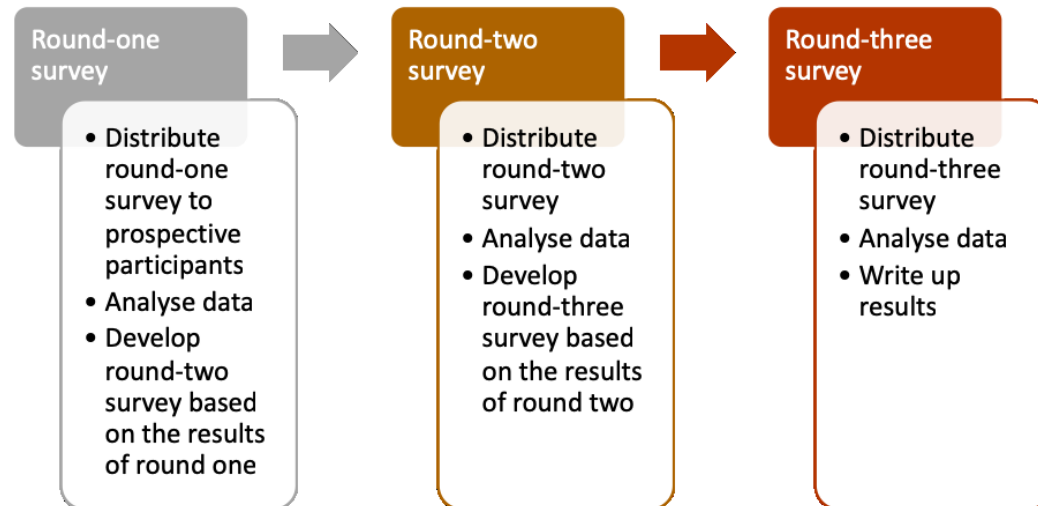


Figure 1: A Map of the project plan

The Delphi technique is designed as a communication process which allows for the inclusion of expert panellists from different sectors to participate in a detailed examination and discussion of a specific problem [15, 21, 22]. Therefore, this method is well suited for consensus building by using a series of questionnaires to collect data from the expert panel. Consensus here is referred to as a statement that is agreed by the majority [15, 23]. As a part of the Delphi process, each individual's responses from each questionnaire will be fed back to the panel alongside a summary of all other responses [15, 24]. The use of successive questionnaires can inform the panel members of the current status of their collective opinions [24]. Typically, more than two rounds of data collection are required to collect needed information and to reach consensus [22, 24, 25].

3.2.1 Study population

Unlike a traditional survey that aims to generalise results, the Delphi is a group decision mechanism requiring individuals who have knowledge, experience or deep understanding of the topic of interest [26]. In that sense, the main focus of this approach is the selection of experts and patients needed for inclusion of all the relevant perspectives [15]. In this proposed Delphi, we aim to recruit international experts and the public who have knowledge and experience of multimorbidity. Individuals who meet one of the following criteria will be included in this study:

Inclusion criteria

Multimorbidity definition and measures
Version 1: 24/February/2020



- Clinicians with experience of treating patients with more than one chronic condition
- Individuals who have been involved in health policy-making or research where multimorbidity was the focus or relevant
- Members of the public who are interested in multimorbidity or have experience of being multimorbid

3.2.2 Number of participants

There is no direction on the number of participants required for a Delphi survey [15]. The size of expert panel in existing Delphi studies varied considerably from under 10 to 500 [15]. In this Delphi study, the minimum number of experts we plan to recruit is approximately 25-30 experts.

3.2.3 Identifying participants

The expert panellists will be identified by SH (Szu-Szu Ho) and BG (Bruce Guthrie) using publicly available information, including:

- 1) published work (to identify researchers and policy makers)
- 2) publicly available websites, reports, and policy documents (to identify healthcare professionals, policy makers or public participants e.g. in guideline development)
- 3) social media, such as twitter, where we will distribute this study information

or experts will be identified by research participants where they forward the study information to colleagues who meet the criteria.

3.2.4 Consenting participants

Participants will be invited to take part in the study through email along with an attachment of the participant information sheet (PIS) (Appendix 3 and 4). Participants will be asked to read the PIS before deciding to take part, and the survey link will be provided in the PIS to ensure that they have read the study information. Each participant will be given two to three weeks to consider and respond to each round.

3.2.5 Withdrawal of Study Participants

Participants will be informed that they can withdraw their participation at any time by not completing the survey and informing our researcher of their decision. If withdrawal occurs their personally-identifiable information will be permanently deleted, and they will also be allowed to request withdrawal of the data they submitted if they wish.

4 DATA COLLECTION

The Delphi process is iterated until consensus or the consistency of responses between successive rounds of survey is achieved [23]. In this proposed Delphi, we plan to use online questionnaires to collect data. Members of the panel will be anonymous to one another but the research team will know their identity in order that they can be sent individual feedback and invitations to participate in subsequent rounds of survey. The promise of anonymity among panellists is to facilitate participants to be open and truthful about their views on multimorbidity without feeling pressured by more influential panel members [15, 25]. We expect to have three rounds of data collection but will terminate early if consensus is

Multimorbidity definition and measures
Version 1: 24/February/2020



reached and consider a fourth round if required for elements where consensus is not reached.

4.1 DEFINING CONSENSUS OR STABILITY

Consensus is pre-defined as 70% of participants agreeing/strongly agreeing or disagreeing/strongly disagreeing with a statement. However, not all statements in a Delphi study will gain consensus irrespective of the number of rounds [15, 25]. von der Gracht [23] therefore proposes that the level of consensus should not be the only criterion for stopping the Delphi process, but rather that sufficient clarification of the different viewpoints can also be a desirable goal. We will therefore not only examine consensus, but also stability of responses between rounds. The stability will be measured as the percentage change in agreement with a statement from round to round, and a change lower than 15% will be considered a stable answer [23]. If in round 3, all responses either achieve consensus or stability, then we will terminate the Delphi after round 3. If there are sufficient responses which lack consensus and are unstable, then we will take those items to a round 4.

4.1.1 Round 1

We will use the findings of the scoping review described above to identify the range of multimorbidity measures used in research and practice, their characteristics and use of standards, and purposes for measuring multimorbidity. The existing evidence and gaps identified from the review will serve as a point of reference for developing the round-one Delphi survey. The design of the questionnaire will be structured in a way that includes closed-ended/likert-scaled questions and some open-ended questions. The combination of both types of questions allows each participant an opportunity to generate additional insights, as well as formally scoring items derived by the research team from the literature review. Prospective participants will be required to rate (from strongly agree to strongly disagree or from very important to not important at all) and rank (rank importance of statements on a scale of 1-7) items or statements using Likert scales [15]. The open-ended responses will be triangulated with close-ended responses, and the results will be used to develop new items.

4.1.2 Round 2

In the second round, participants will receive a structured questionnaire and be asked to review their previous response and the items summarised based on the aggregated results of the first round. Second round items will be a mix of those scored in round 1 which did not achieve consensus, and new items based on round 1 open-ended responses. In this round, consensus may begin to form and areas of disagreement and agreement are likely to be identified.

4.1.3 Round 3

Round three will be designed using the results from round two. Prospective participants will receive a questionnaire that includes items or ratings summarised in the previous round and will be asked to review the results and provide their judgements. This round offers an opportunity for panellists to reflect and make further clarifications on the information developed by previous iterations and make their final judgements.

In an attempt to keep the panel motivated, a summary sheet of statements that have achieved consensus will be provided and serve as feedback of completed work to the panel.

4.2 SOURCE DATA DOCUMENTATION

The documents that contain source data are participant-completed questionnaires stored on the Qualtrics or Jisc online survey tools, and in the downloaded csv file. The anonymous

CFC 0110
11 of 26

Multimorbidity definition and measures
Version 1: 24/February/2020



research data will be stored separately from personally-identifiable information, including email address and name (preferred name given by participants). These will be stored securely in the university server with password protection.

4.3 CASE REPORT FORMS

Not applicable

5 DATA MANAGEMENT

5.1 PERSONAL DATA

The personal information that will be collected in this study are: 1) name and email address; 2) country; 3) type of work they are doing; 4) their expertise (Appendix 6). All data will be stored securely on password-protected servers at the University of Edinburgh. The name and email address of participants will be kept separately from the main dataset, and will only be accessible to the research team. Once this study is completed, the file containing participants' names and email addresses will be deleted permanently. Data, other than names and email addresses, will not contain information that can identify participants, and thus will be stored securely and indefinitely on the university server and will not be transferred to external individuals or organisations outside of the sponsoring organisation.

Participants will be assured that their information will be treated confidentially and that their responses would remain anonymous to other panel members throughout the Delphi process. Nonetheless, the researchers will be able to identify participants through their name and email address, which allows for distributing subsequent rounds of survey to the participants and providing them with individual responses and a summary of results from the previous round. They will be informed that they can withdraw their participation at any time. Ethics approval for the study will be sought and obtained from the Usher Research Ethics Committee at the University of Edinburgh.

5.2 DATA INFORMATION FLOW

Data will be collected using Qualtrics or Jisc survey tools and stored in a downloaded csv file for analysis. After the study is completed, participants' personally-identifiable information, name and email address, will be deleted permanently.

5.3 TRANSFER OF DATA

Data collected by the study (including personal data) will not be transferred to any external individuals or organisations outside of the Sponsoring organisation.

5.4 DATA CONTROLLER

The University of Edinburgh and the research team involved in delivering the study will be the data controllers.

Multimorbidity definition and measures
Version 1: 24/February/2020



Academic and Clinical Central Office for Research and Development



5.5 DATA BREACHES

As described above, we will take care to ensure that identifiable information is kept separate from study data. Given the nature of the study data, the potential harm of any data breach is low. We therefore consider the risk of a data breach to be remote and low risk of harm if occurred. All data breaches will be reported to the University of Edinburgh and HDRUK.

6 STATISTICS AND DATA ANALYSIS

6.1 SAMPLE SIZE CALCULATION

There is no one sample size that has been advocated for Delphi studies. It has been suggested that a smaller sample size would be sufficient for a Delphi study, such as 10-15 participants, although others argue that larger sample sizes are likely to produce more generalizable results. Concerned over the lower response rate in online surveys and no guideline for estimating a Delphi sample size, we aim to recruit 25-30 participants for each round.

6.2 PROPOSED ANALYSES

A database will be set up for the analysis of quantitative data (including demographic data) of rounds 1, 2 and 3 using Rstudio (version 4.0.1). Frequencies and descriptive statistics will be used to provide information on the level of agreement with each statement across rounds and expert groups. If the distributions of the responses show less than 15% change from round to round, the responses will be considered to have reached stability [22]. Central tendencies (medians) and levels of dispersion (inter-quartile range) will be provided to see the probability distribution of responses. Bar charts will be created to visually depict the study results. For qualitative data in round one, similar responses will be collapsed and used to modify existing or construct additional unique statements for round 2. New statements created from round 1 will be used for the design of round 2 survey. Response rate for each round of the survey will be calculated.

7 ADVERSE EVENTS

The only plausible potential harm could occur in this study is breach of participants' confidentiality. Precautions will be seriously taken to prevent their identity being disclosed to other panellists and people outside of the research team. Firstly, the file that contains their private information will be kept on the university server with password protection, and separated from the main dataset. Secondly, an invitation email will be sent to participants individually and for the final report, we will use the BCC field to send an email to the participants who would like to receive the report. Once the study is completed, their name and email address will be deleted permanently. Together, these measures are to protect participants' confidentiality.

Multimorbidity definition and measures
Version 1: 24/February/2020



8 GOOD CLINICAL PRACTICE

8.1 ETHICAL CONDUCT

The study will be conducted in accordance with the principles of the International Conference on Harmonisation Tripartite Guideline for Good Clinical Practice (ICH GCP).

Before the study can commence, all required approvals will be obtained and any conditions of approvals will be met.

8.2 INVESTIGATOR RESPONSIBILITIES

The Investigator is responsible for the overall conduct of the study at the site and compliance with the protocol and any protocol amendments. In accordance with the principles of ICH GCP, the following areas listed in this section are also the responsibility of the Investigator. Responsibilities may be delegated to an appropriate member of study site staff.

8.2.1 Informed Consent

The Investigator is responsible for ensuring informed consent is obtained before any protocol specific procedures are carried out. The decision of a participant to participate in clinical research is voluntary and should be based on a clear understanding of what is involved.

Participants must receive adequate oral and written information – appropriate Participant Information and Informed Consent Forms will be provided. The oral explanation to the participant will be performed by the Investigator or qualified delegated person, and must cover all the elements specified in the Participant Information Sheet and Consent Form.

The participant must be given every opportunity to clarify any points they do not understand and, if necessary, ask for more information. The participant must be given sufficient time to consider the information provided. It should be emphasised that the participant may withdraw their consent to participate at any time without loss of benefits to which they otherwise would be entitled.

The participant will be informed and agree to their medical records being inspected by regulatory authorities and representatives of the sponsor(s).

The Investigator or delegated member of the trial team and the participant will sign and date the Informed Consent Form(s) to confirm that consent has been obtained. The participant will receive a copy of this document and a copy filed in the Investigator Site File (ISF) and participant's medical notes (if applicable).

8.2.2 Study Site Staff

The Investigator must be familiar with the protocol and the study requirements. It is the Investigator's responsibility to ensure that all staff assisting with the study are adequately informed about the protocol and their trial related duties.

8.2.3 Data Recording

Not applicable

8.2.4 Investigator Documentation

Not applicable

8.2.5 GCP Training

For non-CTIMP (i.e. non-drug) studies all researchers are encouraged to undertake GCP training in order to understand the principles of GCP. However, this is not a mandatory requirement unless deemed so by the sponsor. GCP training status for all investigators should be indicated in their respective CVs.

Multimorbidity definition and measures
Version 1: 24/February/2020



8.2.6 Confidentiality

All laboratory specimens, evaluation forms, reports, and other records must be identified in a manner designed to maintain participant confidentiality. All records must be kept in a secure storage area with limited access. Clinical information will not be released without the written permission of the participant. The Investigator and study site staff involved with this study may not disclose or use for any purpose other than performance of the study, any data, record, or other unpublished information, which is confidential or identifiable, and has been disclosed to those individuals for the purpose of the study. Prior written agreement from the sponsor or its designee must be obtained for the disclosure of any said confidential information to other parties.

8.2.7 Data Protection

All Investigators and study site staff involved with this study must comply with the requirements of the appropriate data protection legislation (including the General Data Protection Regulation and Data Protection Act) with regard to the collection, storage, processing and disclosure of personal information.

Computers used to collate the data will have limited access measures via user names and passwords.

Published results will not contain any personal data and be of a form where individuals are not identified and re-identification is not likely to take place.

9 STUDY CONDUCT RESPONSIBILITIES

9.1 PROTOCOL AMENDMENTS

Any changes in research activity, except those necessary to remove an apparent, immediate hazard to the participant in the case of an urgent safety measure, must be reviewed and approved by the Chief Investigator.

Amendments will be submitted to a sponsor representative for review and authorisation before being submitted in writing to the appropriate REC, and local R&D for approval prior to participants being enrolled into an amended protocol.

9.2 MANAGEMENT OF PROTOCOL NON COMPLIANCE

Not applicable

9.3 SERIOUS BREACH REQUIREMENTS

A serious breach is a breach which is likely to effect to a significant degree:

- (a) the safety or physical or mental integrity of the participants of the trial; or
- (b) the scientific value of the trial.

If a potential serious breach is identified by the Chief investigator, Principal Investigator or delegates, the co-sponsors (seriousbreach@accord.scot) must be notified within 24 hours. It is the responsibility of the co-sponsors to assess the impact of the breach on the scientific value of the trial, to determine whether the incident constitutes a serious breach and report to research ethics committees as necessary.

9.4 STUDY RECORD RETENTION

All study documentation will be kept for a minimum of 3 years from the protocol defined end of study point. When the minimum retention period has elapsed, study documentation will not be destroyed without permission from the sponsor.

Multimorbidity definition and measures
Version 1: 24/February/2020



9.5 END OF STUDY

The end of study is defined as the last participant's last visit.

The Investigators or the co-sponsor(s) have the right at any time to terminate the study for clinical or administrative reasons.

The end of the study will be reported to the REC, and R+D Office(s) and co-sponsors within 90 days, or 15 days if the study is terminated prematurely. The Investigators will inform participants of the premature study closure and ensure that the appropriate follow up is arranged for all participants involved. End of study notification will be reported to the co-sponsors via email to resgov@accord.scot

A summary report of the study will be provided to the REC within 1 year of the end of the study.

10 REPORTING, PUBLICATIONS AND NOTIFICATION OF RESULTS

10.1 AUTHORSHIP POLICY

Ownership of the data arising from this study resides with the study team.

11 REFERENCES

1. Afshar, S., et al., *Multimorbidity and the inequalities of global ageing: a cross-sectional study of 28 countries using the World Health Surveys*. BMC Public Health, 2015. **15**(776): p. 1-10.
2. Garin, N., et al., *Global multimorbidity patterns: a cross-sectional, population-based, multi-country study*. Journals of Gerontology Series A, 2015. **71**(2): p. 205-214.
3. Violan, C., et al., *Prevalence, determinants and patterns of multimorbidity in primary care: a systematic review of observational studies*. PloS one, 2014. **9**(7): p. e1021-1049.
4. Barnett, K., et al., *Epidemiology of multimorbidity and implications for health care, research, and medical education: a cross-sectional study*. The Lancet, 2012. **380**(9836): p. 37-43.
5. Schiøtz, M.L., et al., *Social disparities in the prevalence of multimorbidity – A register-based population study*. BMC Public Health, 2017. **17**(422): p. 1-11.
6. Sakib, M.N., et al., *The prevalence of multimorbidity and associations with lifestyle factors among middle-aged Canadians: an analysis of Canadian Longitudinal Study on Aging data*. BMC Public Health, 2019. **19**(243): p. 1-13.
7. Willadsen, T.G., et al., *The role of diseases, risk factors and symptoms in the definition of multimorbidity – a systematic review*. Scandinavian Journal of Primary Health Care, 2016. **34**(2): p. 112-121.
8. Tugwell, P. and J.A. Knottnerus, *Multimorbidity and Comorbidity are now separate MESH headings*. Journal of Clinical Epidemiology, 2019. **105**: p. vi-viii.
9. Huntley, A.L., et al., *Measures of multimorbidity and morbidity burden for use in primary care and community settings: a systematic review and guide*. The Annals of Family Medicine, 2012. **10**(2): p. 134-141.
10. Diederichs, C., K. Berger, and D.B. Bartels, *The Measurement of Multiple Chronic Diseases—A Systematic Review on Existing Multimorbidity Indices*. The Journals of Gerontology: Series A, 2010. **66A**(3): p. 301-311.
11. de Groot, V., et al., *How to measure comorbidity: a critical review of available methods*. Journal of Clinical Epidemiology, 2003. **56**(3): p. 221-229.



Academic and Clinical Central Office for Research and Development

Multimorbidity definition and measures
Version 1: 24/February/2020

12. Brilleman, S.L. and C. Salisbury, *Comparing measures of multimorbidity to predict outcomes in primary care: a cross sectional study*. Family Practice, 2013. **30**(2): p. 172-178.
13. Calderón-Larrañaga, A., et al., *Assessing and Measuring Chronic Multimorbidity in the Older Population: A Proposal for Its Operationalization*. The Journals of Gerontology, 2016. **72**(10): p. 1417-1423.
14. Wister, A., et al., *Development and validation of a multi-domain multimorbidity resilience index for an older population: results from the baseline Canadian Longitudinal Study on Aging*. BMC Geriatrics, 2018. **18**(170): p. 1-13.
15. Keeney, S., H. McKenna, and F. Hasson, *The Delphi technique in nursing and health research*. 2011, Oxford: John Wiley & Sons.
16. McIlfatrick, S.J. and S. Keeney, *Identifying cancer nursing research priorities using the Delphi technique*. Journal of Advanced Nursing, 2003. **42**(6): p. 629-636.
17. Adler, M. and E. Ziglio, *Gazing into the oracle: The Delphi method and its application to social policy and public health*. 1996, London: Jessica Kingsley Publishers.
18. Schwermer, M., et al., *An expert consensus-based guideline for the integrative anthroposophic treatment of acute gastroenteritis in children*. Complementary Therapies in Medicine, 2019. **45**: p. 289-294.
19. The Joanna Briggs Institute. *The Joanna Briggs Institute Reviewers' Manual 2015 Methodology for JBI Scoping Review*. 2015 [cited 2020 07 January]; Available from: <https://nursing.isuhsc.edu/JBI/docs/ReviewersManuals/Scoping-.pdf>.
20. Munn, Z., et al., *Methodological guidance for systematic reviews of observational epidemiological studies reporting prevalence and cumulative incidence data*. International Journal of Evidence-based Healthcare, 2015. **13**: p. 147-153.
21. Hsu, C.-C. and B.A. Sandford, *The Delphi technique: making sense of consensus*. Practical Assessment, Reserach & Evaluation, 2007. **12**(10): p. 1-8.
22. Nair, R., R. Aggarwal, and D. Khanna, *Methods of formal consensus in classification/diagnostic criteria and guideline development*. Semin Arthritis Rheum, 2011. **41**(2): p. 95-105.
23. von der Gracht, H.A., *Consensus measurement in Delphi studies: review and implications for future quality assurance*. Technological Forecasting & Social Change, 2012. **79**: p. 1525-1536.
24. Hasson, F., S. Keeney, and H. McKenna, *Research guidelines for the Delphi survey technique*. Journal of Advanced Nursing, 2000. **32**(4): p. 1008-1015.
25. Milevska-Kostova, N. and W.N. Dunn, *Delphi analysis*, in *Methods and Tools in Public Health: A Handbook for Teachers, Researchers and Health Professionals*, L. Zaletel-Kragelj and J. Bozиков, Editors. 2010, Hans Jacobs Publishing Company: Hellweg. p. 423-436.
26. Okoli, C. and S.D. Pawlowski, *The Delphi method as a research tool: an example, design considerations and applications*. Information & Management, 2004. **42**(1): p. 15-29.

Multimorbidity definition and measures
Version 1: 24/February/2020



12 APPENDICES

APPENDIX 1 – SEARCH STRATEGY

Database	Search strategy
<u>Ovid Interface</u> PsycINFO Embase Global Health Ovid MEDLINE	<ol style="list-style-type: none"> 1. (multimorbidit\$ or multi-morbidit\$ or comorbidit\$ or co-morbidit\$ or polymorbidit\$ or poly-morbidit\$ or multicondition\$ or multicondition\$ or “multiple chronic condition\$” or “morbidity burden” or ((multiple or coexisting or co-existing or concurrent or con-current or comorbid or co-morbid) adj2 (disease\$ or illness\$ or condition\$ or diagnos\$ or morbid\$))).m_titl. 2. (measure\$ or index or indices or instrument\$ or scale\$ or “disease count\$”).mp. 3. 1 and 2 4. Limit 3 to human
<u>EBSCO Interface</u> CINAHL Plus	<ol style="list-style-type: none"> 1. MM (multimorbidit* or multi-morbidit* or comorbidit* or co-morbidit* or polymorbidit* or poly-morbidit* or multicondition* or multicondition* or “multiple chronic condition*” or “morbidity burden” or ((multiple or coexisting or co-existing or concurrent or con-current or comorbid or co-morbid) N2 (disease* or illness* or condition* or diagnos* or morbid*))) 2. AB (measure* or index or indices or instrument* or scale*) 3. 1 AND 2 <p>Limiters – Full Text; Human; Language: English</p>
Scopus	TITLE (multimorbidit* or multi-morbidit* or comorbidit* or co-morbidit* or polymorbidit* or poly-morbidit* or multicondition* or multicondition* or “multiple chronic condition*” or “morbidity burden” or ((multiple or coexisting or co-existing or concurrent or con-current or morbid or co-morbid) W/2 (disease* or illness* or condition* or diagnos?s or morbid*))) AND TITLE (measure* or index or indices or instrument* or scale* or “disease counts”)
Web of Science	(TI=(measure* or index or indices or instrument* or scale*))AND (TI=(multimorbidit* or multi-morbidit* or comorbidit* or co-morbidit* or polymorbidit* or poly-morbidit* or multicondition* or multicondition* or 'multiple chronic condition*' or 'morbidity burden' or ((multiple or coexisting or co-existing or concurrent or con-current or comorbid or co-morbid) NEAR/2 (disease* or illness* or condition* or diagnos* or morbid*)))) AND LANGUAGE: (English)

Multimorbidity definition and measures
Version 1: 24/February/2020



Academic and Clinical Central Office for Research and Development



Cochrane library	(multimorbidity or multi-morbidity or comorbidity or co-morbidity or polymorbidity or poly-morbidity or multicondition or multicondition or 'multiple chronic conditions' or 'morbidity burden' or ((multiple or coexisting or co-existing or concurrent or con-current or comorbid or co-morbid) NEAR/2 (disease or illness or condition or diagnosis or morbid))) AND (measure or index or indices or instrument or scale or "disease count*");ti
ProQuest Dissertations & Theses Global	<p>ti(((multimorbidit* OR multi-morbidit* OR comorbidit* OR co-morbidit* OR polymorbidit* OR poly-morbidit* OR multicondition* OR multicondition* OR 'multiple chronic condition*' OR 'morbidity burden' OR ((multiple OR coexisting OR co-existing OR concurrent OR con-current OR morbid OR co-morbid) NEAR/2 (disease* OR illness* OR condition* OR diagnos?s OR morbid*)))) AND noft((measure* OR index OR indices OR instrument* OR scale*))</p> <p>Limited by: Manuscript type: Doctoral dissertations, Master's theses</p> <p>Language: English</p>

<Multimorbidity definition and measures>
 <Version 1: 24/February/2020>



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APPENDIX 2 – DATA EXTRACTION FORMS FOR THE SCOPING REVIEW

Characteristics of multimorbidity measures

Study	Purpose	Participants	Country/Region	Definition of Multimorbidity	Measurement tool	Data collection method	Data source	Elements in the measure	Rationale for selecting the items	Weighting	Reliability /validity	Prevalence of multimorbidity	Outcome variable
								Condition, severity, frailty...					

Confounding factors	Key results

Items of multimorbidity measures

Measure	Condition name	Condition name	Condition name	Condition name	Condition name	Condition name	Condition name	Severity scale	Age
Name of measure		○	○	○	○				
Name of measure			○	○	○	○			
Name of measure									

<Multimorbidity definition and measures>
<Version 1: 24/February/2020>



APPENDIX 3 – INVITATION EMAIL

Subject: Multimorbidity definition and measurement study

Dear [to be addressed individually to each participant],

We are a research team working on a project aiming to explore an international consensus on the definition and measurement of multimorbidity. This study is funded by the Health Data Research UK (HDR UK – CFC0110).

We send you this email to invite you to participate in a Delphi survey. Your name and email address were identified from one of your published articles, reports, policy documents, or websites relevant to multimorbidity through our scoping review conducted between January and September, 2020. We seek your participation in this survey as we appreciate your valuable input on multimorbidity definition and measurement. International multimorbidity researchers, clinicians, policy makers and members of the public are all welcome to take part in the study. Please share this survey with your colleagues, if you can, to ensure we reach as many experts as possible. This research experience allows us to share, debate and scrutinise anonymously and move forward through consensus.

The Delphi process consists of **two to four** surveys— one that needs to be completed by [date] and the other rounds that will be sent out subsequently in the next few months. The first survey will take about 22 minutes to complete. **Taking part in the survey is voluntary and please read the attached Participant Information Sheet (PIS) carefully before you decide to take part. The online survey can be accessed via the link provided in the attached PIS (this is to ensure your acknowledgement of the study information prior to participation).**

The data you provide us will be treated confidentially and will not be accessed by anyone outside of the research team.

The results are envisioned to support and inform research, practice and policy around multimorbidity definition and measurement thanks to your contribution. A summary of the results will be available to you at the end of the study.

We hope that you are able to support this important work. If you have any questions, please contact the researcher, Iris Ho or the principal investigator, Bruce Guthrie.

Yours Sincerely,

Professor Bruce Guthrie, Chief investigator, Centre for Population and Health Sciences, Usher Institute, University of Edinburgh, Email: bruce.guthrie@ed.ac.uk

Dr Iris S.S. Ho, Centre for Population and Health Sciences, Usher Institute, University of Edinburgh, Email: iris.s.ho@ed.ac.uk

<Multimorbidity definition and measures>
<Version 1: 24/February/2020>



APPENDIX 4 – FOLLOW-UP EMAIL REMINDER

Subject: Multimorbidity definition and measurement study

Dear [to be addressed individually to each participant],

You were recently invited to participate in a Delphi survey aimed at exploring a consensus on multimorbidity definition and measurement (see the email below). If you have not already completed the survey, we encourage you to take a few minutes to do so before [date]. If you have already completed the survey we thank you for your support and ask you to ignore this email. Your valuable opinions can help to shape the future of multimorbidity research and management. If possible, please share this study information with your colleagues in the field.

The survey can be accessed via the link provided in the attached Participant Information Sheet. Please complete the survey by [date].

Thank you in advance.

Yours sincerely,

Professor Bruce Guthrie, Chief investigator, Centre for Population and Health Sciences, Usher Institute, University of Edinburgh, Email: bruce.guthrie@ed.ac.uk

Dr Iris S.S. Ho, Centre for Population and Health Sciences, Usher Institute, University of Edinburgh, Email: iris.s.ho@ed.ac.uk

<Multimorbidity definition and measures>
<Version 1: 24/February/2020>



APPENDIX 5 – PARTICIPANT INFORMATION SHEET

Principal investigator: Professor Bruce Guthrie

Postdoctoral researcher: Dr Iris Ho

Institute: Usher Institute, University of Edinburgh

Research Ethics Committee: Usher Institute Research Ethics Committee at the University of Edinburgh ([ref.](#)).

Survey link:

- If you are **clinicians, academics, researchers or policy makers** who have read the PIS and agree to take part, please access the survey via this link:
- If you are **members of the public** who have read the PIS and agree to take part, please access the survey via this link:

You are being invited to take part in this Delphi study aimed at exploring international consensus and guide on the definition and measurement of multimorbidity. Before you decide to take part, it is important that you understand why this research is being conducted and what it involves. Please take time to read this study information carefully.

Thank you for taking the time to read this.

Who will conduct the research?

This research is being conducted by Iris Ho, a researcher at the University of Edinburgh, and Professor Bruce Guthrie (the Chief Investigator). Our names and contact details are given at the end of this information sheet.

Aim of this study

The aim of this study is to explore a consensus on the definition of multimorbidity and on the design of quantitative measures of multimorbidity.

Why have I been invited to take part?

You are invited to participate in this study because we recognised your expertise relevant to multimorbidity through your published work, publicly-available reports, websites, or policy documents following our scoping review. You may also have been invited to take part in this study by a colleague who has forwarded the survey to you.

Do I have to take part?

No – participation is entirely voluntary. You can ask questions about the study before deciding whether or not to participate. If you do agree to participate, please keep this study information sheet and check the “Yes” boxes at the first page of the online survey to indicate that you agree with the listed statements and consent to take part.

Even if you agree to participate, you may withdraw yourself from the study at any time and without giving a reason by advising the researchers of this decision. We will respect your decision to withdraw and there will be no loss of good feeling/will. If withdrawal occurs, your personal and contact information we collected for this project will be permanently deleted. Participant survey responses collected prior to your withdrawal will be kept for analyses, as they will be completely anonymous.

CFC 0110
23 of 26

<Multimorbidity definition and measures>
<Version 1: 24/February/2020>



What will happen if I decide to take part?

We are inviting you to participate as a panel member in this Delphi study. The Delphi method is used in this study to obtain your opinions and ideas on the definition of multimorbidity, and what should be included in multimorbidity measures and how to use them for different purposes. Two to four rounds of survey will be carried out to ensure that the convergence of opinion on this topic is achieved. This survey takes approximately 22 minutes to complete. A second round of survey will be sent to you via email in a few months following data analysis. Thank you for your contribution.

What are the possible benefits of taking part?

Your valuable input in this Delphi process will allow researchers, practitioners, funders and policy makers in the field to better understand what constitutes multimorbidity, and how to measure it to meet different purposes.

Are there any risks associated with taking part?

There are no foreseeable risks associated with participation in this study.

What happens to the data provided?

We will not tell anyone you have taken part in this study. The research data you give us will be anonymised and stored confidentially at our university server with password protection. Only Bruce Guthrie and Iris Ho have the permission to use the data. The name and email address we collected from you is for sending the subsequent rounds of survey. This information will be permanently deleted after this study is completed. The anonymous research data will be stored securely and indefinitely and will not be transferred to external individuals or organisations outside of the sponsoring organisation.

What will happen with the results of this study?

The results of this study will be summarised in articles and reports, and will be disseminated through peer-reviewed journals and presented at conferences. The results will be made anonymous in any formal outputs, and be available to you all.

Who do I contact if I have a concern about the study or I wish to complain?

If you have any further questions about the study, please contact Dr Iris Ho or the Principal Investigator Professor Bruce Guthrie, who will do their best to answer your query. If you remain unhappy or wish to make a formal complaint, please contact Professor Sarah Cunningham Burley, Dean SMGPHS [Email: sarah.c.burley@ed.ac.uk ; Tel: [0131 650 3217](tel:01316503217)]

Further information and contact details

Principal investigator: Professor Bruce Guthrie [bruce.guthrie@ed.ac.uk]
Postdoctoral researcher: Dr Iris S.S. Ho [iris.s.ho@ed.ac.uk]

Survey link:

- If you are **clinicians, academics, researchers or policy makers** who have read the PIS and agree to take part, please access the survey via this link:
- If you are **members of the public** who have read the PIS and agree to take part, please access the survey via this link:

Measuring multimorbidity in research: a Delphi consensus study

Appendix 2: Surveys

Table of Contents

Round-one survey in the professional panel.....	2
Round-two survey in the professional panel.....	19
Round-three survey in the professional panel.....	37
Round-one survey in the public panel	44
Round-two survey in the public panel	61
Round-three survey in the public panel	80

Round one professional panel

Round-one survey in the professional panel

Socio-demographic information

Q1: Please describe the country where you are currently living or working.

Q2: Please check the category that best describes the type of work you do most of the time (choose one).

- Research
- Public policy or other public sector work
- Clinical Practice
- Other

Q3: Please check the category that best describes the setting in which you work most of the time (choose one).

- Government
- Academia
- Hospital
- Primary care/General practice
- Social care sector
- Other

Q4: Do you have multiple chronic conditions?

- Yes
- No

Q5: Do you have family or friends who have multiple chronic conditions?

- Yes
- No

Q6: To understand multimorbidity, what population would you be more interested in (please choose all that apply)?

Round one professional panel

- General population
- Older people
- Middle-aged and older
- Socially-deprived population (including homeless people or drug users)
- Women
- Men
- Children
- Other

Operational definition of multimorbidity

Q7: Researchers have defined multimorbidity in many ways. Some define it as '2 or more long-term conditions', but others define it as '3 or more', '4 or more' or '5 or more' long-term conditions. How many long-term conditions do you think someone has to have in order to have multimorbidity? Please choose one.

- 2 or more long-term conditions
- 3 or more long-term conditions
- 4 or more long-term conditions
- 5 or more long-term conditions
- Other, X or more long-term conditions (please only type a number in the box)

Q8: How would you define "condition" for the concept of multimorbidity? (please choose all that apply)

- Formal medical diagnoses (e.g. coronary heart disease, alcohol dependence)
- Clinical risk factors (e.g. obesity, high cholesterol)
- Symptoms that are not formal medical diagnoses (e.g. dizziness or fatigue)
- Health behaviours (e.g. smoking or exercise level)
- Health impact (e.g. disability or frailty)
- Social deprivation and poverty
- Consequences of treatment and care (e.g. side effects of medications or the overall burden of treatment)
- Other (please specify)

Round one professional panel

Q9: Researchers justify their choice of conditions in many different ways. Please answer the following questions on the principles for selection of chronic conditions in multimorbidity measures.

- 1) How long-term a condition is: Researchers vary in what they mean by “long-term”. How long does a condition have to be to count as long-term? Please choose one.

- Conditions lasting for three months or more
 Conditions lasting for six months or more
 Conditions lasting for twelve months or more
 Other, conditions lasting for X months or more (please only type a number for X in the box)

- 2) Whether a condition is currently active: Please rate the degree to which you agree or disagree with each of the following statements

Statement	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Don't know
Include conditions which are permanent in their effects (e.g. Parkinson's disease)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Include conditions which are currently active or currently treated (e.g. asthma with intermittent wheeze; asthma using regular inhalers)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Include conditions which may recur but happen rarely (e.g. people with a history of asthma or depression with no current symptoms and not currently on treatment)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other <input style="width: 100px; height: 30px;" type="text"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- 3) Whether condition is treated in healthcare: Please rate the degree to which you agree or disagree with each of the following statements

Statement	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Don't know

Round one professional panel

Only include conditions which usually require formal treatment or care (e.g. hypertension, diabetes, schizophrenia)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other <div style="border: 1px solid black; height: 40px; width: 100%;"></div>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

4) The impact of the condition on a range of outcomes: Please rate the degree to which you agree or disagree with each of the following statements

Statement	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Don't know
Include conditions which significantly increase risk of death	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Include conditions which significantly reduce health-related quality of life	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Include conditions which cause significant physical disability	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Include conditions which cause frailty (general physical and/or mental weakness and vulnerability)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Include conditions which significantly worsen mental health	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Include conditions which significantly worsen self-perceived health status	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Impact: Other <div style="border: 1px solid black; height: 40px; width: 100%;"></div>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q10: Researchers vary in how detailed their definitions of 'condition' are. For example, they might be very broad – one category for “lung disease”. Or they might be more detailed – separately count “asthma”, “chronic obstructive pulmonary disease” and so on. Please choose one option and explain your choice if you like.

Round one professional panel

- Broad disease category based on body and mind system (e.g. cardiovascular disease, mental health problems, skin conditions). Please explain:

- Individual conditions (e.g. coronary heart disease, hypertension, depression, schizophrenia, eczema, psoriasis). Please explain:

- Other. Please explain:

- Don't know

Q11: Some conditions included in multimorbidity measures are closely linked to each other. In particular, some conditions can be caused by other conditions. For example, heart attacks can lead to heart failure. Diabetes can lead to kidney failure. How do you think researchers should count conditions in this situation? Please choose one option and explain your choice if you like.

- Count all of the conditions that are currently active. Please explain:

- Only count the complications (e.g. if people with heart attack develop heart failure, we would count only heart failure). Please explain:

- Count the primary health condition (e.g. if people with diabetes develop kidney failure, we would only count diabetes). Please explain:

- Other. Please explain:

Round one professional panel

Don't know

What conditions should be included?

In our review of over 500 research studies, we identified all the conditions which researchers have counted when measuring multimorbidity. There is very large variation in which conditions researchers choose. Only seven conditions were counted by more than half of studies. Many conditions were rarely counted. We would like you to rate conditions that you think are more or less important to include in multimorbidity measures. There are now a set of questions organised by body system.

Q12: We are starting with body systems/disease domains. Please rate how important you think it is to include the following systems/domains in a multimorbidity measure.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Mental health	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cancer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cardiovascular	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Haematological disease	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Neurological disease	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Metabolic and Endocrine	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Musculoskeletal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Digestive	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Urogenital	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Skin	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ear, Nose and Throat (ENT)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Oral	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ophthalmology	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chronic infections	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q13: Please rate how important you think it is to include the listed mental health conditions in a multimorbidity measure. If you are not sure, just tick 'Don't know'.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Anxiety	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Depression	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dementia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Round one professional panel

Schizophrenia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Substance misuse (including alcohol and drug dependence)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nicotine dependence	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Post-traumatic stress disorder (PTSD)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bipolar disorder	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chronic insomnia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dissociative or personality disorders	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Eating disorders (including bulimia or anorexia)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Learning disability	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Autism	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Obsessive compulsive disorder (OCD)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Somatoform disorders (psychological disorder where a person experiences physical symptoms that cannot be explained by medical doctors)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Attention deficit hyperactivity disorder (ADHD)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q14: Please rate how important you think it is to include the listed cancers in a multimorbidity measure.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Solid organ cancers (e.g. lung,	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Round one professional panel

colon, prostate, breast etc)						
Haematological cancers (e.g. leukaemia, lymphoma, myeloma)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Melanoma (malignant skin cancer)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Non-melanoma skin cancer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Benign cancers (excluding benign skin lumps and bumps)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Metastatic cancers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q15: For cancers, some researchers count every cancer a person has had. Others only count 'cancer' once even if someone has had more than one type of cancer. Which methods would you recommend. Please choose one:

- Count all cancers as one
 Count individual cancers separately.
 Other

Q16: Please rate how important you think it is to include the listed cardiovascular conditions in a multimorbidity measure.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Hypertension	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Stroke	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Transient Ischaemic Attack (mini stroke)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dyslipidaemia/ Lipid disorder (e.g. high cholesterol)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Round one professional panel

Coronary artery disease (heart attack or angina)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Heart failure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Peripheral artery disease	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Arrhythmia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Heart valves problem	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q17: Please rate how important you think it is to include the listed haematological conditions in a multimorbidity measure.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Anaemia (including Iron deficiency anaemia, pernicious anaemia, sickle cell anaemia, aplastic anaemia)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Venous thrombotic disease	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q18: Please rate how important you think it is to include the listed neurological conditions in a multimorbidity measure.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Parkinson's disease	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Epilepsy (fits/ seizures)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chronic pain (including chronic low back pain fibromyalgia,	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Round one professional panel

trigeminal neuralgia and other chronic pain)						
Migraine or other regular headache	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Multiple sclerosis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Peripheral neuropathy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Paralysis/ Hemiplegia/ Paraplegia (not including those caused by stroke)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q19: Please rate how important you think it is to include the listed metabolic/endocrine/nutritional conditions in a multimorbidity measure.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Diabetes (any type)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Thyroid problems (including hypothyroidism and hyperthyroidism)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Malnutrition	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q20: Please rate how important you think it is to include the listed musculoskeletal conditions in a multimorbidity measure.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Osteoporosis (thinning of the bones)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Osteoarthritis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Connective tissue disease	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Gout	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Long-term musculoskeletal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Round one professional panel

problems due to injury (including hip fracture)						
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q21: Please rate how important you think it is to include the listed respiratory conditions in a multimorbidity measure.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Chronic obstructive pulmonary disease	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Asthma	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cystic fibrosis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chronic/Allergic rhinitis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q22: Please rate how important you think it is to include the listed gastrointestinal conditions in a multimorbidity measure.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Chronic liver disease (including liver cirrhosis, liver failure and chronic hepatitis)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Inflammatory bowel disease (including <i>ulcerative colitis</i> and <i>Crohn's disease</i>)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Irritable bowel syndrome	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Diverticular disease	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pancreatic disease	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Round one professional panel

Peptic ulcer (including gastric/ stomach ulcers and duodenal ulcers)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Gastroesophageal reflux (acid reflux and heartburn)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Gall bladder problems (including gallstones)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q23: Please rate how important you think it is to include the listed urogenital conditions in a multimorbidity measure.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Chronic kidney disease	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
End-stage kidney disease (including kidney dialysis and transplant)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Kidney or bladder stones	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chronic urinary tract infections (including chronic bladder infections)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Urinary incontinence	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Uterus (womb) problems (including prolapse and fibroid)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Polycystic ovary syndrome	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Prostatic hypertrophy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Endometriosis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Infertility	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sexual dysfunction	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Round one professional panel

Q24: Please rate how important you think it is to include the listed chronic infectious conditions in a multimorbidity measure.

Condition	Exclude (not important)	Expect to usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Expect to usually include (unless a good reason to exclude in particular context)	Always include (extremely important)
HIV/AIDS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tuberculosis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q25: Please rate how important you think it is to include the listed skin conditions in a multimorbidity measure.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Psoriasis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Eczema	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chronic urticarial (chronic hives)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q26: Please rate how important you think it is to include the listed ENT, eye & oral conditions in a multimorbidity measure.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Hearing impairment or deafness	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Round one professional panel

Meniere's disease	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ear, nose, throat disease (including chronic sinusitis)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Vision impairment or blindness	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cataract	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Glaucoma	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Edentulism (having no teeth)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chronic gum disease	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q27: Please rate how important you think it is to include the listed congenital conditions in a multimorbidity measure.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Congenital disease (conditions that babies are born with, including congenital heart disease, genital anomaly)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q28: Please rate how important you think it is to include the listed risk factors/health behaviour/symptoms/syndromes in a multimorbidity measure.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Obesity (body mass index ≥ 30)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Smoking	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Round one professional panel

High blood pressure (untreated)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
High cholesterol (untreated)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sedentary lifestyle	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Physical disability	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dizziness (without a specific diagnosis)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chronic cough (without a specific diagnosis)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Post-sepsis syndrome	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Side effects of medications	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Treatment burden (the sum of all the hassles of taking medicines or attending appointments)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Social deprivation and poverty	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Weighting

Most researchers define multimorbidity by just counting how many conditions someone has (a “simple count” of conditions). Others use a “weighted” count to estimate multimorbidity burden and predict outcomes (e.g. death, hospitalisation, quality of life). For example, a simple count would say that hay fever + heart attack + back pain = 3 conditions. A weighted measure that gave more weight to risk of death might count hay fever = 0.5, high blood pressure = 3, back pain = 0.5, total score = 4 *weighted for risk of death*. However a weighted measure that gave more weight to quality of life might count hay fever = 1, high blood pressure = 0.5, and back pain = 2, total score = 3.5 *weighted for quality of life*.

In practice, weighted counts have been commonly used for predicting outcomes despite the fact that a simple count is the most common type of measures used for various purposes.

Q29: Please describe what type of measures you would use to measure multimorbidity and for what purposes.

- Weighted morbidity measures for the purpose of ____ (please describe):

Round one professional panel

- A simple count of conditions for the purpose of ___ (please describe):

- Other (please describe)

Q30: There is much debate over whether ‘weighted morbidity measures’ or ‘simple counts of conditions’ are better at predicting outcomes (e.g. mortality, healthcare utilisation etc..). Please describe what type of measures you would use to understand the impact of multimorbidity on outcomes.

- Simple counts of conditions
 Weighted morbidity measures
 Other (please specify)

Note: A key issue for weighted measures, is which outcomes to focus on. Researchers vary in which outcomes they think are most important. Professionals and patients also vary in which outcomes they think are important.

Q31: Please rate the degree to which the outcomes listed below are important to be weighted against.

Outcome	Not at all important	Slightly important	Important	Fairly important	Very important	No opinion
Mortality	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Healthcare use (e.g. number of emergency admissions to hospital; outpatient appointments)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Health-related quality of life	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Physical disability	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Frailty (general physical and/or	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Round one professional panel

mental weakness and vulnerability)						
Mental health	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Treatment burden (the sum of all the hassles of taking medicines or attending appointments)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Healthcare costs (how much treatment and care for each individual costs)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Self-perceived health status	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify) <input type="text"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q32: What weighting methods would you use in a multimorbidity measure?

- Use existing weighted indices.
- Empirically derive weights based on the individual impact of diseases on an outcome (e.g. use regression models to calculate weights)
- Set rules based on level of severity to grade each condition/disease category (e.g. rate each condition/category based on the rules on if having— presence of a condition: 1 point; treatment: additional 1 point; functional limitation: additional 1 point)
- No opinion
- Other

Round two professional panel

Round-two survey in the professional panel

Socio-demographic information

Q1: Please describe the country where you are currently living or working.

Q2: Please check the category that best describes the type of work you do most of the time (choose one).

- Research
- Public policy or other public sector work
- Clinical Practice
- Teaching
- Other

Q3: Please check the category that best describes the setting in which you work most of the time (choose one).

- Government
- Academia
- Hospital
- Primary care/General practice
- Social care sector
- Other

Q4: Do you have multiple chronic conditions?

- Yes
- No

Q5: Do you have family or friends who have multiple chronic conditions?

- Yes
- No

Q6: To understand multimorbidity, what population would you be more interested in (please choose all that apply)?

- General population

Round two professional panel

- Older people
- Middle-aged and older
- Socially-deprived population (including homeless people or drug users)
- Women
- Men
- Children
- Ethnic minority groups or indigenous populations
- People with disabilities
- Other

Operational definition of multimorbidity

Note inserted: In round one, there was no consensus on the number of conditions someone have to have in order to have multimorbidity. There were also numerous free text comments, including some which suggested that there should be distinctions made between ‘simple’ and ‘complex’ multimorbidity. In this section, we are therefore asking you the round 1 question about ‘number of conditions’ and some new questions about ‘simple’ and ‘complex’ multimorbidity.

Q7-1: How many long-term conditions do you think someone has to have in order to have multimorbidity? Please choose one.*

- 2 or more long-term conditions (chosen by 68.5% of panellists in round one)
- 3 or more long-term conditions (chosen by 28.9% of panellists in round one)
- 4 or more long-term conditions (chosen by 1.3% of panellists in round one)
- 5 or more long-term conditions (chosen by 0.7% of panellists in round one)
- Other, X or more long-term conditions

Q7-2-1: Some studies differentiated “complex multimorbidity” from “basic multimorbidity”, and used “complex multimorbidity” to identify people with higher care needs (e.g. older people). Do you agree that defining complex multimorbidity *in addition to a core definition of simple multimorbidity* is useful?

Strongly disagree/Disagree/Neither disagree nor agree/Agree/Strongly agree/Don’t know

Q7-2-2: Irrespective of whether you agree, how would you define “complex multimorbidity” based on number of conditions. (please choose one)

- 3+ conditions irrespective of how many body systems

Round two professional panel

- 3+ conditions from 3+ body systems
- 4+ conditions irrespective of how many body systems
- 4+ conditions from 4+ body systems
- 5+ conditions irrespective of how many body systems
- 5+ conditions from 5+ body systems
- Other ____+ conditions from ____+ body systems

Q7-2-3: Sub-question: In addition to the above option you choose, please describe if there are other statements that, you think, should be included in the definition of “complex multimorbidity”.

- Any combination of 2+ conditions which includes both physical and mental health conditions
- Other

Q8:

Note inserted: Based on the results from round one, only medical diagnoses reached $\geq 70\%$ consensus. Having read a summary of the results from round one, we would like you to answer the question again.

How would you define "condition" for the concept of multimorbidity? (please choose all that apply)

- Formal medical diagnoses (e.g. coronary heart disease, alcohol dependence)
- Clinical risk factors (e.g. obesity, high cholesterol)
- Symptoms that are not formal medical diagnoses (e.g. dizziness or fatigue)
- Health behaviours (e.g. smoking or exercise level)
- Health impact (e.g. disability or frailty)
- Social deprivation and poverty
- Consequences of treatment and care (e.g. side effects of medications or the overall burden of treatment)
- Environmental factors (e.g. polluted areas or busy roads)
- Other (please specify)

Q9-1: Definition of chronicity or long-term

Note inserted: None of the statements in Q9-1 reached $\geq 70\%$ consensus in round one. Most professionals defined long-term conditions as conditions that last for 6 months or more, whereas more than 70% of members of the public considered conditions lasting for 12

Round two professional panel

months or more as “long term”. Having read a summary of responses, please answer Q9-1 again so that we could know if your responses have changed between two rounds.

How long does a condition have to be to count as long-term? Please choose one.*

- Conditions lasting for three months or more
- Conditions lasting for six months or more
- Conditions lasting for twelve months or more
- Conditions lasting for eighteen months or more

Q9-2: Recurrence or remission

Note inserted: In round one, more than 70% of panellists strongly agreed that conditions can be included in a multimorbidity measure if they are permanent in their effects, or are currently active or currently treated. There was no consensus for categories related to remitting/relapsing conditions. The first question below was asked in round 1 (reworded in response to feedback), and the second is based on suggestions in feedback. Please rate the degree to which you agree or disagree with the following statements.

Statement	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Don't know
Include conditions which may recur	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Include remitting-relapsing conditions which have happened during the last five years	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other <div style="border: 1px solid black; height: 40px; width: 100%;"></div>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q9-3: Treatment, care or surveillance

Note inserted: Some panellists suggested that some conditions that do not necessarily require treatment or care should be included because of significant impact on the individual. For example, people with arthritis might not be receiving current treatment/care but their quality of life could still be significantly affected. In addition, around 53.7% of panellists would include clinical risk factors many of which do not require treatment. Due to widely divergent views on Q9-3, we would like to ask you to rate the degree to which you agree or disagree with each of the following statements.

Round two professional panel

Statement	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Don't know
Include conditions which usually require current treatment, care or therapy (e.g. hypertension, diabetes, schizophrenia)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Include conditions which usually require treatment, care or therapy at some point in the future even if not currently treated	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Include conditions which usually require surveillance (e.g. treated cancer or depression)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other <div style="border: 1px solid black; height: 40px; width: 100%; margin-top: 5px;"></div>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q9-4: Principles of selecting conditions based on impacts

Note inserted: In the professional version of survey, more than 70% of panellists strongly agreed that quality of life, physical disability and mental health should be taken into account when selecting conditions, and we are not asking you about these again. On the other hand, only risk of death was strongly agreed by more than 70% of members of the public.

Please rate the degree to which you agree or disagree with each of the following statements

Statement	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
Include conditions which significantly increase risk of death	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Include conditions which cause frailty (general physical and/or mental weakness and vulnerability)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Include conditions which significantly worsen self-perceived health status	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Include conditions which significantly increase treatment burden	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Round two professional panel

Include conditions which could be impacted by or impact social deprivation and poverty	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Impact: Other <div style="border: 1px solid black; height: 40px; width: 100%;"></div>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q10: Categorisation of conditions/counting methods

Note inserted: In round 1, we asked about how to account for complications of conditions and there was consensus (>80%) that all conditions that are currently active should be counted even if some are complications of other conditions. We are not asking this again. There was no consensus about whether to count broader categories of conditions or individual conditions. There was considerable free-text comment, including about the challenges of identifying specific conditions in electronic medical records. We have therefore revised the options for this question.

Please choose one option that you would prefer to use.

- Broad disease category based on body systems (e.g. cardiovascular disease, mental health problems, skin conditions).
- Individual conditions (e.g. myocardial infarction, angina, hypertension, depression, schizophrenia, eczema, psoriasis).
- Grouping together similar conditions that are in the same body system and treated similarly (e.g. angina and myocardial infarction, or aplastic anaemia and sickle cell anaemia)
- Other. Please explain:
- Don't know

Q11: Data source

Multimorbidity has been measured by existing studies using either self-report or databases (e.g. medical records and administrative databases). Please rate the degree to which you agree or disagree the following statements.

Round two professional panel

Statement	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
Conditions included for multimorbidity measurement should be the same in both self-report and databases (e.g. identifying a core set of conditions or condition framework).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Conditions included in multimorbidity measures should differ between self-report and databases	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

What conditions should be included?

Q12: System/disease domain

Note inserted: There was consensus that six body systems should always be included in a multimorbidity measure (mental health, cancer, cardiovascular, neurological, metabolic/ endocrine, and musculoskeletal). We are not asking about these again in round 2. Please rate the degree to which the following systems/disease domains, you think, are important.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Respiratory disease	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Haematological disease	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Digestive	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Urogenital	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Skin	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ear, Nose and Throat (ENT)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Oral	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ophthalmology	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chronic infections	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Note inserted: The number of conditions included in multimorbidity measurement varies substantially, which has led to the heterogeneity of multimorbidity prevalence. In the following section, we would like to ask you to rate a number of conditions that have been used for multimorbidity measurement, with the aim to identify a set of core conditions and conditions likely included for particular populations or regions.

Q13: Mental health

Note inserted: There was consensus that dementia and schizophrenia should always be included in multimorbidity measurement and we are not asking about these again. Please rate

Round two professional panel

the following mental health conditions again which allows us to see if your responses have changed between rounds. If you are not sure, please tick 'Don't know'.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Anxiety	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Depression	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Substance misuse (including alcohol and drug dependence)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nicotine dependence	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Post-traumatic stress disorder (PTSD)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bipolar disorder	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chronic insomnia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dissociative or personality disorders	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Eating disorders (including bulimia or anorexia)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Learning disability	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Autism	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Obsessive compulsive disorder (OCD)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Somatoform disorders (psychological disorder where a person experiences physical symptoms that cannot be explained by medical doctors)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Attention deficit hyperactivity disorder (ADHD)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Round two professional panel

Q14: Note inserted: There was consensus that solid organ cancers, haematological cancers and metastatic cancers should always be included in multimorbidity measurement and we are not asking about these again. Please rate the following cancer conditions again which allows us to see if your responses have changed between rounds. If you are not sure, please tick 'Don't know'.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Melanoma	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Non-melanoma skin cancer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Benign cancers (excluding benign skin lumps and bumps)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q15: Based on the panellists' responses, we have revised the options and would like to ask you to choose the method you would recommend (there were other comments for this question relating to recurrence and remission, but Q9 that you have already answered covers these).

- Count all cancers as one
- Count individual cancers separately irrespective of which systems they affect (e.g. count gastric cancer and liver cancer separately).
- Count individual cancers separately if they affect different systems (e.g. pancreatic cancer and lung cancer).
- Other

Q16: Note inserted: There was consensus that stroke, coronary heart disease, heart failure and peripheral artery disease should always be included in multimorbidity measurement and we are not asking about these again. Please rate the following cardiovascular conditions again which allows us to see if your responses have changed between rounds. If you are not sure, please tick 'Don't know'.

Condition	Exclude (not important)	Usually exclude (unless a good reason	Could include or exclude	Usually include (unless a good reason	Always include (extremely important)	Don't know

Round two professional panel

		to include in a particular context)		to exclude in particular context)		
Hypertension (treated)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
High blood pressure (untreated)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Transient Ischaemic Attack (mini stroke)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dyslipidaemia/ Lipid disorder (treated)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
High cholesterol (untreated)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Arrhythmia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Heart valve problems (Including Rheumatic heart disease)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q17: Haematological conditions

Consistent with the results in Q12 that less than 70% of panellists would always include haematological system in multimorbidity measurement, none of the individual haematological conditions was rated by more than 70% of panellists as 'always include'.

Please rate the following haematological conditions as to whether they should be included or excluded. If you are not sure, please tick 'Don't know'.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Anaemia (including pernicious anaemia, sickle cell anaemia, aplastic anaemia)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Venous thrombotic disease	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Round two professional panel

Q18: Note inserted: There was consensus that Parkinson's disease, epilepsy, multiple sclerosis, and paralysis/ hemiplegia/ paraplegia (not including those caused by stroke) should always be included in multimorbidity measurement and we are not asking about these again. Please rate the following neurological conditions again which allows us to see if your responses have changed between rounds. If you are not sure, please tick 'Don't know'.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Migraine or other regular headache	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Peripheral neuropathy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q19: Note inserted: There was consensus that diabetes (any types) should always be included in multimorbidity measurement and we are not asking about these again. Please rate the following metabolic and endocrine conditions again which allows us to see if your responses have changed between rounds. If you are not sure, please tick 'Don't know'.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Thyroid problems (including hypothyroidism and hyperthyroidism)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hyper and hypoparathyroidism	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Malnutrition (including protein energy deficiency)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Addison's disease	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q20: Note inserted: There was consensus that connective tissue disease (including rheumatoid arthritis or lupus) should always be included in multimorbidity measurement and we are not asking about these again. Please rate the following musculoskeletal conditions again which allows us to see if your responses have changed between rounds. If you are not sure, please tick 'Don't know'.

Round two professional panel

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Osteoporosis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Osteoarthritis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Gout	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Long-term musculoskeletal problems due to injury (including low back pain, complex regional pain syndrome, neuropraxia)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q21: Note inserted: There was consensus that COPD, asthma and cystic fibrosis should always be included in multimorbidity measurement and we are not asking about these again. Please rate the following respiratory conditions again which allows us to see if your responses have changed between rounds.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Chronic/Allergic rhinitis (Nose becomes inflamed by allergens, such as dust, pollen, animal fur)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sleep apnoea	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bronchiectasis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Post-acute COVID-19	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q22: Note inserted: There was consensus that chronic liver disease and inflammatory bowel disease should always be included in multimorbidity measurement and we are not asking about these again. Please rate the following digestive conditions again which allows us to see if your responses have changed between rounds.

Round two professional panel

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Irritable bowel syndrome	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Diverticulosis (small pockets in the lining of the intestine)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pancreatic disease	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Peptic ulcer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Gastroesophageal reflux	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Gall bladder problems (including gallstones)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q23: Note inserted: There was consensus that chronic kidney disease and end-stage kidney disease should always be included in multimorbidity measurement and we are not asking about these again. Please rate the following urogenital conditions again which allows us to see if your responses have changed between rounds.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Kidney or bladder stones	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chronic urinary tract infections (including chronic bladder infections)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Urinary incontinence (loss of control over passing urine)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Uterus (womb) problems (including prolapse and fibroid)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Polycystic ovary syndrome	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Round two professional panel

Prostatic hypertrophy (large prostate glands)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Endometriosis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Infertility	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sexual dysfunction	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q24: Note inserted: There was consensus that HIV/AIDS should always be included in multimorbidity measurement and we are not asking about these again. Please rate the following chronic infection conditions again which allows us to see if your responses have changed between rounds.

Condition	Exclude (not important)	Expect to usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Expect to usually include (unless a good reason to exclude in particular context)	Always include (extremely important)
Tuberculosis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lyme disease	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q25: Note inserted: None of the individual skin conditions was rated by more than 70% of panellists as 'always include'. Please rate the following skin conditions as to whether they should be included or excluded. If you are not sure, please tick 'Don't know'.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Psoriasis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Eczema	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chronic urticarial (chronic hives)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Round two professional panel

Q26: Note inserted: None of the individual ENT, eye and oral conditions was rated by more than 70% of panellists as 'always include'. Please rate the following ENT, eye and oral conditions as to whether they should be included or excluded. If you are not sure, please tick 'Don't know'.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Hearing impairment or Deafness (that cannot be easily corrected with hearing aids)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Meniere's disease (an ear condition that causes sudden attacks of vertigo)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ear, nose, throat disease (including chronic sinusitis)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Vision impairment or Blindness (that cannot be easily corrected with glasses)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cataract	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Glaucoma	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Edentulism (having no teeth)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chronic gum disease	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q27: Note inserted: Congenital condition was rated by less than 70% of panellists as 'always include'. Please rate the following congenital conditions as to whether they should be included or excluded. If you are not sure, please tick 'Don't know'.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Congenital disease (conditions that	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Round two professional panel

babies are born with, including congenial heart disease, chromosomal aberrations)						
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q28: Note inserted: The following risk factors/symptoms have been included in multimorbidity measures by existing studies, but none of them was rated by more than 70% of panellists as 'always include'. Some suggested that those should be measured separately rather than as part of a multimorbidity measure.

Having read a summary of the results from round one, please rate the following statement as to whether this type of conditions should be included or excluded again. If you are not sure, please tick 'Don't know'.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Obesity (body mass index ≥ 30)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Smoking	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sedentary lifestyle	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Physical disability	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dizziness or vertigo (without a specific diagnosis)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chronic cough (without a specific diagnosis)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Post-sepsis syndrome	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Side effects of medications	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Treatment burden (the sum of all the hassles of taking medicines or attending appointments)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Social deprivation and poverty	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Round two professional panel

Weighting

Q29: Weighted count versus simple count

For the following purposes, please choose which type of multimorbidity measure you would prefer to use.

Statement	Simple counts	Weighted measures	Both types of measures	Don't know
For the purpose of estimating the prevalence of multimorbidity, I prefer to use _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
For the purpose of identifying and counting disease clusters, I prefer to use _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
For the purpose of exploring/identifying predictors of multimorbidity (e.g. socio-demographic information), I prefer to use _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
For the purpose of exploring trajectories of multimorbidity (e.g. trends of multimorbidity prevalence and the number of conditions an individual has had), I prefer to use _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
For the purpose of assessing the severity of disease burden, I prefer to use _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
For the purpose of risk adjustment or outcome prediction, I prefer to use _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q31: Outcomes

Note inserted: In round one, you were invited to rate which outcomes are important to be weighted against. Mortality and quality of life were considered very important in round one. However, adapting a measure that fits all purposes (predicting all outcomes) may not be feasible. It has also been suggested that healthcare use and costs should be separated from patient-centred outcomes, and distinct measures for these two outcomes are necessary. Another discrepancy identified from round one is that some preferred to use simple counts for predicting outcomes, but others preferred to use weighted measures. Instead of rating levels of importance, we would like to ask you to choose which type of multimorbidity measures you would prefer to use for predicting the following outcomes.

Outcome	Simple counts	Weighted measures	Both types of measures	No opinion/don't know

Round two professional panel

Mortality	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Healthcare use (e.g. number of emergency admissions to hospital; outpatient appointments)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Health-related quality of life	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Physical disability	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Frailty (general physical and/or mental weakness and vulnerability)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Treatment burden (the sum of all the hassles of taking medicines or attending appointments)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Healthcare costs (how much treatment and care for each individual costs)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Self-perceived health status	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify) <input type="text"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q32: Having reflected results from round one and your responses to the questions so far, please choose which weighting method you would prefer to use in a multimorbidity measure (which allows to see if the responses have changed over time).

- Use existing weighted indices.
- Empirically derive weights based on the individual impact of diseases on an outcome (e.g. use regression models to calculate weights)
- Apply weights by defining specific criteria to each condition/disease category (e.g. set rules based on level of severity to grade each condition/disease category)
- No opinion
- Other

Round three professional panel

Round-three survey in the professional panel

Socio-demographic information

Q1: Please describe the country where you are currently living or working.

Q2: Please check the category that best describes the type of work you do most of the time (choose one).

- Research
- Public policy or other public sector work
- Clinical Practice
- Teaching
- Other

Q3: Please check the category that best describes the setting in which you work most of the time (choose one).

- Government
- Academia
- Hospital
- Primary care/General practice
- Social care sector
- Other

Q4: Do you have multiple chronic conditions?

- Yes
- No

Q5: Do you have family or friends who have multiple chronic conditions?

- Yes
- No

Round three professional panel

Q6: To understand multimorbidity, what population would you be more interested in (please choose all that apply)?

- General population
- Older people
- Middle-aged and older
- Socially-deprived population (including homeless people or drug users)
- Women
- Men
- Children
- Ethnic minority groups or indigenous populations
- People with disabilities
- Other

What is multimorbidity?

Note: In both the professional panel and public panel, there was consensus ($\geq 70\%$) that someone had to have two or more chronic conditions in order to have multimorbidity. In addition, more than 70% of panellists also strongly agreed that conditions included in multimorbidity measurement should have the following characteristics: 1) permanent in their effects, 2) currently active, 3) lasting six months or longer, 4) requiring current treatment, care or therapy. However, less than 70% of professional panellists agreed that it was useful to conceptualise complex multimorbidity in addition to basic multimorbidity. It is therefore not entirely clear whether and how we should define complex multimorbidity. Please answer the following questions again.

Q7: Please rate the degree to which you agree or disagree with the following statement again so we can see if there is a change between round 2 and round 3.

	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree	Don't know
Do you agree that defining complex multimorbidity in addition to a core definition of simple multimorbidity is useful?						

Q8: Irrespective of whether you agree that complex morbidity is a useful concept, we would still like to invite you to define “complex multimorbidity” based on number of conditions. (please choose one)

- 3+ conditions irrespective of how many body systems

Round three professional panel

- 3+ conditions from 2+ body systems
- 3+ conditions from 3+ body systems
- 4+ conditions irrespective of how many body systems
- No opinion
- Other

Note: In the professional and public panel, there was no consensus on what additional patterns of conditions should be included in the definition of complex multimorbidity. We have added a few more statements based on panellists' comments.

Q8-1: Sub-question: Please choose the following statements that, you think, should be included in the definition of "complex multimorbidity".

- No other patterns that I would like to include
- Any combination of two or more conditions which includes both physical and mental health conditions
- Any combination of two or more conditions with significantly physical functional limitation
- Difficulty in managing illnesses due to social factors/social determinants of health (e.g. poverty).
- Any combination of two or more conditions and frailty
- Other

Q9. Recurrence or remission

Note inserted: More than 70% of panellists in the professional and public panels agreed that conditions that may recur or remit could be included in the measurement of multimorbidity. However, it remains uncertain as to how this type of conditions should be defined in the concept of multimorbidity. Some suggested suggested take 'treatment' into account when deciding which remitting-relapsing conditions to include, and thus we have revised the statements.

Please rate the degree to which you agree or disagree with the following statements.

Statement	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree	Don't know
Include remitting-relapsing conditions that require ongoing treatment/therapy/care (e.g. depression, epilepsy)—newly added	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Include remitting-relapsing conditions which have relapsed during the last five years	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Round three professional panel

Q10: Treatment, care or surveillance

Note inserted: More than 70% of panellists strongly agreed to include conditions that require current treatment, care, or therapy, and this question will not be asked again in round three. Please rate the degree to which you agree or disagree with the following statements.

Statement	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree	Don't know
Include conditions which usually require treatment, care or therapy 'at some point in the future' even if not currently treated (one panellist suggested to conceptualise this as 'current risk to future health outcomes')	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Include conditions which usually require surveillance (one panellist suggested to conceptualise this as 'current health needs or complexity of providing care')	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q11: Categorisation of conditions/counting methods

Please choose one option that you would prefer to use.

- Broad disease category based on body and mind system (e.g. cardiovascular disease, mental health problems, skin conditions).
- Individual conditions (e.g. TIA (mini stroke) and stroke are counted separately).
- Grouping together similar conditions that are in the same category and treated similarly (e.g. group together 'Angina and Myocardial Infarction' or 'Aplastic anaemia and Sickle cell anaemia')
- Other. Please explain:

- Don't know

Q12: Data source

Please rate the following statement again.

Round three professional panel

Statement	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree	Don't know
Conditions included for multimorbidity measurement should be the same/similar in both self-report and databases (e.g. identifying a core set of conditions or condition framework).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other comments	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

What conditions should be included?

Q13: Note inserted: In cancer conditions, we added two new statements based on panellists' comments. Please rate the following cancer conditions as to whether they should be included or excluded. If you are not sure, please tick 'Don't know'.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Treated cancer that requires surveillance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Treated cancer that did not recur over the past 5 years and does not require surveillance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Benign cerebral tumours (brain tumours that can cause functional limitations)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q14: Please choose the categorisation method you would prefer again.

- Count all primary cancers as one
- Count individual primary cancers separately irrespective of which systems they affect (e.g. count gastric cancer and liver cancer separately).
- Count individual primary cancers separately only if they affect different systems (e.g. pancreatic cancer and lung cancer).
- Other

Round three professional panel

Q15: Note inserted: Conditions relevant to chronic pain and consequences of injury were revised based on panellists' comments. Please rate the following conditions as to whether they should be included or excluded. If you are not sure, please tick 'Don't know'.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Chronic or recurrent low back pain	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chronic primary pain (defined as pain with no clear underlying condition but significant impact on the person)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Long-term musculoskeletal problems due to injury (e.g. consequences of accidental injuries)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q16: Conditions newly added in round two

Please rate again the following conditions so we can see if your responses have changed between round two and round three

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Addison's disease	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bronchiectasis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Post-acute covid 19 ("long COVID")	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chronic Lyme disease	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Aneurysm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Type of measures to use for a particular purpose

Q17: Which type of measures you would use for a particular purpose? (Please tick one or both - if you choose both a simple count and weighted measures, we would count either as being acceptable/usable for that purpose)

Round three professional panel

Type of measures	Estimating the prevalence of multimorbidity	Identifying and counting disease clusters	Exploring trajectories of multimorbidity	Exploring/identifying predictors of multimorbidity	Assessing the severity of disease burden	Risk adjustment or outcome prediction
Prefer simple count of conditions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Prefer weighted measure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Either is acceptable/useable	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Don't know	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q18: Which type of measures you would use for prediction of a particular outcome? (Please tick one or both - if you choose both a simple count and weighted measures, we would count it as either being acceptable/usable for that purpose)

Type of measures	Risk of death	Health - related quality of life	Physical disability	Frailty	Treatment burden	Healthcare use	Healthcare costs	Self-perceived health	Mental health
Prefer simple count of conditions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Prefer weighted measure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Either is acceptable / useable	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Don't know	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Round one public panel

Round-one survey in the public panel

Socio-demographic information

Q1: Please describe the country where you are currently living.

Q2: What is your age?

- 18-34
- 35-54
- 55-64
- ≥ 65
- Prefer not to answer

Q3: What gender do you identify as?

- Female
- Male
- Other _____
- Prefer not to answer

Q4: We are seeking your views as a member of the public, but we know that some of you will have worked in healthcare or academia. Do you currently or did you previously work in academia, health and social care practice or healthcare policy?

- Yes
- No

Q5: Do you have multiple chronic conditions?

- Yes
- No

Q6: Do you have family or friends who have multiple chronic conditions?

- Yes
- No

What is multimorbidity?

Q7: Researchers have defined multimorbidity in many ways. Some define it as '2 or more long-term conditions', but others define it as '3 or more', '4 or more' or '5 or more' long-term conditions. How many long-term conditions do you think someone has to have in order to have multimorbidity? Please choose one.

Round one public panel

- 2 or more long-term conditions
- 3 or more long-term conditions
- 4 or more long-term conditions
- 5 or more long-term conditions
- Other, X or more long-term conditions (please only type a number in the box)

Q8: How would you define "condition" for the concept of multimorbidity? (please choose all that apply)

- Formal medical diagnoses (e.g. coronary heart disease, alcohol dependence)
- Clinical risk factors (e.g. obesity, high cholesterol)
- Symptoms that are not formal medical diagnoses (e.g. dizziness or fatigue)
- Health behaviours (e.g. smoking or exercise level)
- Health impact (e.g. disability or frailty)
- Social deprivation and poverty
- Consequences of treatment and care (e.g. side effects of medications or the overall burden of treatment)
- Other (please specify)

Q9: Researchers justify their choice of conditions in many different ways. Please answer the following questions on the principles for selection of chronic conditions in multimorbidity measures.

- 1) How long-term a condition is:
Researchers vary in what they mean by "long-term". How long does a condition have to be to count as long-term? Please choose one.

- Conditions lasting for three months or more
- Conditions lasting for six months or more
- Conditions lasting for twelve months or more
- Other, conditions lasting for X months or more (please only type a number for X in the box)

- 2) Whether a condition is currently active: Please rate the degree to which you agree or disagree with each of the following statements

Round one public panel

Statement	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree	Don't know
Include conditions which are permanent in their effects (e.g. Parkinson's disease)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Include conditions which are currently active or currently treated (e.g. asthma with intermittent wheeze; asthma using regular inhalers)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Include conditions which may recur but happen rarely (e.g. people with a history of asthma or depression with no current symptoms and not currently on treatment)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other <div style="border: 1px solid black; height: 40px; width: 100%;"></div>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3) Whether condition is treated in healthcare: Please rate the degree to which you agree or disagree with each of the following statements

Statement	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree	Don't know
Only include conditions which usually require formal treatment or care (e.g. hypertension, diabetes, schizophrenia)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other <div style="border: 1px solid black; height: 40px; width: 100%;"></div>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4) The impact of the condition on a range of outcomes: Please rate the degree to which you agree or disagree with each of the following statements

Statement	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	Don't know

Round one public panel

Include conditions which significantly increase risk of death	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Include conditions which significantly reduce quality of life	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Include conditions which cause significant physical disability	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Include conditions which cause frailty (general physical and/or mental weakness and vulnerability)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Include conditions which significantly worsen mental health	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Include conditions which significantly worsen how people perceive their general health	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other impact <div style="border: 1px solid black; height: 40px; width: 100%; margin-top: 5px;"></div>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q10: Researchers vary in how detailed their definitions of ‘condition’ are. For example, they might be very broad – one category for “lung disease”. Or they might be more detailed – separately count “asthma”, “chronic obstructive pulmonary disease” and so on. Please choose one option and explain your choice if you like.

- Broad disease category based on body and mind system (e.g. cardiovascular disease, mental health problems, skin conditions). Please explain:

- Individual conditions (e.g. coronary heart disease, hypertension, depression, schizophrenia, eczema, psoriasis). Please explain:

- Other. Please explain:

Round one public panel

Don't know

Q11: Some conditions included in multimorbidity measures are closely linked to each other. In particular, some conditions can be caused by other conditions. For example, heart attacks can lead to heart failure. Diabetes can lead to kidney failure. How do you think researchers should count conditions in this situation? Please choose one option and explain your choice if you like.

Count all of the conditions that are currently active. Please explain:

Only count the complications (e.g. if people with heart attack develop heart failure, we would count only heart failure). Please explain:

Count the primary health condition (e.g. if people with diabetes develop kidney failure, we would only count diabetes). Please explain:

Other. Please explain:

Don't know

What conditions should be included?

In our review of over 500 research studies, we identified all the conditions which researchers have counted when measuring multimorbidity. There is very large variation in which conditions researchers choose. Only seven conditions were counted by more than half of studies. Many conditions were rarely counted. We would like you to rate conditions that you think are more or less important to include in multimorbidity measures. There are now a set of questions organised by body system.

Q12: We are starting with body systems/disease domains. Please rate how important you think it is to include the following systems/domains in a multimorbidity measure.

Round one public panel

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Mental health	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cancer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cardiovascular	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Blood disease (which affects formation of blood cells and blood clots)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Neurological disease (which affects the nervous system)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Metabolic and Endocrine (which affects metabolic regulation)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Musculoskeletal (which affects joints, bones and muscles)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Digestive (which affects stomach, bowels, liver, pancreas and gallbladder)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Urogenital (which affects urinary and genital organs)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Skin	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ear, Nose and Throat (ENT)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Oral	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ophthalmology (which affects eyes)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chronic infections	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q13: Please rate how important you think it is to include the listed mental health conditions in a multimorbidity measure. If you are not sure, just tick 'Don't know'.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Anxiety	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Depression	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dementia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Schizophrenia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Round one public panel

Substance misuse (including alcohol and drug dependence)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nicotine dependence	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Post-traumatic stress disorder (PTSD)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bipolar disorder	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chronic insomnia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dissociative or personality disorders (altering to be a person with different personality and the alters are imaginary)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Eating disorders (including bulimia or anorexia)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Learning disability	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Autism	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Obsessive compulsive disorder (OCD)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Somatoform disorders (psychological disorder where a person experiences physical symptoms that cannot be explained by medical doctors)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Attention deficit hyperactivity disorder (ADHD)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q14: Please rate how important you think it is to include the listed cancers in a multimorbidity measure.

Condition	Exclude (not important)	Usually exclude (unless a	Could include or exclude	Usually include (unless a	Always include	Don't know
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Round one public panel

		good reason to include in a particular context)		good reason to exclude in particular context)	(extremely important)	
Solid organ cancers (e.g. lung, colon, prostate, breast etc)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Haematological cancers (cancer that affects blood, e.g. leukaemia, lymphoma, myeloma)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Melanoma (malignant skin cancer)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Non-melanoma skin cancer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Benign cancers (excluding benign skin lumps and bumps)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Metastatic cancers (which have spread to other parts of the body)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q15: For cancers, some researchers count every cancer a person has had. Others only count 'cancer' once even if someone has had more than one type of cancer. Which methods would you recommend. Please choose one:

- Count all cancers as one
 Count individual cancers separately.
 Other

Q16: Please rate how important you think it is to include the listed cardiovascular conditions in a multimorbidity measure.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know

Round one public panel

Hypertension	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Stroke	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Transient Ischaemic Attack (mini stroke)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lipid disorder (e.g. high cholesterol)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Coronary artery disease (heart attack or angina)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Heart failure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Peripheral artery disease (circulation problems in the legs)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Heart rhythm problem (irregular or very fast heart beats)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Heart valves problem (leaking or tight heart valves)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Aneurysm (a weakening or bulging of an artery wall)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q17: Please rate how important you think it is to include the listed haematological conditions in a multimorbidity measure.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Anaemia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Venous thrombotic disease (blood clots formed inside a blood vessel that can block circulation)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Round one public panel

Q18: Please rate how important you think it is to include the listed neurological conditions in a multimorbidity measure.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Parkinson's disease	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Epilepsy (fits/ seizures)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chronic pain (including chronic low back pain and other neurological pain)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Migraine or other regular headache	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Multiple sclerosis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Peripheral neuropathy (damage to the nerves going to legs or arms)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Paralysis/ Hemiplegia/ Paraplegia (not including those caused by stroke)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q19: Please rate how important you think it is to include the listed metabolic/endocrine/nutritional conditions in a multimorbidity measure.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Diabetes (any type)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Thyroid problems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Malnutrition	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q20: Please rate how important you think it is to include the listed musculoskeletal conditions in a multimorbidity measure.

Round one public panel

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Osteoporosis (thinning of the bones)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Osteoarthritis (wearing and tearing of joints that leads to inflammation and degeneration)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Connective tissue disease (autoimmune disease that can affect our bones, cartilages or joints, such as rheumatoid arthritis or lupus)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Gout (crystals that formed inside or around joints, causing pain)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Long-term musculoskeletal problems due to injury (including hip fracture)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q21: Please rate how important you think it is to include the listed respiratory conditions in a multimorbidity measure.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Chronic obstructive pulmonary disease (COPD – smoking related lung damage)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Asthma	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sleep apnoea (breathing)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Round one public panel

problems when asleep)						
Cystic fibrosis (inherited condition that damages lungs)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chronic/Allergic rhinitis (long-term nasal inflammation)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q22: Please rate how important you think it is to include the listed digestive conditions in a multimorbidity measure.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Chronic liver disease (including liver cirrhosis, liver failure and chronic hepatitis)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Inflammatory bowel disease (including ulcerative colitis and Crohn's disease)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Irritable bowel syndrome	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Diverticular disease (small pockets in the lining of the intestine)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pancreatic disease	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Peptic ulcer (including gastric/ stomach ulcers and duodenal ulcers)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Gastroesophageal reflux (acid reflux and heartburn)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Gall bladder problems (including gallstones)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Round one public panel

Q23: Please rate how important you think it is to include the listed urogenital conditions in a multimorbidity measure.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Chronic kidney disease	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
End-stage kidney disease (including kidney dialysis and transplant)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Kidney or bladder stones	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chronic urinary tract infections (including chronic bladder infections)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Urinary incontinence (loss of control over passing urine)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Uterus (womb) problems (including prolapse and fibroid)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Polycystic ovary syndrome	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Prostatic hypertrophy (large prostate glands)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Endometriosis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Infertility	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sexual dysfunction	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q24: Please rate how important you think it is to include the listed chronic infectious conditions in a multimorbidity measure.

Condition	Exclude (not important)	Expect to usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Expect to usually include (unless a good reason to exclude in particular context)	Always include (extremely important)

Round one public panel

HIV/AIDS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tuberculosis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q25: Please rate how important you think it is to include the listed skin conditions in a multimorbidity measure.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Psoriasis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Eczema	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chronic urticarial (chronic hives)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q26: Please rate how important you think it is to include the listed ENT, eye & oral conditions in a multimorbidity measure.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Hearing impairment or deafness	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Meniere's disease (an ear condition that causes sudden attacks of vertigo)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ear, nose, throat disease (including chronic sinusitis)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Vision impairment or blindness	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cataract	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Glaucoma	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Edentulism (having no teeth)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Round one public panel

Chronic gum disease	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q27: Please rate how important you think it is to include the listed congenital conditions in a multimorbidity measure.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Congenital disease (conditions that babies are born with, including congenial heart disease, genital anomaly)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q28: Please rate how important you think it is to include the listed risk factors/health behaviour/symptoms/syndromes in a multimorbidity measure.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Obesity (body mass index ≥ 30)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Smoking	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
High blood pressure (untreated)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
High cholesterol (untreated)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sedentary lifestyle (spending most of the day sitting)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Physical disability	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dizziness (without a specific diagnosis)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Round one public panel

Chronic cough (without a specific diagnosis)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Post-sepsis syndrome	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Side effects of medications	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Treatment burden (the sum of all the hassles of taking medicines or attending appointments)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Social deprivation and poverty	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Weighting

Q29: Most researchers define multimorbidity by just counting how many conditions someone has (a “simple count” of conditions). Others use a “weighted” count to estimate multimorbidity burden and predict outcomes (e.g. death, hospitalisation, quality of life). For example, a simple count would say that hay fever + heart attack + back pain = 3 conditions. A weighted measure that gave more weight to risk of death might count hay fever = 0.5, high blood pressure = 3, back pain = 0.5, total score = 4 *weighted for risk of death*. However a weighted measure that gave more weight to quality of life might count hay fever = 1, high blood pressure = 0.5, and back pain = 2, total score = 3.5 *weighted for quality of life*. In theory, weighted scores are better than simple counts at predicting if someone is going to have the outcome focused on.

A key issue for weighted measures, is which outcomes to focus on. Researchers vary in which outcomes they think are most important. Professionals and patients also vary in which outcomes they think are important.

We would like to know which outcomes you think are most important.

Outcome	Not at all important	Slightly important	Important	Sufficiently important	Very important	No opinion
Death	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Healthcare use (e.g. number of emergency admissions to hospital; outpatient appointments)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Quality of life	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Physical disability	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Frailty (general physical and/or mental weakness and vulnerability)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Round one public panel

Mental health	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Treatment burden (the sum of all the hassles of taking medicines or attending appointments)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Healthcare costs (how much treatment and care for each individual costs)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
How people perceive their general health overall (e.g. whether it is excellent, very good, fair, poor, very poor)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify) _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify) _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Round two public panel

Round-two survey in the public panel

Socio-demographic information

Q1: Please describe the country where you are currently living.

Q2: What is your age?

- 18-34
- 35-54
- 55-64
- ≥ 65
- Prefer not to answer

Q3: What gender do you identify as?

- Female
- Male
- Other _____
- Prefer not to answer

Q4: We are seeking your views as a member of the public, but we know that some of you will have worked in healthcare or academia. Do you currently or did you previously work in academia, health and social care practice or healthcare policy?

- Yes
- No

Q5: Do you have multiple chronic conditions?

- Yes
- No

Q6: Do you have family or friends who have multiple chronic conditions?

- Yes
- No

What is multimorbidity?

Note inserted: In round one, more than 80% of panellists defined multimorbidity as the co-occurrence of two or more long-term conditions. This question has been agreed by more than 70% of panellists and thus will not be asked again in round two.

Round two public panel

There were also numerous free text comments, including some which suggested that there should be distinctions made between ‘simple’ and ‘complex’ multimorbidity. In this section, we are therefore asking you some new questions about ‘simple’ and ‘complex’ multimorbidity.

Q7-1: Do you agree that defining complex multimorbidity *in addition to a core definition of simple multimorbidity* is useful?

Strongly disagree/Disagree/Neither disagree nor agree/Agree/Strongly agree/Don’t know

Q7-2: Irrespective of whether you agree, how would you define “complex multimorbidity” based on number of conditions. (please choose one)

- 3+ conditions irrespective of how many body systems
- 3+ conditions from 3+ body systems
- 4+ conditions irrespective of how many body systems
- 4+ conditions from 4+ body systems
- 5+ conditions irrespective of how many body systems
- 5+ conditions from 5+ body systems
- Other ___+ conditions from ___+ body systems

Q7-3: Sub-question: In addition to the above option you choose, please describe if there are other statements that, you think, should be included in the definition of “complex multimorbidity”.

- Any combination of 2+ conditions which includes both physical and mental health conditions
- Other

Q8: Defining ‘condition’ for multimorbidity measurement

Note inserted: Based on the results from round one, only medical diagnoses reached $\geq 70\%$ consensus. Having read a summary of the results from round one, we would like you to answer the question again.

How would you define "condition" for the concept of multimorbidity? (please choose all that apply)

- Formal medical diagnoses (e.g. coronary heart disease, alcohol dependence)
- Clinical risk factors (e.g. obesity, high cholesterol)
- Symptoms that are not formal medical diagnoses (e.g. dizziness or fatigue)
- Health behaviours (e.g. smoking or exercise level)

Round two public panel

- Health impact (e.g. disability or frailty)
- Social deprivation and poverty
- Consequences of treatment and care (e.g. side effects of medications or the overall burden of treatment)
- Other (please specify)

Q9: Recurrence or remission

Note-inserted: In round one, more than 70% of members of the public defined long-term conditions as conditions that last for 6 months or more, and strongly agreed that conditions can be included in a multimorbidity measure if they are permanent in their effects. There was no consensus for categories related to active conditions and remitting/relapsing conditions. The first two questions below were asked in round 1 (reworded in response to feedback), and the third is based on suggestions in feedback. Please rate the degree to which you agree or disagree with the following statements.

Statement	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Don't know
Include conditions which are currently active	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Include conditions which may recur	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Include remitting-relapsing conditions which have happened during the last five years	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q10: Treatment, care or surveillance

Note inserted: Some panellists suggested that some conditions that do not necessarily require treatment or care should be included because of significant impact on the individual. For example, people with arthritis might not be receiving current treatment/care but their quality of life could still be significantly affected. In addition, around 60% of panellists would

Round two public panel

include clinical risk factors many of which do not require treatment. Due to widely divergent views on Q10, we would like to ask you to rate the degree to which you agree or disagree with each of the following statements.

Statement	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Don't know
Include conditions which usually require current treatment, care or therapy (e.g. hypertension, diabetes, schizophrenia), diabetes, schizophrenia)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Include conditions which usually require treatment, care or therapy at some point in the future even if not currently treated	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Include conditions which usually require surveillance (e.g. treated cancer or depression)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other <div style="border: 1px solid black; height: 40px; width: 100%; margin-top: 5px;"></div>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q11: Principles of selecting conditions based on impacts

Note inserted: In the public version of survey, more than 70% of panellists strongly agreed that death should be taken into account when selecting conditions, and we are not asking you about this again. On the other hand, quality of life, physical disability and mental health were strongly agreed by more than 70% of professionals.

In addition, social deprivation factor is listed here to explore your views on whether it should be one of the determinants of condition selection for multimorbidity measurement. In other parts of the survey, a third of panellists voted to exclude social deprivation as a "condition" but there was considerable comment about its importance, including that it could be taken into account when selecting conditions for multimorbidity measurement.

Please rate the degree to which you agree or disagree with each of the following statements

Statement	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Don't know
Include conditions which significantly reduce quality of life	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Round two public panel

Include conditions which cause significant physical disability	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Include conditions which cause frailty (general physical and/or mental weakness and vulnerability)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Include conditions which significantly worsen mental health	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Include conditions which significantly worsen how people perceive their general health	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Include conditions which significantly increase treatment burden (the sum of all the hassles of taking medicines or attending appointments)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Include conditions which could be impacted by or impact social deprivation and poverty	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other impact <div style="border: 1px solid black; height: 40px; width: 100%; margin-top: 5px;"></div>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q12: Categorisation of conditions/counting methods

In round 1, we asked about how to account for complications of conditions and there was consensus (>70%) that all conditions that are currently active should be counted even if some are complications of other conditions. We are not asking this again. There was considerable free-text comment, including about the challenges of identifying specific conditions in electronic medical records. We have therefore revised the options for this question.

Please choose one option that you would prefer to use.

- Broad disease category based on body systems (e.g. cardiovascular disease, mental health problems, skin conditions).
- Individual conditions (e.g. myocardial infarction, angina, hypertension, depression, schizophrenia, eczema, psoriasis).
- Grouping together similar conditions that are in the same body system and treated similarly (e.g. angina and myocardial infarction, or aplastic anaemia and sickle cell anaemia)

Round two public panel

Other. Please explain:

Don't know

Q13: Multimorbidity has been measured by existing studies using either medical records or public self-reported surveys. Please rate the degree to which you agree or disagree the following statements.

Statement	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Don't know
Conditions included for multimorbidity measurement should be the same in both self-report and databases (e.g. identifying a core set of conditions or condition framework).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Conditions included in multimorbidity measures should differ between self-report and databases	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

What conditions should be included?

Q14: System/disease domain

Note inserted: There was no consensus that which body systems should always be included in a multimorbidity measure.

Please rate the degree to which the following systems/domains, you think, are important.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Mental health	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cancer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cardiovascular	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Blood disease (which affects formation of blood cells and blood clots)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Respiratory disease	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Round two public panel

Neurological disease (which affects the nervous system)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Metabolic and Endocrine (which affects metabolic regulation. E.g. diabetes, thyroid problem)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Musculoskeletal (which affects joints, bones and muscles)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Digestive (which affects stomach, bowels, liver, pancreas and gallbladder)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Urogenital (which affects urinary and genital organs)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Skin	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ear, Nose and Throat (ENT)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Oral	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ophthalmology (which affects eyes)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chronic infections	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Note inserted: The number of conditions included in multimorbidity measurement varies substantially, which has led to the heterogeneity of multimorbidity prevalence. In the following section, we would like to ask you to rate a number of conditions that have been used for multimorbidity measurement, with the aim to identify a set of core conditions and conditions likely included for particular populations or regions.

Q15: Mental health

Note inserted: In mental health domain, none of the individual mental health conditions was rated by more than 70% of panellists as 'always include'. On the other hand, in the professional panel, there was consensus that dementia and schizophrenia should always be included in multimorbidity measurement.

Please rate the following mental health conditions as to whether they should be included or excluded, which allows us to see if your responses have changed between rounds. If you are not sure, please tick 'Don't know'.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Anxiety	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Depression	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Round two public panel

Dementia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Schizophrenia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Substance use disorder(including alcohol and drug dependence)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nicotine dependence	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Post-traumatic stress disorder (PTSD)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bipolar disorder	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chronic insomnia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dissociative or personality disorders (altering to be a person with different personality and the alters are imaginary)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Eating disorders (including bulimia or anorexia)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Learning disability	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Autism	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Obsessive compulsive disorder (OCD)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Somatoform disorders (psychological disorder where a person experiences physical symptoms that cannot be explained by medical doctors)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Attention deficit hyperactivity disorder (ADHD)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q16: In cancer domain, none of the individual cancer conditions was rated by more than 70% of panellists as 'always include'. On the other hand, in the professional panel, there was consensus that solid organ cancers, haematological cancers and metastatic cancers should always be included in multimorbidity measurement. Please rate the following cancer

Round two public panel

conditions as to whether they should be included or excluded. If you are not sure, please tick 'Don't know'.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Solid organ cancers (e.g. lung, colon, prostate, breast etc)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Haematological cancers (cancer that affects blood, e.g. leukaemia, lymphoma, myeloma)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Melanoma (serious form of malignant skin cancer)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Non-melanoma skin cancer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Benign cancers (excluding benign skin lumps and bumps)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Metastatic cancers (which have spread to other parts of the body)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q17: Based on the panellists' responses, we have revised the options and would like to ask you to choose the method you would recommend.

- Count all cancers as one
- Count individual cancers separately irrespective of which systems they affect (e.g. count gastric cancer and liver cancer separately).
- Count individual cancers separately if they affect different systems (e.g. breast cancer and lung cancer).

Other

Round two public panel

Q18: Note inserted: In cardiovascular domain, none of the individual cardiovascular conditions was rated by more than 70% of panellists as 'always include'. On the other hand, in the professional panel, there was consensus that stroke, coronary heart disease, heart failure and peripheral artery disease should always be included in multimorbidity measurement. Please rate the following cardiovascular conditions as to whether they should be included or excluded. If you are not sure, please tick 'Don't know'.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Hypertension (treated)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
High blood pressure (untreated)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Stroke	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Transient Ischaemic Attack (mini stroke)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
High cholesterol (treated)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
High cholesterol (untreated)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Coronary artery disease (heart attack or angina)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Heart failure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Peripheral artery disease (circulation problems in the legs)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Heart rhythm problem (irregular or very fast heart beats)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Heart valves problem (leaking or tight heart valves)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Aneurysm (a weakening or bulging of an artery wall)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Round two public panel

Q19: Consistent with the results in Q14 that less than 70% of panellists would always include haematological system in multimorbidity measurement, none of the individual haematological conditions was rated by more than 70% of panellists as 'always include'.

Please rate the following haematological conditions as to whether they should be included or excluded. If you are not sure, please tick 'Don't know'.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Anaemia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Venous thrombotic disease (blood clots formed inside a blood vessel that can block circulation)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q20: Note inserted: In neurological domain, none of the individual neurological conditions was rated by more than 70% of panellists as 'always include'. On the other hand, in the professional panel, there was consensus that Parkinson's disease, epilepsy, multiple sclerosis, and paralysis/ hemiplegia/ paraplegia (not including those caused by stroke) should always be included in multimorbidity measurement.

Please rate the following neurological conditions as to whether they should be included or excluded. If you are not sure, please tick 'Don't know'.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Parkinson's disease	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Epilepsy (fits/ seizures)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Migraine or other regular headache	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Multiple sclerosis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Peripheral neuropathy (damage to the nerves going to legs or arms)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Paralysis/ Hemiplegia/ Paraplegia (not including those caused by stroke)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Round two public panel

Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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Q21: Note inserted: In metabolic and endocrine domain, none of the individual conditions was rated by more than 70% of panellists as 'always include'. On the other hand, in the professional panel, there was consensus that diabetes (any types) should always be included in multimorbidity measurement.

Please rate the following metabolic and endocrine conditions as to whether they should be included or excluded. If you are not sure, please tick 'Don't know'.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Diabetes (including type 1 and type 2)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Thyroid problems (abnormal production of thyroid hormones)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Malnutrition (including protein energy deficiency, commonly in low-income countries)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Addison's disease (adrenal insufficiency)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q22: Note inserted: In musculoskeletal domain, none of the individual conditions was rated by more than 70% of panellists as 'always include'. On the other hand, in the professional panel, there was consensus that connective tissue disease (including rheumatoid arthritis or lupus) should always be included in multimorbidity measurement.

Please rate the following musculoskeletal conditions as to whether they should be included or excluded. If you are not sure, please tick 'Don't know'.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Osteoporosis (thinning of the bones)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Round two public panel

Osteoarthritis (wearing and tearing of joints that leads to inflammation and degeneration)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Connective tissue disease (autoimmune disease that can affect our bones, cartilages or joints, such as rheumatoid arthritis or lupus)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Gout (crystals that formed inside or around joints, causing pain)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Long-term musculoskeletal problems due to injury (including low back pain)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q23: Note inserted: In respiratory domain, none of the individual conditions was rated by more than 70% of panellists as 'always include'. On the other hand, in the professional panel, there was consensus that COPD, asthma and cystic fibrosis should always be included in multimorbidity measurement.

Please rate the following respiratory condition as to whether it should be included or excluded. If you are not sure, please tick 'Don't know'.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Chronic obstructive pulmonary disease (COPD – smoking related lung damage)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Asthma	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sleep apnoea (breathing problems when asleep)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cystic fibrosis (inherited condition that damages lungs)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Round two public panel

Chronic/Allergic rhinitis (long-term nasal inflammation)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bronchiectasis (consistent infection in the lungs)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Post-acute COVID-19	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q24: Note inserted: In digestive domain, none of the individual conditions was rated by more than 70% of panellists as 'always include'. On the other hand, in the professional panel, there was consensus that chronic liver disease and inflammatory bowel disease should always be included in multimorbidity measurement.

Please rate the following digestive conditions as to whether they should be included or excluded. If you are not sure, please tick 'Don't know'.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Chronic liver disease (including liver cirrhosis, liver failure and chronic hepatitis)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Inflammatory bowel disease (including ulcerative colitis and Crohn's disease)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Irritable bowel syndrome	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Diverticulosis (small pockets in the lining of the intestine)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pancreatic disease	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Upper digestive disease— Peptic ulcer (including gastric/ stomach ulcers and duodenal ulcers) and Gastroesophageal reflux (acid reflux and heartburn)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Gall bladder problems (including gallstones)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Round two public panel

Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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Q25: Note inserted: In urogenital domain, none of the individual conditions was rated by more than 70% of panellists as 'always include'. On the other hand, in the professional panel, there was consensus that chronic kidney disease and end-stage kidney disease should always be included in multimorbidity measurement.

Please rate the following urogenital conditions as to whether they should be included or excluded. If you are not sure, please tick 'Don't know'.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Chronic kidney disease	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
End-stage kidney disease (including kidney dialysis and transplant)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Kidney or bladder stones	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chronic urinary tract infections (including chronic bladder infections)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Urinary incontinence (loss of control over passing urine)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Uterus (womb) problems (including prolapse and fibroid)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Polycystic ovary syndrome	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Prostatic hypertrophy (large prostate glands)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Endometriosis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Infertility	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sexual dysfunction	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Round two public panel

Q26: Note inserted: In chronic infections domain, none of the individual conditions was rated by more than 70% of panellists as 'always include'. On the other hand, in the professional panel, there was consensus that HIV/AIDS should always be included in multimorbidity measurement.

Please rate the following chronic infections conditions as to whether they should be included or excluded. If you are not sure, please tick 'Don't know'.

Condition	Exclude (not important)	Expect to usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Expect to usually include (unless a good reason to exclude in particular context)	Always include (extremely important)
HIV/AIDS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tuberculosis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lyme disease (a bacterial infection that can be spread to humans by infected ticks)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q27: Note inserted: In skin domain, none of the individual conditions was rated by more than 70% of panellists as 'always include', in both members of the public panel and professional panel.

Please rate the following skin conditions as to whether they should be included or excluded again. If you are not sure, please tick 'Don't know'.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Psoriasis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Eczema	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chronic urticarial (chronic hives)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Round two public panel

Q28: Note inserted: In ENT, eye and oral domains, none of the individual conditions was rated by more than 70% of panellists as 'always include', in both members of the public panel and professional panel.

Please rate the following ENT, eye and oral conditions as to whether they should be included or excluded again. If you are not sure, please tick 'Don't know'.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Hearing impairment or Deafness (that cannot be easily corrected with hearing aids)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Meniere's disease (an ear condition that causes sudden attacks of vertigo)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chronic sinusitis (sinus infection)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Vision impairment or Blindness (that cannot be easily corrected with glasses)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cataract	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Glaucoma	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Edentulism (having no teeth)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chronic gum disease	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q29: Note inserted: In congenital disease domain, none of the individual conditions was rated by more than 70% of panellists as 'always include', in both members of the public panel and professional panel.

Please rate the following statement as to whether congenital conditions should be included or excluded again. If you are not sure, please tick 'Don't know'.

Condition	Exclude (not important)	Usually exclude (unless a	Could include or exclude	Usually include (unless a	Always include	Don't know

Round two public panel

		good reason to include in a particular context)		good reason to exclude in particular context)	(extremely important)	
Congenital disease (conditions that babies are born with, including congenial heart disease, chromosomal aberrations)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q30: Note inserted: The following risk factors/symptoms have been included in multimorbidity measures by existing studies, but none of them was rated by more than 70% of panellists as 'always include'. Some suggested that those should be measured separately rather than as part of a multimorbidity measure.

Having read a summary of the results from round one, please rate the following statement as to whether these conditions should be included or excluded again. If you are not sure, please tick 'Don't know'.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Obesity (body mass index ≥ 30)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Smoking	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sedentary lifestyle (spending most of the day sitting)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Physical disability	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dizziness (without a specific diagnosis)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chronic cough (without a specific diagnosis)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Post-sepsis syndrome	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Side effects of medications	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Treatment burden (the sum of all the hassles of taking medicines or attending appointments)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Round two public panel

Social deprivation and poverty	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify either one or more conditions):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Weighting

Q31:

Reflecting on a summary of the results from round one and your responses so far, please rate the degree to which these outcomes, you think, are important to be considered when investigating the impact of multimorbidity.

Outcome	Not at all important	Slightly important	Important	Sufficiently important	Very important	No opinion
Death	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Healthcare use (e.g. number of emergency admissions to hospital; outpatient appointments)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Quality of life	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Physical disability	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Frailty (general physical and/or mental weakness and vulnerability)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Treatment burden (the sum of all the hassles of taking medicines or attending appointments)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Healthcare costs (how much treatment and care for each individual costs)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
How people perceive their general health overall (e.g. whether it is excellent, very good, fair, poor, very poor)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Round three public panel

Round-three survey in the public panel

Socio-demographic information

Q1: Please describe the country where you are currently living.

Q2: What is your age?

- 18-34
 35-54
 55-64
 ≥ 65
 Prefer not to answer

Q3: What gender do you identify as?

- Female
 Male
 Other _____
 Prefer not to answer

Q4: We are seeking your views as a member of the public, but we know that some of you will have worked in healthcare or academia. Do you currently or did you previously work in academia, health and social care practice or healthcare policy?

- Yes
 No

Q5: Do you have multiple chronic conditions?

- Yes
 No

Q6: Do you have family or friends who have multiple chronic conditions?

- Yes
 No

What is multimorbidity?

Q7: Please rate the degree to which you agree or disagree with the following statement again so we can see if there is a change between round 2 and round 3.

	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree	Don't know
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Round three public panel

Do you agree that defining complex multimorbidity in addition to a core definition of simple multimorbidity is useful?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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Q8: Irrespective of whether you agree that complex multimorbidity is a useful concept, we would like to invite you to define “complex multimorbidity” based on number of conditions (please choose one).

- 3+ conditions irrespective of how many body systems
- 3+ conditions from 2+ body systems
- 3+ conditions from 3+ body systems
- 4+ conditions irrespective of how many body systems
- No opinion
- Other

Note: In the public and professional panel, there was no consensus on what additional patterns of conditions should be included in the definition. We have added a few more statements based on panellists’ comments.

Sub-question: Please choose the following statements that, you think, should be included in the definition of “complex multimorbidity”.

- No other patterns that I would like to include
- Any combination of two or more conditions which includes both physical and mental health conditions
- Any combination of two or more conditions with significant physical functional limitation
- Difficulty in managing illnesses due to social factors/social determinants of health (e.g. poverty).
- Any combination of two or more conditions and frailty
- Other

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Q9. Recurrence or remission

Please rate the degree to which you agree or disagree with the following statements.

Statement	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree	Don't know

Round three public panel

Include remitting-relapsing conditions that require ongoing treatment/ therapy/ care (e.g. depression, epilepsy)—newly added	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Include remitting-relapsing conditions which have relapsed during the last five years	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q10: Treatment, care or surveillance

Note inserted: More than 70% of panellists strongly agreed to include conditions that require current treatment, care, or therapy, and this question will not be asked again in round three. Please rate the degree to which you agree or disagree with the following statements.

Statement	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree	Don't know
Include conditions which usually require treatment, care or therapy 'at some point in the future' even if not currently treated (one panellist suggested to conceptualise this as 'current risk to future health outcomes')	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Include conditions which usually require surveillance (one panellist suggested to conceptualise this as 'current health needs or complexity of providing care')	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q11: Categorisation of conditions/counting methods

Please choose one option that you would prefer to use.

- Broad disease category based on body and mind system (e.g. cardiovascular disease, mental health problems, skin conditions).
- Individual conditions (e.g. TIA (mini stroke) and stroke are counted separately).
- Grouping together similar conditions that are in the same category and treated similarly (e.g. grouping together 'Angina and Myocardial Infarction')
- Other. Please explain:

Round three public panel

Don't know

Q12: Data source

Please rate the following statements again.

Statement	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree	Don't know
Conditions included for multimorbidity measurement should be the same/similar in both self-report and databases (e.g. identifying a core set of conditions or condition framework).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other comments	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

What conditions should be included?

Note inserted: In the previous section, more than 70% of panellists have agreed to include formal medical diagnoses, clinical risk factors, conditions that are permanent in their effects, conditions that last 12 months or longer, and require current treatment, care, or therapy.

Q13: Note inserted: In cancer conditions, we added three new statements based on panellists' comments. Please rate the following cancer conditions as to whether they should be included or excluded. If you are not sure, please tick 'Don't know'.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Treated cancer that requires surveillance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Treated cancer that did not recur over the past 5 years and does not require surveillance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Benign cerebral tumours (brain tumours that can cause functional limitations)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Round three public panel

Q14: Please choose the categorisation method you would prefer again.

- Count all primary cancers as one
- Count individual primary cancers separately irrespective of which systems they affect (e.g. count gastric cancer and liver cancer separately).
- Count individual primary cancers separately if they affect different systems (e.g. pancreatic cancer and lung cancer).
- Other

Q15: Conditions relevant to chronic pain and consequences of injury were revised based on panellists' comments. Please rate the following conditions as to whether they should be included or excluded. If you are not sure, please tick 'Don't know'.

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Chronic or recurrent low back pain	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chronic primary pain (defined as pain with no clear underlying condition but significant impact on the person)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Long-term musculoskeletal problems due to injury (e.g. consequences of accidental injuries)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q16: Conditions newly added in round two

Please rate again the following conditions so we can see if your responses have changed between round two and round three

Condition	Exclude (not important)	Usually exclude (unless a good reason to include in a particular context)	Could include or exclude	Usually include (unless a good reason to exclude in particular context)	Always include (extremely important)	Don't know
Addison's disease (adrenal insufficiency, which is an uncommon	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Round three public panel

disorder which is fatal without lifelong treatment)						
Bronchiectasis (a lung condition that causes cough, sputum production, and recurrent respiratory infections)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Post-acute covid 19 (“long COVID”)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chronic Lyme disease (a bacterial infection that can be spread to humans by infected ticks)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

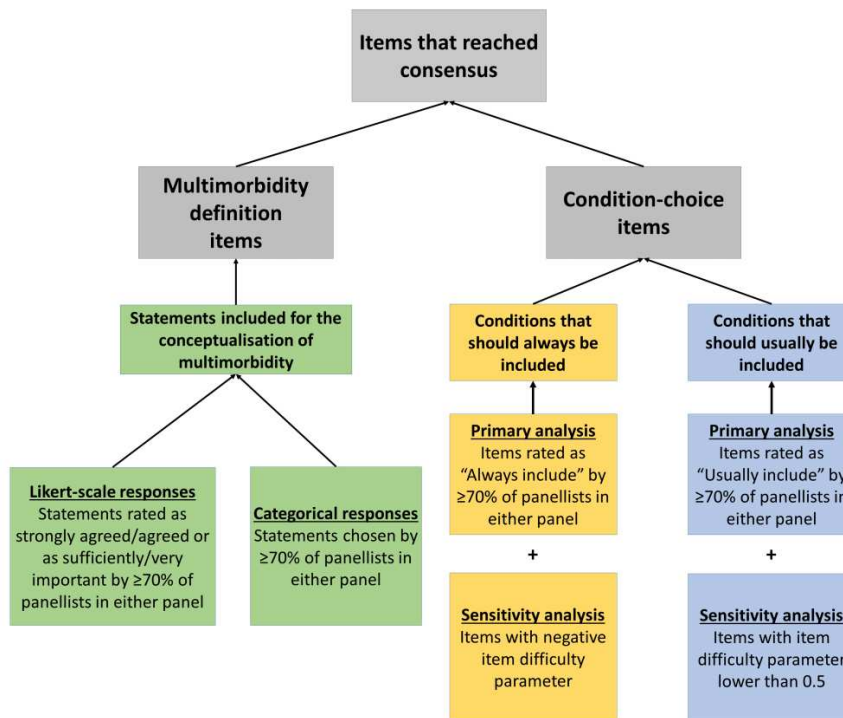
Measuring multimorbidity in research: a Delphi consensus study

Appendix 3

Table of Contents

Figure S1: Criteria for defining consensus of items	2
Box 1: Rasch Model used for sensitivity analysis.....	3
Table S1: Characteristics of non-respondents and unidentified panelists	4
Table S2: Responses to questions on conceptualising multimorbidity	6
Figure S2: Type of conditions to include when defining multimorbidity.....	8
Table S3: Defining “condition” in the concept of multimorbidity (based on participant free-text comments, questions changed from round to round)	9
Table S4: Consideration of conditions to include based on impact (based on participant free-text comments, questions changed from round to round)	10
Table S5: Responses to questions relevant to weighting (based on participant free-text comments, questions changed from round to round)	11
Table S6: Professional ratings for choice of simple counts vs weighted measures depending on the purpose of a study	13
Table S7: Professional ratings for choice of simple counts vs weighted measures for outcome prediction depending on the outcome being measured	14
Table S8: Professional scores for ‘always include’	15
Table S9: Public scores for ‘always include’	17
Table S10: Professional scores for ‘usually include’ (the sum of ‘always’ and ‘usually’).....	19
Table S11: Public scores for ‘usually include’ (the sum of ‘always’ and ‘usually’).....	21
Table S12: Conditions not recommended to ‘always include’ or ‘usually include’ by both panels.	23
Table S13: Differential item functioning (used to examine which condition-choice items were more likely to be endorsed by panelists with varying interest in different populations [4]).....	24
Table S14: Level of endorsement of the condition-related items	26
References	30

Figure S1: Criteria for defining consensus of items



Box 1: Rasch Model used for sensitivity analysis

The Rasch dichotomous model is an item response theory model with one item parameter [1]. We used Rasch modelling to examine the degree to which condition-relevant items were endorsed by panelists. The common feature in the Rasch model is conditional maximum likelihood estimation which leads to the separability of item and person parameters [2]. Item discrimination (the level of endorsement varies with person ability) in the Rasch analysis is fixed for all items [3].

The mathematical form of the Rasch dichotomous model is given as follows [1, 3]:

$$P(X_{is} = 1 | \theta_s, \beta_i) = \frac{e^{\theta_s - \beta_i}}{1 + e^{\theta_s - \beta_i}}$$

X_{is} refers to response (X) made by subject s to item i .

$X_{is} = 1$ refers to an endorsement of the item

β_i refers to the difficulty of item i

θ refers to person's trait/ability

To estimate the trait level, we can take the natural log of a ratio of proportion endorsed responses to proportion unendorsed responses:

$$\theta = \ln(P_s / (1 - P_s))$$

To estimate item difficulty, we can take the natural log of a ratio of proportion unendorsed responses to proportion endorsed responses.

$$\beta = \ln(1 - P_s / P_s)$$

Table S1: Characteristics of non-respondents and unidentified panelists†

Characteristics	Professional round one participant who did not respond or could not be tracked in round two (n=42) ^a No (%)	Professional round two participant who did not respond in round three Professional round two (n=15) ^b No (%)	Public round one participant who did not respond or could not be tracked in round two (n=10) ^c No (%)	Public round two participant who did not respond or could not be tracked in round three (n=7) ^d No (%)
Continent				
Europe	24 (57.1%)	9 (60.0%)	7 (70.0%)	7 (100.0%)
North America	7 (16.7%)	2 (13.3%)	1 (10.0%)	0
Australasia	1 (2.4%)	2 (13.3%)	0	0
Asia	9 (21.4%)	1 (6.7%)	1 (10.0%)	0
South America	1 (2.4%)	0	0	0
Africa	0	1 (6.7%)	0	0
Not stated	0	0	1 (10.0%)	0
Country income				
High-income	39 (92.9%)	14 (93.3%)	8 (80.0%)	7 (100.0%)
Low and middle income	3 (7.1%)	1 (6.7%)	1 (10.0%)	0
Not stated	0	0	1 (10.0%)	0
Participant has multimorbidity				
Yes	2 (4.8%)	3 (20.0%)	13 (52.0%)	19 (61.3%)
No	40 (95.2%)	12 (80.0%)	12 (48.0%)	12 (38.7%)
Not stated	0	0	0	0
Family or friends have multimorbidity				
Yes	28 (66.7%)	10 (66.7%)	6 (60.0%)	5 (71.4%)
No	14 (33.3%)	5 (33.3%)	4 (40.0%)	2 (28.6%)
Type of work*				
Research	31 (73.8%)	13 (86.7%)	-	-
Public policy	4 (9.5%)	2 (13.3%)	-	-
Clinical practice	16 (38.1%)	4 (26.7%)	-	-
Teaching	2 (4.8%)	0	-	-
Main work setting				
Government	4 (9.5%)	0	-	-
Academia	26 (61.9%)	13 (86.7%)	-	-
Hospital	2 (4.8%)	0	-	-
Primary care	10 (23.8%)	2 (13.3%)	-	-
Other	0	0	-	-
Populations of interest*				
General population	27 (64.3%)	11 (73.3%)	-	-
Older people	29 (69.0%)	7 (46.7%)	-	-
Middle-aged and older	26 (61.9%)	6 (40.0%)	-	-
Socially-deprived population	23 (54.8%)	6 (40.0%)	-	-
Women	10 (23.8%)	2 (13.3%)	-	-
Men	10 (23.8%)	1 (6.7%)	-	-
Children	5 (11.9%)	1 (6.7%)	-	-
Ethnic minority/indigenous	1 (2.4%)	3 (20.0%)	-	-
People with disability	0	2 (13.3%)	-	-
Age group				
18-34	-	-	1 (10.0%)	0
35-54	-	-	2 (20.0%)	2 (28.6%)
55-64	-	-	3 (30.0%)	1 (14.3%)
≥65	-	-	4 (40.0%)	4 (57.1%)

Characteristics	Professional round one participant who did not respond or could not be tracked in round two (n=42) ^a No (%)	Professional round two participant who did not respond in round three Professional round two (n=15) ^b No (%)	Public round one participant who did not respond or could not be tracked in round two (n=10) ^c No (%)	Public round two participant who did not respond or could not be tracked in round three (n=7) ^d No (%)
Gender				
Female	-	-	4 (40.0%)	6 (85.7%)
Male	-	-	6 (60.0%)	1 (14.3%)

‡“Unidentified panelists” is defined as “panelists who did not provide their email or preferred name in the previous and following rounds”. Some who dropped out in the following round did not provide their email and preferred name either. Thus, they were in the pool of those who either dropped out or cannot be identified”. As we couldn’t distinguish these two groups in the pool, we reported the characteristics of the two groups together.

*multiple select question

a. The 42 panelists consist of 38 who dropped out in round 2, and 4 are unidentified.

b. The 15 non-respondents in round 2

c. The 10 panelists consist of 6 who dropped out in round 2 and 4 are unidentified

d. The 7 panelists consist of 6 who dropped out in round 3 and 1 are unidentified

Table S2: Responses to questions on conceptualising multimorbidity

Question	Choice	Professional panel			Public panel		
		Round 1 (n=150)	Round 2 (n=112)	Round 3 (n=97)	Round 1 (n=25)	Round 2 (n=31)	Round 3 (n=25)
Number of conditions to define multimorbidity	2 or more	68.3%	84.8%	-	88.0%	-	-
	3 or more	29.3%	12.5%		8.0%		
	4 or more	1.3%	0.9%		0		
	5 or more	0.7%	0		4.0%		
	Other	0.7%	1.8%		0		
How long-term a condition should be	3 months or more	16.7%	3.6%	-	8.0%	-	-
	6 months or more	42.7%	70.5%		8.0%		
	12 months or more	33.3%	23.2%		76.0%		
	Other	7.3%	2.7%		8.0%		
Do you agree that defining complex multimorbidity in addition to a core definition of simple multimorbidity is useful?	Strongly agree	-	36.4%	60.4%	-	33.3%	36.0%
	Agree		32.7%	27.1%		53.3%	48.0%
	Neither agree nor disagree		9.1%	4.2%		3.3%	4.0%
	Disagree		15.5%	5.2%		6.7%	4.0%
	Strongly disagree		6.4%	3.1%		3.3%	8.0%
How would you define complex multimorbidity based on number of conditions?	3 or more conditions irrespective of how many body systems	-	17.9%	25.8%	-	41.9%	76.0%
	3 or more conditions from two or more body systems		29.5%	33.0%		16.1%	12.0%
	3 or more conditions from three or more body systems		14.3%	26.8%		19.4%	12.0%
	4 or more conditions irrespective of how many body systems		6.3%	3%		9.7%	0
	4 or more conditions four or more body systems		1.8%	0		0	0
	4 or more conditions four or more body systems		3.6%	0		0	0
	5 or more conditions irrespective of how many body systems		1.8%	0		0	0
5 or more conditions five or more body systems		25.0%	11.3%		12.9%	0	
Other patterns I would like to include in the definition of complex multimorbidity*	No other patterns that I would like to include	-	29.5%	22.7%	-	16.1%	20.0%
	Any combination of two or more conditions which includes both physical and mental health conditions		36.6%	33.0%		64.5%	44.0%
	Any combination of two or more conditions with significantly physical functional limitation		0	30.9%		0	32.0%
	Difficulty in managing illnesses due to social factors/social determinants of health		0	26.8%		0	28.0%
	Any combination of two or more conditions and frailty		0	25.8%		0	12.0%
What kind of conditions to include*	Formal medical diagnosis	98.7%	99.1%	-	96.0%	96.8%	-
	Clinical risk factor	54.0%	49.1%		60.0%	74.2%	
	Symptom	22.7%	20.5%		28.0%	58.1%	

	Health behaviour (e.g. smoking)	11.3%	8.9%		16.0%	51.6%	
	Health impact (e.g. disability)	39.3%	36.6%		40.0%	25.8%	
	Social deprivation and poverty	15.3%	10.7%		16.0%	38.7%	
	Consequences of treatment	22.7%	21.4%		40.0%	29.0%	
	Environmental factors	-	4.5%		-	22.6%	
How to count conditions (round 1)	Count broad disease category based on body and mind system	23.1%	-	-	12.0%	-	-
	Count individual conditions	72.0%			88.0%		
	Other	4.9%			0		
How to count conditions (round 2)	Count all of the conditions that are currently active	84.0%	-	-	80.0%	-	-
	Count the primary health condition	4.0%			16.0%		
	Only count the complications	2.0%			0		
How to count cancers (round 1)	Count all cancers as one	25.3%	-	-	24%	-	-
	Count individual cancers separately	62.0%			76%		
	Other	12.7%			0		
How to count cancers (round 2)	Count all cancers as one	-	14.3%	-	-	16.1%	-
	Count individual cancers separately irrespective of which systems they affect		38.4%			38.7%	
	Count individual cancers separately if they affect different systems		45.5%			45.2%	
	Other		1.8%			0	
How to count cancers (round 3)	Count all primary cancers as one	-	-	11.3%	-	-	12.0%
	Count individual primary cancers separately irrespective of which systems they affect			55.7%			48.0%
	Count individual primary cancers separately only if they affect different systems			33.0%			36.0%
	Other			0			4.0%
Conditions included for multimorbidity measurement should be the same/similar in both self-report and databases	Strongly agree	-	32.1%	29.1%	-	36.7%	44.0%
	Agree		41.3%	42.7%		60.0%	52.0%
	Neither agree nor disagree		11.9%	5.5%		3.3%	4.0%
	Disagree		11.9%	7.3%		0	0
	Strongly disagree		2.8%	1.8%		0	0

* multiple select question

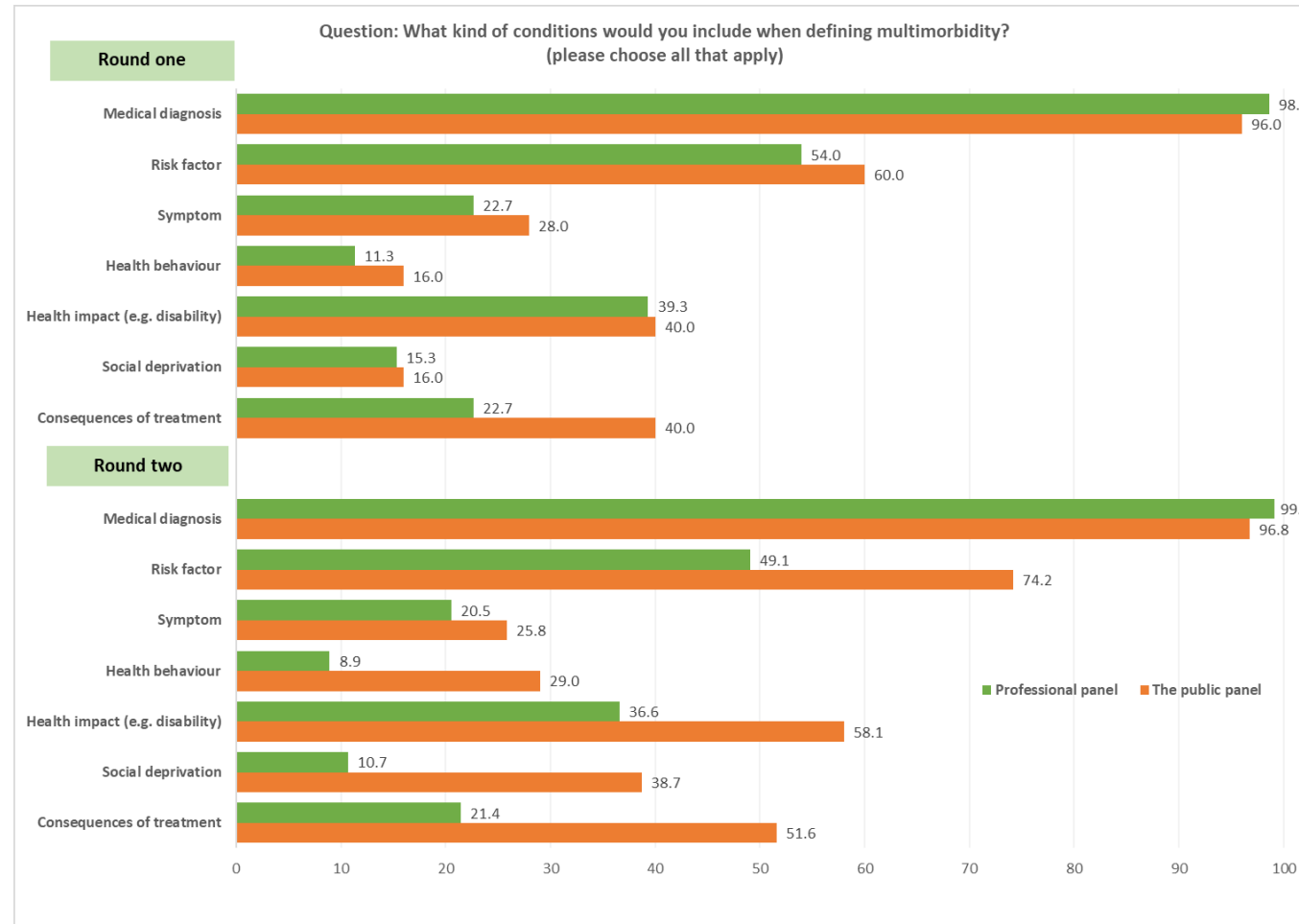
Figure S2: Type of conditions to include when defining multimorbidity

Table S3: Defining “condition” in the concept of multimorbidity (questions changed from round to round based on participant free-text feedback)

Statement	Rating	Professional panel			Public panel		
		Round 1 (n=150)	Round 2 (n=112)	Round 3 (n=97)	Round 1 (n=25)	Round 2 (n=31)	Round 3 (n=25)
Include conditions which are permanent in their effects	Strongly agree	89.9%			80.0%		
	Agree	8.7%			16.0%		
	Neither agree/disagree	0			0		
	Disagree	0			0		
	Strongly disagree	1.3%			4.0%		
Include conditions which are currently active	Strongly agree	73.2%			60.0%	64.5%	
	Agree	25.5%			28.0%	29.0%	
	Neither agree/disagree	0			8.0%	3.2%	
	Disagree	0.7%			0	0	
	Strongly disagree	0.7%			4.0%	3.2%	
Include conditions which may recur but happen rarely	Strongly agree	13.6%			28.0%		
	Agree	25.9%			16.0%		
	Neither agree/disagree	19.7%			36.0%		
	Disagree	35.4%			20.0%		
	Strongly disagree	5.4%			0		
Include conditions which may recur or remit	Strongly agree		27.3%			41.9%	
	Agree		48.2%			45.2%	
	Neither agree/disagree		14.5%			9.7%	
	Disagree		7.3%			0	
	Strongly disagree		2.7%			3.2%	
Include remitting-relapsing conditions which have relapsed during the last five years	Strongly agree		23.4%	12.9%		43.3%	21.0%
	Agree		56.1%	48.4%		40.0%	37.5%
	Neither agree/disagree		10.3%	22.6%		10.0%	37.5%
	Disagree		10.3%	15.1%		3.3%	0
	Strongly disagree		0	1.1%		3.3%	4.2%
Include remitting-relapsing conditions that require ongoing treatment/ therapy/ care	Strongly agree			49.0%			52.0%
	Agree			44.8%			40.0%
	Neither agree/disagree			2.1%			0
	Disagree			3.1%			0
	Strongly disagree			1.0%			8.0%
Only include conditions which usually require formal treatment or care	Strongly agree	13.4%			28.0%		
	Agree	31.5%			20.0%		
	Neither agree/disagree	14.1%			8.0%		
	Disagree	32.9%			28.0%		
	Strongly disagree	8.1%			16.0%		
Include conditions which usually require 'current' treatment, care or therapy	Strongly agree		77.5%			71.0%	
	Agree		22.5%			25.8%	
	Neither agree/disagree		0			0	
	Disagree		0			0	
	Strongly disagree		0			3.2%	
Include conditions which usually require treatment, care or therapy 'at some point in the future' even if not currently treated	Strongly agree		36.7%	13.7%		27.6%	24.0%
	Agree		38.5%	43.2%		51.7%	44.0%
	Neither agree/disagree		11.9%	23.2%		10.3%	20.0%
	Disagree		12.8%	17.9%		3.4%	8.0%
	Strongly disagree		0	2.1%		6.9%	4.0%
Include conditions which usually require surveillance	Strongly agree		38.0%	20.0%		41.9%	32.0%
	Agree		37.0%	54.7%		45.2%	56.0%
	Neither agree/disagree		11.1%	12.6%		9.7%	8.0%
	Disagree		13.0%	11.6%		0	0
	Strongly disagree		0.9%	1.1%		3.2%	4.0%

Percentages were rounded.

Number of panelists voting “No opinion/Don’t know” was not added in the denominator when calculating percentages

Table S4: Consideration of conditions to include based on impact (based on participant free-text comments, questions changed from round to round)

Statement	Rating	Professional panel		Public panel	
		Round one (n=150)	Round two (n=112)	Round one (n=25)	Round two (n=31)
Include conditions which significantly increase risk of death	Strongly agree	68.7%	69.4%	80.0%	
	Agree	20.4%	25.2%	20.0%	
	Neither agree nor disagree	5.4%	2.7%	0	-
	Disagree	4.8%	0.9%	0	
	Strongly disagree	0.7%	1.8%	0	
Include conditions which significantly reduce quality of life	Strongly agree	76.5%		60.0%	67.7%
	Agree	20.1%		28.0%	25.8%
	Neither agree nor disagree	2.7%	-	8.0%	3.2%
	Disagree	0.7%		4.0%	0
	Strongly disagree	0		0	3.2%
Include conditions which cause significant physical disability	Strongly agree	69.8%		68.0%	64.5%
	Agree	23.5%		24.0%	32.3%
	Neither agree nor disagree	5.4%	-	8.0%	0
	Disagree	1.3%		0	0
	Strongly disagree	0		0	3.2%
Include conditions which cause frailty	Strongly agree	65.8%	61.5%	44.0%	51.6%
	Agree	24.8%	28.4%	40.0%	38.7%
	Neither agree nor disagree	7.4%	5.5%	16.0%	6.5%
	Disagree	2.0%	1.8%	0	0
	Strongly disagree	0	2.8%	0	3.2%
Include conditions which significantly worsen mental health	Strongly agree	71.8%		62.5%	64.5%
	Agree	20.8%		16.7%	22.6%
	Neither agree nor disagree	6.0%	-	20.8%	9.7%
	Disagree	1.3%		0	0
	Strongly disagree	0		0	3.2%
Include conditions which significantly worsen self-perceived health status	Strongly agree	49.7%	48.6%	17.4%	16.7%
	Agree	28.9%	28.8%	43.5%	46.7%
	Neither agree nor disagree	17.4%	16.2%	26.1%	30.0%
	Disagree	4.0%	4.5%	13.0%	0
	Strongly disagree	0	1.8%	0	6.7%
Include conditions which significantly increase treatment burden	Strongly agree		55.0%		51.6%
	Agree		32.4%		35.5%
	Neither agree nor disagree	-	7.2%	-	9.7%
	Disagree		3.6%		0
	Strongly disagree		1.8%		3.2%
Include conditions which could be impacted by or impact social deprivation and poverty	Strongly agree		25.5%		38.7%
	Agree		38.7%		35.5%
	Neither agree nor disagree	-	21.7%	-	16.1%
	Disagree		11.3%		3.2%
	Strongly disagree		2.8%		6.5%

Percentages were rounded.

Table S5: Responses to questions relevant to weighting (based on participant free-text comments, questions changed from round to round)

Question	Responses	Professional round 1 No. (%)	Professional round 2 No. (%)	Professional round 3 No. (%)	Public round 1 No. (%)	Public round 2 No. (%)	Public round 3 No. (%)
Please describe what type of measures you would use to measure multimorbidity*	Weighted morbidity measure A simple count of conditions Other	91 (53.2%) 69 (40.4%) 11 (6.4%)	-	-	-	-	-
Please choose what type of measures you would use to understand the impact of multimorbidity on outcomes	Weighted morbidity measure A simple count of conditions Both Other	92 (61.3%) 38 (25.3%) 7 (4.7%) 13 (8.7%)	-	-	-	-	-
What weighting methods would you use in a multimorbidity measure? ^{a*}	Use existing weighted indices Empirically derive weights based on the individual impact of diseases on an outcome (e.g. use regression models to calculate weights) Set rules based on level of severity to grade each condition/disease category (e.g. if having "presence of a condition": 1 point, "treatment": additional 1 point, "functional limitation": additional 1 point) Other	47 (27.3%) 60 (34.9%) 47 (27.3%) 18 (10.5%)	20 (21.7%) 43 (46.7%) 24 (26.1%) 5 (5.4%)	-	-	-	-
Please rate the degree to which the outcomes listed are important to weight against ^a							
Death	Not at all important Slightly important Important Sufficiently important Very important	2 (1.4%) 2 (1.4%) 6 (4.3%) 12 (8.6%) 117 (84.2%)	-	-	0 2 (8.3%) 2 (8.3%) 4 (16.7%) 16 (66.7%)	0 0 1 (3.2%) 3 (9.7%) 27 (87.1%)	-
Healthcare use	Not at all important Slightly important Important Sufficiently important Very important	1 (0.7%) 5 (3.5%) 17 (12.1%) 31 (22.0%) 87 (61.7%)	-	-	0 0 7 (29.2%) 4 (16.7%) 13 (54.2%)	0 0 3 (9.7%) 11 (35.5%) 17 (54.8%)	-
Health-related quality of life	Not at all important Slightly important Important Sufficiently important Very important	1 (0.7%) 3 (2.1%) 7 (4.9%) 17 (11.9%) 115 (80.4%)	-	-	0 3 (12.5%) 3 (12.5%) 7 (29.2%) 11 (45.8%)	1 (3.2%) 0 2 (6.5%) 8 (25.8%) 20 (64.5%)	-

Question	Responses	Professional round 1 No. (%)	Professional round 2 No. (%)	Professional round 3 No. (%)	Public round 1 No. (%)	Public round 2 No. (%)	Public round 3 No. (%)
Physical disability	Not at all important	1 (0.7%)	-	-	0	0	-
	Slightly important	3 (2.2%)	-	-	1 (4.2%)	1 (3.3%)	-
	Important	13 (9.4%)	-	-	10 (41.7%)	3 (10.0%)	-
	Sufficiently important	30 (21.6%)	-	-	6 (25.0%)	12 (40.0%)	-
	Very important	92 (66.2%)	-	-	7 (29.2%)	14 (46.7%)	-
Frailty	Not at all important	2 (1.4%)	-	-	0	0	-
	Slightly important	3 (2.2%)	-	-	5 (20.0%)	1 (3.3%)	-
	Important	14 (10.1%)	-	-	10 (40.0%)	6 (20.0%)	-
	Sufficiently important	42 (30.2%)	-	-	4 (16.0%)	11 (36.7%)	-
	Very important	78 (56.1%)	-	-	6 (24.0%)	12 (40.0%)	-
Mental health	Not at all important	2 (1.4%)	-	-	0	^b	-
	Slightly important	6 (4.3%)	-	-	1 (4.0%)		-
	Important	14 (10.1%)	-	-	8 (32.0%)		-
	Sufficiently important	36 (26.1%)	-	-	5 (20.0%)		-
	Very important	80 (58.0%)	-	-	11 (44.0%)		-
Treatment burden	Not at all important	3 (2.2%)	-	-	1 (4.2%)	1 (3.3%)	-
	Slightly important	9 (6.5%)	-	-	10 (40.0%)	6 (20%)	-
	Important	24 (17.3%)	-	-	2 (8.0%)	3 (10%)	-
	Sufficiently important	32 (23.0%)	-	-	7 (28.0%)	12 (40.0%)	-
	Very important	71 (51.1%)	-	-	5 (20.0%)	8 (26.7%)	-
Healthcare costs	Not at all important	5 (3.6%)	-	-	3 (12.5%)	2 (6.7%)	-
	Slightly important	8 (5.8%)	-	-	6 (24.0%)	10 (33.3%)	-
	Important	26 (18.7%)	-	-	4 (16.0%)	8 (26.7%)	-
	Sufficiently important	46 (33.1%)	-	-	6 (24.0%)	5 (16.7%)	-
	Very important	54 (38.8%)	-	-	6 (24.0%)	5 (16.7%)	-
Self-perceived health status	Not at all important	3 (2.1%)	-	-	2 (8.0%)	2 (6.5%)	-
	Slightly important	11 (7.9%)	-	-	5 (20.0%)	6 (19.4%)	-
	Important	22 (15.7%)	-	-	6 (24.0%)	7 (22.6%)	-
	Sufficiently important	40 (28.6%)	-	-	6 (24.0%)	9 (29.0%)	-
	Very important	64 (45.7%)	-	-	6 (24.0%)	7 (22.6%)	-

Number of panelists voting "no opinion" was not added in the denominator when calculating percentages. *multiple select question; a: Non-mandatory question; b: we did not ask this question in round two because some panelists commented that conditions cannot be weighted against based on the general term "mental health"

Table S6: Professional ratings for choice of simple counts vs weighted measures depending on the purpose of a study

Question	Response	Round 2 No. of panelists (%)	Round 3 No. of panelists (%)	Round 3 summary
For the purpose of estimating the prevalence of multimorbidity	Prefer simple count Prefer weighted measure Either is acceptable	66 (59.5%) 18 (16.2%) 27 (24.3%)	58 (63.0%) 15 (16.3%) 19 (20.7%)	77 (83.7%) prefer a simple count or think it equally acceptable 34 (37.0%) prefer a weighted measure or think it equally acceptable
For the purpose of identifying and counting disease clusters	Prefer simple count Prefer weighted measure Either is acceptable	66 (68.8%) 15 (15.6%) 15 (15.6%)	59 (64.8%) 18 (19.8%) 14 (15.4%)	73 (80.2%) prefer a simple count or think it equally acceptable 32 (35.2%) prefer a weighted measure or think it equally acceptable
For the purpose of exploring trajectories of multimorbidity (e.g. trends of multimorbidity prevalence and the number of conditions an individual has had)	Prefer simple count Prefer weighted measure Either is acceptable	35 (32.4%) 27 (25.0%) 46 (42.6%)	34 (38.6%) 24 (27.3%) 30 (34.1%)	64 (72.7%) prefer a simple count or think it equally acceptable 54 (61.4%) prefer a weighted measure or think it equally acceptable
For the purpose of exploring/identifying predictors of multimorbidity (e.g. socio-demographic information)	Prefer simple count Prefer weighted measure Either is acceptable	30 (27.5%) 35 (32.1%) 44 (40.4%)	28 (30.8%) 32 (35.2%) 31 (34.1%)	59 (64.9%) prefer a simple count or think it equally acceptable 63 (69.3%) prefer a weighted measure or think it equally acceptable
For the purpose of assessing the severity of disease burden	Prefer simple count Prefer weighted measure Either is acceptable	12 (10.8%) 56 (50.5%) 43 (38.7%)	5 (5.4%) 66 (71.7%) 21 (22.8%)	26 (28.2%) prefer a simple count or think it equally acceptable 87 (94.5%) prefer a weighted measure or think it equally acceptable
For the purpose of risk adjustment or outcome prediction	Prefer simple count Prefer weighted measure Either is acceptable	8 (7.3%) 57(52.3%) 44 (40.4%)	8 (8.8%) 62 (68.1%) 21 (23.1%)	29 (31.9%) prefer a weighted measure or think it equally acceptable 83 (91.2%) prefer a weighted measure or think it equally acceptable

Table S7: Professional ratings for choice of simple counts vs weighted measures for outcome prediction depending on the outcome being measured

For the following outcomes of interest, please choose which type of multimorbidity measures you would prefer to use for outcome prediction ^a		Round 2 No. of panelists (%)	Round 3 No. of panelists (%)	Round 3 summary
Death	Prefer simple count Prefer weighted measure Either is acceptable	25 (24.5%) 41 (40.2%) 36 (35.3%)	10 (10.6%) 54 (57.4%) 30 (31.9%)	40 (42.5%) prefer a simple count or think it equally acceptable 94 (89.3%) prefer a weighted measure or think it equally acceptable
Healthcare use	Prefer simple count Prefer weighted measure Either is acceptable	28 (26.2%) 39 (36.4%) 40 (37.4%)	15 (16.1%) 41 (44.1%) 37 (39.8%)	52 (55.1%) prefer a simple count or think it equally acceptable 78 (83.9%) prefer a weighted measure or think it equally acceptable
Health-related quality of life	Prefer simple count Prefer weighted measure Either is acceptable	15 (14.2%) 49 (46.2%) 42 (39.6%)	5 (5.3%) 54 (57.4%) 35 (37.2%)	40 (42.5%) prefer a simple count or think it equally acceptable 89 (94.6%) prefer a weighted measure or think it equally acceptable
Physical disability	Prefer simple count Prefer weighted measure Either is acceptable	18 (16.8%) 49 (45.8%) 40 (37.4%)	8 (8.5%) 54 (57.4%) 32 (34.0%)	40 (42.5%) prefer a simple count or think it equally acceptable 86 (91.4%) prefer a weighted measure or think it equally acceptable
Frailty	Prefer simple count Prefer weighted measure Either is acceptable	17 (15.9%) 47 (43.9%) 43 (23.4%)	9 (9.6%) 52 (55.3%) 33 (35.1%)	42 (44.7%) prefer a simple count or think it equally acceptable 85 (90.4%) prefer a weighted measure or think it equally acceptable
Mental health	Prefer simple count Prefer weighted measure Either is acceptable	25 (40.2%) 43 (56.2%) 39 (36.4%)	14 (15.2%) 42 (45.7%) 36 (39.1%)	50 (54.3%) prefer a simple count or think it equally acceptable 78 (84.8%) prefer a weighted measure or think it equally acceptable
Treatment burden	Prefer simple count Prefer weighted measure Either is acceptable	19 (17.8%) 47 (43.9%) 41 (38.3%)	12 (12.8%) 53 (56.4%) 29 (30.9%)	41 (43.7%) prefer a simple count or think it equally acceptable 82 (87.3%) prefer a weighted measure or think it equally acceptable
Healthcare costs	Prefer simple count Prefer weighted measure Either is acceptable	20 (18.9%) 40 (37.7%) 46 (43.4%)	14 (15.2%) 41 (44.6%) 37 (40.2%)	51 (55.4%) prefer a simple count or think it equally acceptable 78 (84.8%) prefer a weighted measure or think it equally acceptable
Self-perceived health status	Prefer simple count Prefer weighted measure Either is acceptable	24 (23.1%) 41 (39.4%) 39 (37.5%)	15 (16.1%) 40 (43.0%) 38 (40.9%)	53 (57.0%) prefer a simple count or think it equally acceptable 78 (83.9%) prefer a weighted measure or think it equally acceptable

Table S8: Professional scores for 'always include'

Condition	Round 1 N=150 %	Round 2 N=112 %	Round 3 N=97 %	Professional panel consensus
Heart failure ^a	90.0	-	-	Always include
Chronic liver disease ^a	88.5	-	-	Always include
Diabetes ^a	87.3	-	-	Always include
Parkinson's disease ^a	86.6	-	-	Always include
End-stage kidney disease ^a	86.4	-	-	Always include
Chronic obstructive pulmonary disease ^a	85.9	-	-	Always include
Coronary artery disease ^a	82.7	-	-	Always include
Dementia ^a	82.6	-	-	Always include
Inflammatory bowel disease ^a	82.6	-	-	Always include
Multiple sclerosis ^a	80.7	-	-	Always include
Stroke ^a	80.0	-	-	Always include
Connective tissue disease ^a	79.7	-	-	Always include
Chronic kidney disease ^a	79.3	-	-	Always include
HIV/AIDS ^a	78.5	-	-	Always include
Metastatic cancers ^a	77.4	-	-	Always include
Haematological cancers ^a	77.2	-	-	Always include
Solid organ cancers ^a	76.5	-	-	Always include
Paralysis ^a	76.0	-	-	Always include
Cystic fibrosis ^a	75.8	-	-	Always include
Schizophrenia ^a	75.2	-	-	Always include
Epilepsy ^a	73.0	-	-	Always include
Peripheral artery disease ^a	71.1	-	-	Always include
Asthma ^a	70.7	-	-	Always include
Depression	69.6	67.0	-	
Heart valve disorders	57.7	53.6	-	
Bipolar disorder	61.9	61.8	-	
Melanoma	65.8	54.5	-	
Addison's disease ^b	-	48.1	34.5	
Bronchiectasis ^b	-	36.9	31.1	
Osteoarthritis	59.7	51.4	-	
Pancreatic disease	66.0	38.5	-	
Arrhythmia	58.4	46.4	-	
Thyroid problems	59.7	40.0	-	
Venous thrombotic disease	45.9	43.5	-	
Drug/alcohol misuse	51.4	51.8	-	
Anaemia	43.9	44.0	-	
Chronic Lyme disease ^b	-	29.8	25.3	
Transient ischaemic attack	49.3	48.2	-	
Hypertension	56.7	43.8	-	
Anxiety	52.0	47.3	-	
Treated cancer that requires surveillance ^c	-	-	35.9	
Eating disorders	45.0	44.5	-	
Vision impairment or blindness that cannot be corrected with glasses	52.7	46.4	-	
Musculoskeletal problems due to injury	44.5	41.1	36.1	
Tuberculosis	61.5	46.8	-	
Gout	45.3	38.5	-	
Endometriosis	42.4	35.5	-	
Chronic primary pain ^d	48.3	-	33.0	
Peptic ulcer	48.6	36.9	-	
Hearing impairment or deafness that cannot be corrected with hearing aids	48.0	39.6	-	
Post-acute COVID-19 ^b	-	27.7	24.5	
Post-traumatic stress disorder	38.0	42.2	-	

Psoriasis	43.2	31.2	-
Benign cerebral tumours ^c	-	-	28.9
Peripheral neuropathy	52.4	36.1	-
Hypertension (untreated)	54.7	39.6	-
Sleep apnoea	45.5	29.9	-
Congenital disease and chromosomal abnormalities	46.2	35.8	-
Chronic low back pain ^d	-	-	30.9
Chronic urinary tract infection	38.6	30.0	-
Aneurysm ^c	-	-	22.7
Meniere's disease	34.9	26.9	-
Migraine or other regular headache	37.8	28.7	-
Osteoporosis	52.0	41.4	-
Autism	36.2	29.0	-
Obsessive compulsive disorder	38.6	32.7	-
Dissociative or personality disorders	41.0	40.7	-
Glaucoma	44.2	36.0	-
Urinary incontinence	38.8	31.5	-
Irritable bowel syndrome	38.8	29.4	-
Polycystic ovary syndrome	36.6	29.8	-
Chronic insomnia	35.0	30.8	-
Obesity	48.3	35.1	-
Dyslipidaemia (treated)	39.6	33.6	-
Uterine (womb) problems	31.0	21.6	-
Cataract	31.8	26.1	-
Gall bladder problems	35.9	26.4	-
Prostatic hypertrophy	29.5	27.2	-
Attention deficit hyperactivity disorder	27.0	25.9	-
Somatoform disorders	30.7	25.5	-
Gastroesophageal reflux	32.0	27.3	-
Chronic urticaria	29.1	19.2	-
Malnutrition	36.2	28.3	-
High cholesterol (untreated)	44.9	25.5	-
Learning disability	28.1	25.2	-
Kidney or bladder stones	28.6	22.4	-
Physical disability	38.9	27.9	-
Eczema	25.9	19.3	-
Non-melanoma skin cancer	30.3	23.1	-
Chronic sinusitis	27.4	17.3	-
Chronic/allergic rhinitis	30.1	17.4	-
Diverticulosis	38.7	22.2	-
Chronic gum disease	16.8	19.8	-
Nicotine dependence	20.0	22.2	-
Sexual dysfunction	14.0	16.2	-
Edentulism	20.1	18.7	-
Smoking	29.3	27.9	-
Social deprivation and poverty	24.3	17.9	-
Infertility	10.6	14.0	-
Post-sepsis syndrome	14.3	15.7	-
Treatment burden	16.1	14.5	-
Dizziness	10.3	10.8	-
Side effects of medications	12.0	11.9	-
Chronic cough	8.3	10.7	-
Benign cancers	18.6	9.3	-
Sedentary lifestyle	14.4	9.9	-
Treated cancer not requiring surveillance ^c	-	-	5.4

a. Reached 'always include' consensus after round 1

b. Proposed as additional conditions by participants after round 1

c. Proposed as additional conditions by participants after round 2

d. Chronic pain asked about in rounds 1, split into chronic primary pain and chronic low back pain by participants after round 2

Table S9: Public scores for 'always include'

Condition	Round 1 N=150 %	Round 2 N=112 %	Round 3 N=97 %	Public panel consensus
End-stage kidney disease	68.0	90.3	-	Always include
Heart failure	68.0	83.9	-	Always include
Dementia	60.0	83.3	-	Always include
Chronic liver disease	64.0	80.6	-	Always include
Stroke	60.0	80.6	-	Always include
Chronic kidney disease	64.0	80.6	-	Always include
Parkinson's disease	56.0	77.4	-	Always include
Multiple sclerosis	60.0	77.4	-	Always include
Coronary artery disease	64.0	74.2	-	Always include
Cystic fibrosis	62.5	74.2	-	Always include
Diabetes	64.0	71.0	-	Always include
HIV/AIDS	37.5	71.0	-	Always include
Epilepsy	44.0	71.0	-	Always include
Addison's disease	-	40.0	70.8	Always include
Metastatic cancers	70.8	80.0	-	Always include
Haematological cancers	70.8	77.4	-	Always include
Solid organ cancers	70.8	80.0	-	Always include
Inflammatory bowel disease	60.0	58.1	-	
Heart valve disorders	36.0	61.3	-	
Melanoma	58.3	67.7	-	
Chronic obstructive pulmonary disease	60.0	67.7	-	
Peripheral artery disease	24.0	35.5	-	
Venous thrombotic disease	48.0	64.5	-	
Transient ischaemic attack	32.0	64.5	-	
Aneurysm	-	67.7	-	
Pancreatic disease	48.0	53.3	-	
Anaemia	24.0	43.3	-	
Peripheral neuropathy	44.0	26.7	-	
Schizophrenia	56.5	67.7	-	
Bipolar disorder	52.2	51.6	-	
Connective tissue disease	54.2	66.7	-	
Paralysis	56.0	63.3	-	
Post-acute COVID-19	-	44.8	60.0	
Tuberculosis	54.2	54.8	-	
Congenital disease	44.0	53.3	-	
Prostatic hypertrophy	25.0	23.3	-	
Endometriosis	36.4	50.0	-	
Bronchiectasis	-	45.2	48.0	
Osteoarthritis	41.7	41.9	-	
Thyroid problems	37.5	35.5	-	
Autism	22.7	35.5	-	
Chronic urinary tract infection	20.0	40.0	-	
Polycystic ovary syndrome	40.9	37.9	-	
Arrhythmia	28.0	39.3	-	
Peptic ulcer	29.2	35.5	-	
Learning disability	25.0	38.7	-	
Asthma	32.0	58.1	-	
Osteoporosis	33.3	45.2	-	
Uterine (womb) problems	22.7	35.5	-	
Treated cancer that requires surveillance	-	-	36.0	
Chronic primary pain	24.0	-	20.0	
Malnutrition	14.3	36.7	-	
Non-melanoma skin cancer	30.4	36.7	-	
Chronic Lyme disease	-	38.7	45.8	

Depression	37.5	25.8	-	
Irritable bowel syndrome	20.0	26.7	-	
Kidney or bladder stones	20.0	26.7	-	
Benign cerebral tumours	-		52.0	
Diverticulosis	25.0	24.1	-	
Drug/alcohol misuse	20.8	35.5	-	
Eating disorders	34.8	45.2	-	
Vision impairment or blindness that cannot be corrected with glasses	36.0	41.9	-	
Hearing impairment or deafness that cannot be corrected with hearing aids	25.0	38.7	-	
Post-traumatic stress disorder	30.4	25.8	-	
Dyslipidaemia (treated)	24.0	29.0	-	
Physical disability	29.2	41.9	-	
Hypertension (untreated)	29.2	35.5	-	
Meniere's disease	29.2	25.8	-	
Dissociative or personality disorders	42.9	41.9	-	
Musculoskeletal problems due to injury	25.0	16.1	45.8	
Glaucoma	39.1	33.3	-	
Gall bladder problems	29.2	36.7	-	
Sleep apnoea	37.5	19.4	-	
Obsessive compulsive disorder	14.3	22.6	-	
Urinary incontinence	20.8	22.6	-	
Chronic/allergic rhinitis	16.7	16.1	-	
Gout	25.0	19.4	-	
Psoriasis	16.7	16.1	-	
Obesity	20.8	16.1	-	
Attention deficit hyperactivity disorder	19.0	12.9	-	
Somatoform disorders	5.0	17.2	-	
Hypertension (treated)	29.2	16.7	-	
Anxiety	25.0	16.7	-	
Benign cancers	17.4	17.2	-	
Migraine or other regular headache	20.8	12.9	-	
Gastroesophageal reflux	24.0	12.9	-	
Eczema	20.8	6.5	-	
Post-sepsis syndrome	23.8	28.6	-	
Chronic low back pain	-	-	24.0	
Cataract	20.8	16.1	-	
Treatment burden	12.5	20.0	-	
Side effects of medications	16.7	23.3	-	
Social deprivation and poverty	17.4	23.3	-	
Chronic sinusitis	16.0	9.7	-	
Nicotine dependence	13.6	22.6	-	
High cholesterol (untreated)	29.2	12.9	-	
Smoking	17.4	16.1	-	
Chronic insomnia	18.2	13.3	-	
Chronic urticaria	13.0	6.9	-	
Chronic gum disease	21.7	9.7	-	
Chronic cough	12.5	3.2	-	
Sedentary lifestyle	0.0	9.7	-	
Sexual dysfunction	13.6	13.8	-	
Edentulism	8.3	6.5	-	
Dizziness	17.4	3.2	-	
Infertility	22.7	17.2	-	
Treated cancer not requiring surveillance	-	-	8.0	

Table S10: Professional scores for 'usually include' (the sum of 'always' and 'usually')

Condition	Round 1 N=150 %	Round 2 N=112 %	Round 3 N=97 %	Professional panel consensus
Heart failure	98.7	-	-	Always include
Chronic liver disease	98.6	-	-	Always include
Diabetes	98.7	-	-	Always include
Parkinson's disease	98.0	-	-	Always include
End-stage kidney disease	94.6	-	-	Always include
Chronic obstructive pulmonary disease	98.7	-	-	Always include
Coronary artery disease	97.3	-	-	Always include
Dementia	96.6	-	-	Always include
Inflammatory bowel disease	94.0	-	-	Always include
Multiple sclerosis	94.0	-	-	Always include
Stroke	97.3	-	-	Always include
Connective tissue disease	97.3	-	-	Always include
Chronic kidney disease	97.3	-	-	Always include
HIV/AIDS	94.0	-	-	Always include
Metastatic cancers	91.1	-	-	Always include
Haematological cancers	94.0	-	-	Always include
Solid organ cancers	94.6	-	-	Always include
Paralysis	88.4	-	-	Always include
Cystic fibrosis	90.6	-	-	Always include
Schizophrenia	94.0	-	-	Always include
Epilepsy	95.3	-	-	Always include
Peripheral artery disease	92.6	-	-	Always include
Asthma	92.7	-	-	Always include
Depression	93.9	92.9	-	Usually include
Heart valve disorder	85.2	92.0	-	Usually include
Bipolar disorder	90.5	90.0	-	Usually include
Melanoma	87.7	88.2	-	Usually include
Addison's disease	-	83.7	86.9	Usually include
Bronchiectasis	-	78.6	86.7	Usually include
Osteoarthritis	87.9	84.7	-	Usually include
Pancreatic disease	88.9	84.4	-	Usually include
Arrhythmia	85.9	83.9	-	Usually include
Thyroid problems	83.9	82.7	-	Usually include
Venous thrombotic disease	77.4	82.4	-	Usually include
Drug/alcohol misuse	82.4	81.8	-	Usually include
Anaemia	75.0	81.7	-	Usually include
Chronic Lyme disease	-	61.5	81.3	Usually include
Transient ischaemic attack	76.7	80.4	-	Usually include
Hypertension (treated)	78.7	80.4	-	Usually include
Anxiety	86.5	80.0	-	Usually include
Treated cancer that requires surveillance	-	-	79.3	Usually include
Eating disorders	74.3	79.1	-	Usually include
Vision impairment or blindness that cannot be corrected with glasses	80.1	78.6	-	Usually include
Musculoskeletal problems due to injury	80.1	78.6	78.4	Usually include
Tuberculosis	82.4	76.6	-	Usually include
Gout	79.1	76.1	-	Usually include
Endometriosis	73.6	75.7	-	Usually include
Chronic primary pain	78.5	-	75.3	Usually include
Peptic ulcer	79.7	73.9	-	Usually include
Hearing impairment or deafness that cannot be corrected with hearing aids	70.9	73.9	-	Usually include
Post-acute COVID-19	-	70.3	73.4	Usually include
Post-traumatic stress disorder	77.5	73.4	-	Usually include

Psoriasis	77.0	73.4	-	Usually include
Benign cerebral tumours	-	-	73.3	Usually include
Peripheral neuropathy	83.4	73.1	-	Usually include
Hypertension (untreated)	73.6	73.0	-	Usually include
Sleep apnoea	77.2	72.9	-	Usually include
Congenital disease	79.7	72.6	-	Usually include
Chronic low back pain	-	-	72.2	Usually include
Chronic urinary tract infection	73.8	71.8	-	Usually include
Aneurysm	-	-	71.6	Usually include
Meniere's disease	63.0	71.3	-	Usually include
Migraine or other regular headache	68.9	71.3	-	Usually include
Osteoporosis	77.3	70.3	-	Usually include
Autism	63.0	70.1	-	Usually include
Obsessive compulsive disorder	63.6	70.1	-	Usually include
Dissociative or personality disorders	69.8	69.4	-	
Glaucoma	72.8	69.4	-	
Urinary incontinence	67.3	66.7	-	
Irritable bowel syndrome	63.9	66.1	-	
Polycystic ovary syndrome	66.9	65.4	-	
Chronic insomnia	69.3	64.5	-	
Obesity	69.1	64.0	-	
Dyslipidaemia (treated)	63.1	63.6	-	
Uterine (womb) problems	71.0	63.1	-	
Cataract	62.2	63.1	-	
Gall bladder problems	67.6	62.7	-	
Prostatic hypertrophy	55.0	62.1	-	
Attention deficit hyperactivity disorder	56.9	60.2	-	
Somatiform disorders	55.7	59.4	-	
Gastroesophageal reflux	60.5	59.1	-	
Chronic urticaria	59.6	58.7	-	
Malnutrition	64.5	57.5	-	
High cholesterol (untreated)	63.9	57.3	-	
Learning disability	53.3	55.1	-	
Kidney or bladder stones	57.1	55.1	-	
Physical disability	60.4	55.0	-	
Eczema	60.5	54.1	-	
Non-melanoma skin cancer	54.5	53.7	-	
Chronic sinusitis	54.1	53.6	-	
Chronic/allergic rhinitis	58.2	53.2	-	
Diverticulosis	69.7	50.0	-	
Chronic gum disease	46.2	49.1	-	
Nicotine dependence	42.9	48.1	-	
Sexual dysfunction	42.0	46.7	-	
Edentulism	38.8	41.1	-	
Smoking	45.6	37.8	-	
Social deprivation and poverty	41.0	36.6	-	
Infertility	33.3	33.6	-	
Post-sepsis syndrome	42.1	32.4	-	
Treatment burden	27.3	31.8	-	
Dizziness	33.6	30.6	-	
Side effects of medications	28.9	29.4	-	
Chronic cough	29.0	27.7	-	
Benign cancers	35.9	26.2	-	
Sedentary lifestyle	28.8	18.0	-	
Treated cancer not requiring surveillance	-	-	21.5	

Table S11: Public scores for ‘usually include’ (the sum of ‘always’ and ‘usually’)

Condition	Round 1 N=25 %	Round 2 N=31 %	Round 3 N=25 %	Public panel consensus
End-stage kidney disease	96.0	100.0	-	Always include
Heart failure	100.0	96.8	-	Always include
Dementia	92.0	96.7	-	Always include
Chronic liver disease	100.0	100.0	-	Always include
Stroke	92.0	96.8	-	Always include
Chronic kidney disease	100.0	100.0	-	Always include
Parkinson’s disease	92.0	96.8	-	Always include
Multiple sclerosis	100.0	100.0	-	Always include
Coronary artery disease	96.0	96.8	-	Always include
Cystic fibrosis	100.0	96.8	-	Always include
Diabetes	92.0	100.0	-	Always include
HIV/AIDS	91.7	90.3	-	Always include
Epilepsy	92.0	100.0	-	Always include
Addison’s disease	-	88.0	95.8	Always include
Metastatic cancers	91.7	96.7	-	Always include
Haematological cancers	91.7	100.0	-	Always include
Solid organ cancers	91.7	100.0	-	Always include
Inflammatory bowel disease	100.0	100.0	-	Usually include
Heart valve disorders	76.0	100.0	-	Usually include
Melanoma	91.7	100.0	-	Usually include
Chronic obstructive pulmonary disease	100.0	96.8	-	Usually include
Peripheral artery disease	88.0	96.8	-	Usually include
Venous thrombotic disease	80.0	96.8	-	Usually include
Transient ischaemic attack	88.0	96.8	-	Usually include
Aneurysm	-	96.8	-	Usually include
Pancreatic disease	96.0	96.7	-	Usually include
Anaemia	60.0	96.7	-	Usually include
Peripheral neuropathy	76.0	96.7	-	Usually include
Schizophrenia	91.3	93.5	-	Usually include
Bipolar disorder	95.7	93.5	-	Usually include
Connective tissue disease	83.3	93.3	-	Usually include
Paralysis	84.0	93.3	-	Usually include
Post-acute COVID-19	-	93.1	92.0	Usually include
Tuberculosis	91.7	90.3	-	Usually include
Congenital disease	88.0	90.0	-	Usually include
Prostatic hypertrophy	58.3	90.0	-	Usually include
Endometriosis	72.7	89.3	-	Usually include
Bronchiectasis	-	87.1	88.0	Usually include
Osteoarthritis	79.2	87.1	-	Usually include
Thyroid problems	75.0	87.1	-	Usually include
Autism	63.6	87.1	-	Usually include
Chronic urinary tract infection	60.0	86.7	-	Usually include
Polycystic ovary syndrome	72.7	86.2	-	Usually include
Arrhythmia	68.0	85.7	-	Usually include
Peptic ulcer	66.7	83.9	-	Usually include
Learning disability	50.0	83.9	-	Usually include
Asthma	96.0	80.6	-	Usually include
Osteoporosis	70.8	80.6	-	Usually include
Uterine (womb) problems	63.6	80.6	-	Usually include
Treated cancer that requires surveillance	-	-	80.0	Usually include
Chronic primary pain	76.0	-	80.0	Usually include
Malnutrition	57.1	80.0	-	Usually include
Non-melanoma skin cancer	69.6	80.0	-	Usually include
Chronic Lyme disease	-	83.9	79.2	Usually include

Depression	87.5	77.4	-	Usually include
Irritable bowel syndrome	68.0	76.7	-	Usually include
Kidney or bladder stones	52.0	76.7	-	Usually include
Benign cerebral tumours	58.3	-	76.0	Usually include
Diverticulosis	62.5	75.9	-	Usually include
Drug/alcohol misuse	78.3	74.2	-	Usually include
Eating disorders	72.0	74.2	-	Usually include
Vision impairment or blindness that cannot be corrected with glasses	58.3	74.2	-	Usually include
Hearing impairment or deafness that cannot be corrected with hearing aids	65.2	74.2	-	Usually include
Post-traumatic stress disorder	64.0	74.2	-	Usually include
Dyslipidaemia (treated)	70.8	74.2	-	Usually include
Physical disability	79.2	74.2	-	Usually include
Hypertension (untreated)	75.0	71.0	-	Usually include
Meniere's disease	81.0	71.0	-	Usually include
Dissociative or personality disorders	70.8	71.0	-	Usually include
Musculoskeletal problems due to injury	69.6	67.7	70.8	Usually include
Glaucoma	58.3	70.0	-	Usually include
Gall bladder problems	62.5	70.0	-	Usually include
Sleep apnoea	47.6	67.7	-	
Obsessive compulsive disorder	41.7	67.7	-	
Urinary incontinence	50.0	67.7	-	
Chronic/allergic rhinitis	41.7	67.7	-	
Gout	54.2	64.5	-	
Psoriasis	58.3	64.5	-	
Obesity	47.6	61.3	-	
Attention deficit hyperactivity disorder	45.0	61.3	-	
Somatoform disorders	83.3	58.6	-	
Hypertension (treated)	62.5	56.7	-	
Anxiety	52.2	56.7	-	
Benign cancers	58.3	55.2	-	
Migraine or other regular headache	56.0	54.8	-	
Gastroesophageal reflux	45.8	54.8	-	
Eczema	66.7	54.8	-	
Post-sepsis syndrome	-	53.6	-	
Chronic low back pain	41.7	-	52.0	
Cataract	29.2	51.6	-	
Treatment burden	41.7	50.0	-	
Side effects of medications	39.1	50.0	-	
Social deprivation and poverty	44.0	46.7	-	
Chronic sinusitis	40.9	45.2	-	
Nicotine dependence	66.7	45.2	-	
High cholesterol (untreated)	34.8	41.9	-	
Smoking	54.5	41.9	-	
Chronic insomnia	43.5	40.0	-	
Chronic urticaria	34.8	37.9	-	
Chronic gum disease	54.2	35.5	-	
Chronic cough	13.0	35.5	-	
Sedentary lifestyle	45.5	35.5	-	
Sexual dysfunction	25.0	34.5	-	
Edentulism	47.8	32.3	-	
Dizziness	45.5	32.3	-	
Infertility	-	27.6	-	
Treated cancer not requiring surveillance	-	-	24.0	

Table S12: Conditions not recommended to 'always include' or 'usually include' by both panels

Condition	Professional panel (%)	Public panel (%)	Both panels (difficulty parameter, logit)	Final consensus
Consensus to usually include in one panel (n=22)				
Hypertension (treated)	80.4 (R2)	56.7 (R2)	0.3 (R2)	Usually include*
Anxiety	80.0 (R2)	56.7 (R2)	0.4 (R2)	Usually include*
Gout	76.1 (R2)	64.5 (R2)	0.4 (R2)	Usually include*
Psoriasis	73.4 (R2)	64.5 (R2)	0.6 (R2)	No consensus
Sleep apnoea	72.9 (R2)	67.7 (R2)	0.6 (R2)	No consensus
Obsessive compulsive disorder	70.1 (R2)	67.7 (R2)	0.7 (R2)	No consensus
Prostatic hypertrophy	62.1 (R2)	90.0 (R2)	0.7 (R2)	No consensus
Polycystic ovary syndrome	65.4 (R2)	86.2 (R2)	0.7 (R2)	No consensus
Dissociative or personality disorders	69.4 (R2)	71.0 (R2)	0.7 (R2)	No consensus
Glaucoma	69.4 (R2)	70.0 (R2)	0.7 (R2)	No consensus
Chronic low back pain	72.2 (R3)	52.0 (R3)	0.8 (R3)	No consensus
Migraine	71.3 (R2)	54.8 (R2)	0.8 (R2)	No consensus
Uterine (womb) problems	63.1 (R2)	80.0 (R2)	0.8 (R2)	No consensus
Irritable bowel syndrome	66.1 (R2)	76.7 (R2)	0.8 (R2)	No consensus
Gall bladder problems	62.7 (R2)	70.0 (R2)	1.0 (R2)	No consensus
Malnutrition	57.5 (R2)	80.0 (R2)	1.1 (R2)	No consensus
Learning disability	55.1 (R2)	83.9 (R2)	1.2 (R2)	No consensus
Kidney or bladder stones	55.1 (R2)	76.7 (R2)	1.2 (R2)	No consensus
High cholesterol (untreated)	57.3 (R2)	74.2 (R2)	1.2 (R2)	No consensus
Non-melanoma skin cancer	53.7 (R2)	80.6 (R2)	1.3 (R2)	No consensus
Physical disability	55.0 (R2)	74.2 (R2)	1.3 (R2)	No consensus
Diverticulosis	50.0 (R2)	75.9 (R2)	1.5 (R2)	No consensus
No consensus in either panel (n=27)				
Urinary incontinence	66.7 (R2)	67.7 (R2)	0.9 (R2)	No consensus
Obesity	64.0 (R2)	61.3 (R2)	1.0 (R2)	No consensus
Cataract	63.1 (R2)	51.6 (R2)	1.2 (R2)	No consensus
Attention deficit hyperactivity disorder	60.2 (R2)	61.3 (R2)	1.2 (R2)	No consensus
Gastroesophageal reflux	59.1 (R2)	54.8 (R2)	1.3 (R2)	No consensus
Chronic insomnia	64.5 (R2)	40.0 (R2)	1.3 (R2)	No consensus
Dyslipidaemia (treated)	63.6 (R2)	41.9 (R2)	1.3 (R2)	No consensus
Somatoform disorders	59.4 (R2)	58.6 (R2)	1.3 (R2)	No consensus
Chronic/Allergic rhinitis	53.2 (R2)	67.7 (R2)	1.4 (R2)	No consensus
Eczema	54.1 (R2)	54.8 (R2)	1.5 (R2)	No consensus
Chronic urticarial (chronic hives)	58.7 (R2)	37.9 (R2)	1.6 (R2)	No consensus
Chronic sinusitis	53.6 (R2)	45.2 (R2)	1.7 (R2)	No consensus
Chronic gum disease	49.1 (R2)	35.5 (R2)	1.9 (R2)	No consensus
Nicotine dependence	48.1 (R2)	45.2 (R2)	2.0 (R2)	No consensus
Sexual dysfunction	46.7 (R2)	34.5 (R2)	2.1 (R2)	No consensus
Edentulism	41.1 (R2)	32.3 (R2)	2.3 (R2)	No consensus
Smoking	37.8 (R2)	41.9 (R2)	2.4 (R2)	No consensus
Social deprivation and poverty	36.6 (R2)	46.7 (R2)	2.4 (R2)	No consensus
Post-sepsis syndrome	32.4 (R2)	53.6 (R2)	2.5 (R2)	No consensus
Treatment burden	31.8 (R2)	50.0 (R2)	2.5 (R2)	No consensus
Benign cancers	26.2 (R2)	55.2 (R2)	2.7 (R2)	No consensus
Infertility	33.6 (R2)	27.6 (R2)	2.7 (R2)	No consensus
Side effects of medications	29.4 (R2)	50.0 (R2)	2.8 (R2)	No consensus
Chronic cough	27.7 (R2)	35.5 (R2)	2.9 (R2)	No consensus
Dizziness	30.6 (R2)	32.3 (R2)	2.9 (R2)	No consensus
Treated cancer not requiring surveillance	21.5 (R3)	24.0 (R3)	3.4 (R3)	No consensus
Sedentary lifestyle	18.0 (R2)	35.5 (R2)	3.4 (R2)	No consensus

* Consensus to 'usually include' in one panel and difficulty parameter across both panels ≤ 0.5

Table S13: Differential item functioning (used to examine which condition-choice items were more likely to be endorsed by panelists with varying interest in different populations [4])

Subgroup	Condition	Group 1 (b parameter, logit)	Group 0 (b parameter, logit)	Z-statistic	p-value
Panelists specifically interested in multimorbidity in women (group1) versus those not specifically interested (group 0)	Anaemia	-0.6	-0.2	-0.7	0.51
	Depression	-1.0	-1.8	0.9	0.35
	Anxiety	0.04	-0.1	0.3	0.78
	Dementia	-1.9	-2.8	0.9	0.35
	Eating disorder	-0.3	0.06	-0.5	0.62
	Osteoarthritis	-1.5	-0.3	-1.5	0.14
	Osteoporosis	0.04	0.7	-1.2	0.25
	Connective tissue disease	-2.6	-2.8	0.2	0.86
	Endometriosis	0.08	0.3	-0.3	0.78
	Chronic urinary tract infection	0.3	0.5	-0.4	0.71
	Polycystic ovary syndrome	0.9	0.9	-0.004	1.0
	Urinary incontinence	0.3	1.0	-1.2	0.25
	Uterus (womb) problems	1.0	1.0	0.004	1.0
Panelists specifically interested in multimorbidity in children (group1) versus those not specifically interested (group 0)	Anxiety	-0.8	0.01	-0.9	0.37
	Depression	-0.8	-1.7	1.0	0.32
	Drug/Alcohol misuse	-0.8	-0.2	-0.7	0.50
	Eating disorder	-0.2	0.02	-0.2	0.83
	Autism	-0.8	0.8	-1.8	0.07
	Learning disability	1.4	1.5	-0.08	0.94
	Attention deficit hyperactivity disorder	-0.2	1.4	-2.0	0.04
	Haematological cancers	-1.8	-1.9	0.01	1.0
	Benign brain tumour	2.9	3.2	-0.4	0.65
	Epilepsy	-1.0	-2.4	1.5	0.12
	Cystic fibrosis	-1.8	-1.3	-0.5	0.61
	Congenital diseases	-0.08	0.5	-0.7	0.46
	Asthma	-1.8	-1.6	-0.2	0.84
Panelists specifically interested in multimorbidity in socially-deprived populations (group1) versus those not specifically interested (group 0)	Anxiety	-0.7	0.4	-2.1	0.04
	Depression	-1.5	-2.0	0.6	0.56
	Schizophrenia	-1.5	-2.6	1.4	0.15
	Drug/Alcohol misuse	-0.4	-0.2	-0.4	0.71
	Nicotine dependence	1.6	1.9	-0.6	0.52
	Post-traumatic stress disorder	0.3	0.4	-0.2	0.85
	Bipolar disorder	-1.2	-1.1	-0.1	0.91
	Chronic liver disease	-3.4	-3.0	0.4	0.69
	HIV/AIDS	-2.0	-2.1	0.2	0.88

Subgroup	Condition	Group 1 (b parameter, logit)	Group 0 (b parameter, logit)	Z-statistic	p-value
	Tuberculosis	0.07	0.01	0.1	0.91

p-value larger than 0.05 indicates that there is no statistical difference between group 1 and group 0. A positive value for the z-statistic indicates that group 0 is more likely to endorse the condition than group 1.

Table S14: Level of endorsement of the condition-related items

Condition	Difficulty parameter (log(odds), 95% Confidence Interval)		
	Professional panel	Public panel	Both panels combined
System domain			
Cardiovascular diseases	-4.2 (-6.1 to -2.2)	-1.0 (-2.2 to 0.2)	-2.8 (-3.8 to -1.8)
Respiratory diseases	-3.8 (-5.8 to -1.8)	endorsed by all panelists	-3.9 (-5.9 to -2.0)
Neurological diseases	-3.4 (-4.9 to -2.0)	-1.5 (-2.9 to -0.03)	-2.8 (-3.8 to -1.8)
Metabolic and endocrine	-2.7 (-3.7 to -1.7)	-1.0 (-2.2 to 0.2)	-2.2 (-3.0 to -1.4)
Mental health	-2.2 (-3.1 to -1.4)	-0.2 (-1.1 to 0.8)	-1.6 (-2.2 to -0.9)
Haematological disorders	-2.0 (-3.0 to -1.1)	-1.0 (-2.2 to 0.2)	-1.7 (-2.5 to -1.0)
Cancers	-1.9 (-2.7 to 1.2)	-1.5 (-2.9 to -0.03)	-1.8 (-2.4 to -1.1)
Musculoskeletal diseases	-1.6 (-2.3 to 1.0)	-0.7 (-1.8 to 0.4)	-1.4 (-2.0 to -0.8)
Digestive diseases	-1.1 (-1.8 to -0.4)	-1.0 (-2.2 to 0.2)	-1.0 (-1.6 to -0.4)
Chronic infections	-1.2 (-1.9 to -0.5)	0.3 (-0.6 to 1.1)*	-0.7 (-1.2 to -0.2)
Urogenital disorders	-0.8 (-1.4 to -0.1)	-0.7 (-1.8 to 0.4)	-0.7 (-1.2 to -0.2)
Eye diseases	0.05 (-0.5 to 0.6)	0.3 (-0.6 to 1.1)*	0.1 (-0.3 to 0.6)*
Ear, Nose and Throat disorders	0.3 (-0.2 to 0.8)*	-0.2 (-1.1 to 0.8)	0.2 (-0.2 to 0.7)*
Oral disorders	0.4 (-0.05 to 0.9)*	0.1 (-0.8 to 1.0)*	0.4 (-0.02 to 0.8)*
Skin disorders	0.5 (0.02 to 1.0)*	0.1 (-0.8 to 1.0)*	0.4 (-0.02 to 0.9)*
Mental health and behaviour disorders			
Dementia	-2.4 (-3.4 to -1.5)	-2.2 (-4.2 to -0.2)	-2.3 (-3.2 to -1.5)
Schizophrenia	-1.7 (-2.4 to -1.0)	-1.5 (-2.9 to -0.03)	-1.6 (-2.2 to -1.0)
Depression	-1.5 (-2.3 to -0.7)	0.1 (-0.8 to 1.0)	-0.9 (-1.5 to -0.4)
Bipolar disorder	-1.0 (-1.7 to -0.3)	-1.5 (-2.9 to -0.03)	-1.1 (-1.7 to -0.5)
Anxiety	-0.02 (-0.6 to 0.5)	1.2 (0.4 to 1.9)	0.4 (-0.08 to 0.8)*
Drug/Alcohol misuse	-0.2 (-0.7 to 0.4)	0.3 (-0.6 to 1.1)*	-0.02 (-0.5 to 0.4)
Eating disorder	0.1 (-0.5 to 0.6)*	0.3 (-0.6 to 1.1)*	0.2 (-0.3 to 0.6)*
Post-traumatic stress disorder	0.5 (-0.002 to 1.0)*	0.3 (-0.6 to 1.1)*	0.5 (0.05 to 0.9)*
Dissociative or personality disorder	0.7 (0.3 to 1.2)	0.4 (-0.4 to 1.3)*	0.7 (0.3 to 1.1)
Chronic insomnia	1.0 (0.6 to 1.5)	1.9 (1.1 to 2.8)	1.3 (0.9 to 1.7)
Autism	0.7 (0.2 to 1.2)	-0.7 (-1.8 to 0.4)	0.5 (0.03 to 0.9)*
Obsessive compulsive disorder	0.5 (0.2 to 1.2)*	0.6 (0.2 to 1.4)	0.7 (0.3 to 1.1)
Attention deficit hyperactivity disorder	1.3 (0.8 to 1.7)	1.4 (0.7 to 2.2)	1.2 (0.8 to 1.6)
Somatoform disorders	1.3 (0.9 to 1.8)	1.0 (0.2 to 1.7)	1.3 (0.9 to 1.7)
Learning disability	1.5 (1.1 to 2.0)	-0.4 (-1.4 to 0.6)	1.2 (0.8 to 1.5)
Nicotine dependence	1.9 (1.5 to 2.3)	1.8 (1.0 to 2.5)	1.9 (1.5 to 2.3)
Cardiovascular diseases			
Heart failure	-3.4 (-4.9 to -2.0)	-2.2 (-4.2 to -0.2)	-3.1 (-4.3 to -2.0)
Coronary heart diseases	-2.7 (-3.7 to -1.7)	-2.2 (-4.2 to -0.2)	-2.6 (-3.5 to -1.6)
Stroke	-2.7 (-3.7 to -1.7)	-2.2 (-4.2 to -0.2)	-2.6 (-3.5 to -1.6)
Peripheral artery diseases	-1.5 (-2.2 to -0.9)	-2.2 (-4.2 to -0.2)	-1.6 (-2.2 to -0.9)
Arrhythmia	-0.4 (-1.0 to 0.2)	-0.6 (1.7 to 0.5)	-0.4 (-0.9 to 0.1)
Heart valve disorders	-0.3 (-0.8 to 0.2)	endorsed by all panelists	-1.6 (-2.3 to -0.9)
Venous thrombotic disease	-0.3 (-0.8 to -0.3)	-2.2 (-4.2 to -0.2)	-0.5 (-1.0 to -0.003)
Hypertension (treated)	-0.1 (-0.6 to 0.4)	1.2 (0.4 to 2.0)	0.3 (-0.1 to 0.7)*

Hypertension (untreated)	0.4 (-0.05 to 0.9)*	0.4 (-0.4 to 1.3)*	0.4 (-0.1 to 0.9)*
Aneurysm	0.6 (0.05 to 1.1)	-2.2 (-4.2 to -0.2)	0.5 (0.1 to 0.9)*
Dyslipidaemia (treated)	1.0 (0.6 to 1.5)	1.9 (1.1 to 2.7)	1.3 (0.9 to 1.7)
High cholesterol (untreated)	1.4 (0.9 to 1.8)	0.4 (-0.4 to 1.3)*	1.2 (0.8 to 1.5)
Disorders of the blood			
Anaemia	-0.2 (-0.7 to 0.4)	-2.2 (-4.2 to -0.2)	-0.4 (-0.9 to 0.08)
Cancers			
Solid organ cancers	-1.9 (-2.6 to -1.1)	endorsed by all panelists	-2.0 (-2.7 to -1.3)
Haematological cancers	-1.7 (-2.5 to -1.0)	endorsed by all panelists	-1.9 (-2.6 to -1.2)
Metastatic cancers	-1.3 (-1.9 to -0.6)	-2.2 (-4.2 to -0.2)	-1.3 (-1.9 to -0.7)
Melanoma	-0.8 (-1.5 to -0.2)	endorsed by all panelists	-1.1 (-1.7 to -0.5)
Treated cancers requiring surveillance	-0.04 (-0.6 to 0.5)	0.03 (-1.0 to 1.1)*	0.01 (-0.5 to 0.5)*
Benign cerebral tumours	0.3 (-0.2 to 0.9)*	0.3 (-0.7 to 1.3)*	0.4 (-0.1 to 0.8)*
Non-melanoma skin cancers	1.6 (1.2 to 2.0)	-0.1 (-1.0 to 0.9)	1.3 (0.9 to 1.7)
Benign cancers	3.2 (2.7 to 3.7)	1.3 (0.5 to 2.1)	2.7 (2.3 to 3.1)
Treated cancer not requiring surveillance	3.4 (2.9 to 4.0)	3.1 (2.1 to 4.1)	3.4 (2.9 to 3.9)
Neurological diseases			
Parkinson's disease	-3.0 (-4.2 to -1.8)	-2.2 (-4.2 to -0.2)	-2.8 (-3.8 to -1.8)
Epilepsy	-2.1 (-2.9 to -1.3)	endorsed by all panelists	-2.2 (-3.0 to -1.4)
Multiple sclerosis	-1.8 (-2.5 to -1.1)	endorsed by all panelists	-1.9 (-2.6 to -1.2)
Paralysis	-0.9 (-1.5 to -0.3)	-1.4 (-2.9 to 0.01)	-0.9 (-1.4 to -0.4)
Transient ischaemic attack	-0.1 (-0.6 to 0.4)	-2.2 (-4.2 to -0.2)	-0.4 (-0.8 to 0.1)
Chronic primary pain	0.2 (-0.3 to 0.8)*	0.003 (-1.0 to 1.1)*	0.2 (-0.2 to 0.7)*
Peripheral neuropathy	0.5 (-0.02 to 1.0)*	-2.2 (-4.2 to -0.2)	0.1 (-0.3 to 0.6)*
Sleep apnoea	0.5 (-0.3 to 1.0)*	0.6 (-0.2 to 1.4)	0.6 (0.2 to 1.0)
Migraine	0.5 (0.1 to 1.1)*	1.3 (0.5 to 2.1)	0.8 (0.4 to 1.2)
Metabolic and endocrine disorders			
Diabetes	-3.4 (-4.9 to -2.0)	endorsed by all panelists	-3.5 (-4.9 to -2.1)
Cystic fibrosis	-1.2 (-1.8 to -0.6)	-2.2 (-4.2 to -0.2)	-1.3 (-1.9 to -0.7)
Thyroid disorders	-0.3 (-0.9 to 0.3)	-0.7 (-1.8 to 0.4)	-0.3 (-0.8 to 0.2)
Addison's disease	-0.6 (-1.3 to 0.1)	-1.7 (-3.8 to 0.3)	-0.8 (-1.4 to 0.1)
Malnutrition	1.4 (0.9 to 1.8)	-0.1 (-1.0 to 0.9)	1.1 (0.7 to 1.5)
Musculoskeletal diseases			
Connective tissue disease	-3.4 (-4.8 to -2.0)	-1.4 (-2.9 to 0.01)	-2.3 (-3.1 to -1.5)
Osteoarthritis	-0.5 (-1.0 to 0.1)	-0.7 (-1.8 to 0.4)	-0.5 (-1.0 to 0.04)
Long-term musculoskeletal impairment due to injuries	0.01 (-0.5 to 0.6)*	0.6 (-0.3 to 1.6)	0.2 (-0.3 to 0.7)*
Gout	0.2 (-0.3 to 0.7)*	0.8 (-0.009 to 1.6)	0.4 (0.01 to 0.9)*
Chronic low back pain	0.5 (-0.1 to 1.0)*	1.6 (0.7 to 2.4)	0.8 (0.3 to 1.2)
Osteoporosis	0.6 (0.2 to 1.1)	-0.2 (-1.1 to 0.8)	0.5 (0.08 to 0.9)*
Respiratory diseases			
Chronic obstructive pulmonary disease	-3.4 (-4.8 to -2.0)	-2.2 (-4.2 to -0.2)	-3.1 (-4.2 to -1.9)
Asthma	-1.5 (-2.2 to -0.9)	0.2 (-1.1 to 0.8)	-1.1 (-1.7 to -0.6)
Bronchiectasis	-0.7 (-1.3 to 0.001)	-1.1 (-2.6 to 0.4)	-0.7 (-1.3 to -0.1)
Post-acute COVID-19	0.4 (-0.2 to 0.9)*	-0.6 (-1.9 to 0.6)	0.2 (-0.3 to 0.7)*
Chronic/Allergic rhinitis	1.6 (1.2 to 2.0)	0.6 (-0.2 to 1.4)	1.4 (1.0 to 1.8)

Infectious diseases			
HIV/AIDS	-1.7 (-2.5 to -1.0)	-1.0 (-2.2 to 0.2)	-1.5 (-2.2 to -0.9)
Chronic Lyme disease	-0.1 (0.7 to 0.5)	0.2 (-0.9 to 1.2)*	-0.03 (-0.5 to 0.5)
Tuberculosis	0.2 (-0.3 to 0.7)*	-1.0 (-2.2 to 0.2)	0.07 (-0.4 to 0.5)*
Digestive diseases			
Chronic liver diseases	-3.4 (-4.8 to -2.0)	endorsed by all panelists	-3.5 (-4.9 to -2.1)
Inflammatory bowel disease	-1.8 (-2.5 to -1.0)	endorsed by all panelists	-1.9 (-2.6 to -1.2)
Pancreatic disease	-0.4 (-1.0 to 0.1)	-2.2 (-4.2 to -0.2)	-0.7 (-1.2 to -0.1)
Peptic ulcer	0.4 (-1.0 to 0.9)*	-0.4 (-1.4 to 0.6)	0.3 (-0.2 to 0.7)*
Irritable bowel syndrome	0.9 (0.4 to 1.4)	0.1 (-0.8 to 1.0)*	0.8 (0.4 to 1.2)
Gall bladder disorders	1.1 (0.6 to 1.5)	0.5 (-0.3 to 1.4)*	1.0 (0.6 to 1.4)
Gastroesophageal reflux	1.3 (0.9 to 1.7)	1.3 (0.5 to 2.1)	1.3 (0.9 to 1.7)
Diverticulosis	1.8 (1.4 to 2.3)	0.1 (-0.8 to 1.0)*	1.5 (1.1 to 1.9)
Urogenital diseases			
Chronic kidney disease	-2.7 (-3.7 to -1.7)	endorsed by all panelists	-2.8 (-3.8 to -1.8)
End-stage kidney disease	-1.9 (-2.6 to -1.1)	endorsed by all panelists	-2.0 (-2.7 to -1.2)
Endometriosis	0.3 (-0.2 to 0.8)*	-0.7 (-2.0 to 0.5)	0.1 (-0.3 to 0.6)*
Chronic urinary tract infection	0.5 (-0.05 to 1.0)*	-0.6 (-1.7 to 0.4)	0.3 (-0.1 to 0.8)*
Polycystic ovary syndrome	0.9 (0.5 to 1.4)	-0.6 (-1.7 to 0.5)	0.7 (0.2 to 1.1)
Urinary incontinence	0.9 (0.4 to 1.3)	0.6 (-0.2 to 1.4)	0.9 (0.5 to 1.3)
Uterine (womb) problems	1.1 (0.6 to 1.5)	-0.2 (-1.1 to 0.8)	0.8 (0.4 to 1.2)
Prostatic hypertrophy	1.1 (0.7 to 1.6)	-1.0 (-2.2 to 0.2)	0.7 (0.3 to 1.2)
Kidney or bladder stones	1.5 (1.1 to 2.0)	0.1 (-0.8 to 1.0)*	1.2 (0.8 to 1.6)
Sexual dysfunction	2.0 (1.5 to 2.4)	2.3 (1.5 to 3.2)	2.1 (1.7 to 2.5)
Infertility	2.7 (2.2 to 3.2)	2.8 (1.9 to 3.7)	2.7 (2.3 to 3.1)
Skin disorders			
Psoriasis	0.4 (-0.05 to 0.9)*	0.8 (-0.009 to 1.6)	0.6 (0.2 to 1.0)
Eczema	1.6 (1.1 to 2.0)	1.3 (0.5 to 2.1)	1.5 (1.2 to 1.9)
Chronic urticarial	1.4 (0.9 to 1.8)	2.1 (1.3 to 2.9)	1.6 (1.2 to 2.0)
Eye diseases			
Vision impairment that cannot be corrected with glasses	0.05 (-0.5 to -0.6)*	0.3 (-0.6 to 1.1)*	0.1 (-0.3 to 0.6)*
Glaucoma	0.7 (0.2 to 1.1)	0.5 (-0.3 to 1.3)*	0.7 (0.3 to 1.1)
Cataract	1.0 (0.6 to 1.5)	1.4 (0.7 to 2.2)	1.2 (0.8 to 1.6)
ENT disorders			
Hearing impairment that cannot be corrected with hearing aids	0.4 (-0.1 to -0.9)*	0.3 (-0.6 to 1.1)*	0.4 (-0.02 to 0.8)*
Meniere's disease	0.6 (0.1 to 1.1)	0.4 (-0.4 to 1.3)*	0.5 (0.2 to 1.0)*
Chronic sinusitis	1.6 (1.1 to 2.0)	1.8 (1.0 to 2.5)	1.7 (1.3 to 2.0)
Oral disorders			
Chronic gum disease	1.3 (0.9 to 1.7)	2.3 (1.4 to 3.1)	2.0 (1.6 to 2.4)
Edentulism	1.9 (1.5 to 2.3)	2.4 (1.6 to 3.3)	2.3 (1.9 to 2.7)
Congenital and chromosomal abnormalities	0.5 (-0.003 to 1.0)*	-1.0 (-2.2 to 0.2)	0.2 (-0.2 to 0.7)*
Risk factors/Symptoms/Behaviour			
Obesity	1.0 (0.5 to 1.4)	1.0 (0.2 to 1.7)	1.0 (0.6 to 1.4)
Physical disability	1.5 (1.1 to 2.0)	0.3 (-0.6 to 1.1)*	1.3 (0.9 to 1.6)

Smoking	2.5 (2.0 to 2.9)	1.9 (1.1 to 2.7)	2.4 (2.0 to 2.8)
Social deprivation or poverty	2.5 (2.1 to 3.0)	1.7 (0.9 to 2.5)	2.4 (2.0 to 2.8)
Post-sepsis syndrome	2.8 (2.3 to 3.3)	1.4 (0.5 to 2.2)	2.5 (2.1 to 2.9)
Treatment burden	2.8 (2.4 to 3.3)	1.5 (0.4 to 2.3)	2.5 (2.2 to 2.9)
Dizziness	2.9 (2.4 to 3.4)	2.4 (1.6 to 3.3)	2.9 (2.4 to 3.4)
Side effects of medicines	3.0 (2.5 to 3.4)	1.5 (0.4 to 2.3)	2.8 (2.4 to 3.2)
Chronic cough	3.1 (2.6 to 3.6)	2.3 (1.4 to 3.1)	2.9 (2.5 to 3.3)
Sedentary lifestyle	3.8 (3.3 to 4.4)	2.3 (1.4 to 3.1)	3.4 (3.0 to 3.9)

Lower difficulty parameter estimates indicate more frequent endorsement of items. Here we classified the numbers to three levels— ≤ 0 (in bold) indicates strongly endorsed, 0-0.5 indicates endorsed (*), and >0.5 indicates infrequently endorsed [5, 6]

References

1. Boone, W.J., *Rasch Analysis for Instrument Development: Why, When, and How?* CBE life sciences education, 2016. **15**(4): p. 1-7.
2. Ptukhin, Y. and Y. Sheng, *Comparing two maximum likelihood algorithms for mixture Rasch models.* Behaviormetrika, 2019. **46**(1): p. 101-119.
3. Khine, M.S., *Rasch measurement applications in quantitative educational research.* 2020, Singapore: Springer.
4. Hagquist, C. and D. Andrich, *Recent advances in analysis of differential item functioning in health research using the Rasch model.* Health and Quality of Life Outcomes, 2017. **15**(181): p. 1-8.
5. Hays, R.D., L.S. Morales, and S.P. Reise, *Item response theory and health outcomes measurement in the 21st century.* Medical care, 2000. **38**(9): p. II28-II42.
6. Verhelst, N.D., *Item response theory*, in *Relating Language examinations to the Common European Framework of Reference for Languages: learning, teaching, assessment 2004*, Language Policy Division: Strasbourg.