CoSign
Community-based signposting tool

University of Essex

NIHR | Applied Research Collaboration East of England

CoSign: A Community-Based Signposting Tool for Mental Distress
Technical Report and Guidance

2 Background

Wider determinants of mental health include societal, economic and environmental factors, such as income and poverty, social relationships, and climate change. These factors significantly impact mental health in the UK[1]. The NHS 10-Year health plan for England[2], recognised the opportunities offered by moving towards a model of community-based healthcare, including reducing demand on overstretched mental health services. Social prescribing emerged from community-based initiatives as a model to refer people experiencing social problems or mild mental health conditions to community-based support based on the individual’s interests and preferences.

[1] Kirkbride JB, Anglin DM, Colman I, Dykxhoorn J, Jones PB, Patalay P, et al. The social determinants of mental health and disorder: evidence, prevention and recommendations. World Psychiatry. 2024;23(1):58-90

[2] NHS England. Fit for the Future: 10 Year Health Plan for England nd [Available from: https://www.england.nhs.uk/long-term-plan/

A tool that can assess whether a particular wider determinant is causing or exacerbating mental distress and can be used independently of health care providers may help people identify factors which are causing or triggering their distress and then to find relevant support without needing to visit a health professional first. This may serve as both empowering individuals to identify their own needs and find support; as well as an early intervention approach, preventing escalation of difficulties which would otherwise lead to the need to access NHS care and/or living with an unmet mental health need, for example, on a waiting list.

Several tools which take into account the wider determinants of mental health have previously been developed in the UK to measure outcomes or to assess need in primary and secondary care settings, e.g. dialogue+, Outcomes Star, Live Well Social prescribing tool. CoSign is not intended to act as or replace outcome measurement tools or as a diagnostic tool. **CoSign has been designed to support an individual over 18 to identify specific wider determinants that may be triggering their current distress and to facilitate signposting to appropriate community-based support**. The signposts generated by CoSign can be used either by individuals or professionals (e.g. social prescribers, community workers, GPs) to signpost individuals to community-based services that are able to offer practical support to tackle the issue.

3 University of Essex Research Team

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4 Funding

The development of CoSign has been supported to date through funding and contributions from multiple stakeholders to enable its design, testing, and implementation.

- **National Institute for Health and Care Research (NIHR) Applied Research Collaboration East of England (NIHR ARC EoE) at Cambridgeshire and Peterborough NHS Foundation Trust**: Provided funding of £66,000 between October 2024 and March 2026 to support the initial stages of tool development, including allocated researcher time and associated project resources. Note that the views expressed are those of the author(s) and not necessarily those of the NIHR or the Department of Health and Social Care.
- **In-kind contributions**: The research team (Prof Susan McPherson, Prof Meena Kumari, Dr Cara Booker) contributed additional time and expertise between October 2024 and March 2026 as part of their employment with University of Essex.

CoSign uses questionnaire items reused in full or adapted from Understanding Society. Understanding Society is the UK Household Longitudinal Study based at the Institute for Social and Economic Research at the University of Essex. Understanding Society is primarily funded by ESRC along with a range of additional financial support.

This section will be updated in subsequent versions of this document should additional funding contribute to further development and evaluation phases of CoSign.

5 Intellectual Property

In accordance with standard employment terms, intellectual property (IP) generated through this work is retained by the University of Essex.

IP derived from both staff at the University of Essex and materials from Understanding Society underpin the development of the tool. As stated, IP generated by University of Essex staff is owned by the University of Essex in accordance with standard employment contracts, and the terms of funding received further support the University's ownership of IP arising from the development of the tool.

Materials drawn from Understanding Society, including certain questionnaire items which are re-used in full or adapted for use within the tool, have been incorporated in line with permitted terms, with no identified restrictions affecting their application. This therefore supports Freedom to Operate (FTO), defined as the ability to use, develop, and deploy a tool without infringing third-party intellectual property rights. In this context, all foreground IP generated through funded activities, together with relevant background IP, is held by the University of Essex. Intellectual Property for the original Understanding Society items within it also remain with the University of Essex.

6 Community Engagement and Involvement

The need for a signposting tool based on wider determinants of mental health itself derived from prior engagement work with the researchers' local community mental health sector. Community Engagement and Involvement (CEI) in the development of CoSign was planned using the INVOLVE research-cycle involvement framework[3], which outlines opportunities for public involvement across the stages of research. The IAP2 Spectrum of Public Participation[4], was used to identify appropriate levels of participation for each group across the stages of research and included "informing", "consulting", "involvement" and "collaboration". All engagement activities were guided by the UK Standards for Public Involvement to ensure that engagement was inclusive, supportive and collaborative[5].

A total of 29 stakeholders (numbers varied across activities), including mental health practitioners, Voluntary, Community, and Social Enterprise sector (VCSE), local policymakers and people with lived experience contributed to developing the signposting tool.

CEI was critical in the development of CoSign
to ensure that practical considerations about how the tool might work in practice were taken into account:

- to advise on appropriate local services to which people might be signposted
- to ensure the Tool avoided jargon and remained accessible to users (e.g. considering digital exclusion, translation, people with hearing/visual impairments);
- to ensure face validity of any question items included in the tool

CoSign was initially developed in the county of Essex (UK) with local stakeholders and therefore makes use of community assets and asset map within Essex. Further adaptations of CoSign will in

[3] INVOLVE. Public involvement in research: Research cycle involvement stages. . National Institute for Health Research.; 2012-2019.

[4] International Association for Public Participation. IAP2 Spectrum of Public Participation 1992 [Available from: https://www.iap2.org/page/pillars

[5] National Institute for Health and Care Research. UK Standards for Public Involvement in Research 2019 [Available from: https://www.nihr.ac.uk/news/nihr-announces-new-standards-public-involvement-research.

future involve developing functionality for other areas in the UK, potentially linking to asset maps based on the location of the user.

7 Stages of Development

7.1 Generating Keywords - Wider Determinants of Mental Health

Stakeholders took part in an activity using Padlet to generate any words or phrases ("keywords") that they considered to be reflect the wider determinants of mental health. Wider determinants were defined as social, economic or environmental determinants. Determinants related to individual psychological or biological factors were not included as well as factors relating to an individual's personal history such as trauma. The research team then identified items from the Understanding Society questionnaire (UKHLS) that could be used to measure each keyword.

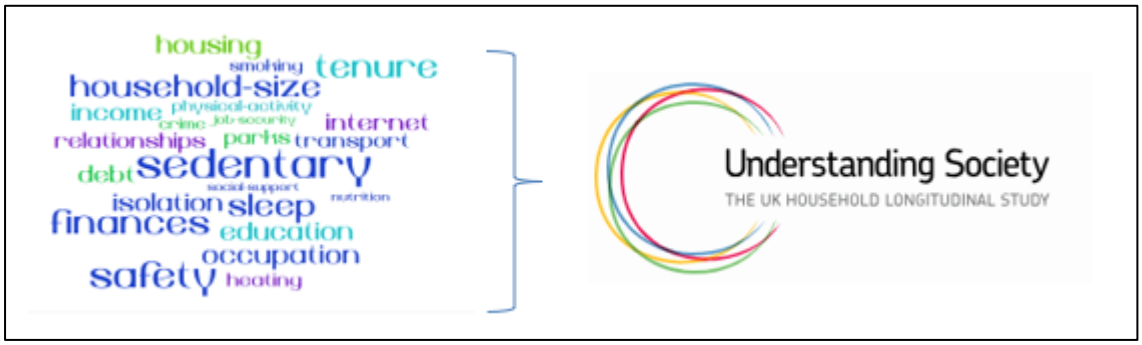

Figure 1: Process of feeding keywords into the dataset

Forty-five keywords associated with 329 UKHLS question items were identified in this stage of development.

7.2 Categorising and refining keywords

The research team, with input from our stakeholder partners, using a Qualtrics sorting task, grouped the keywords into themes.

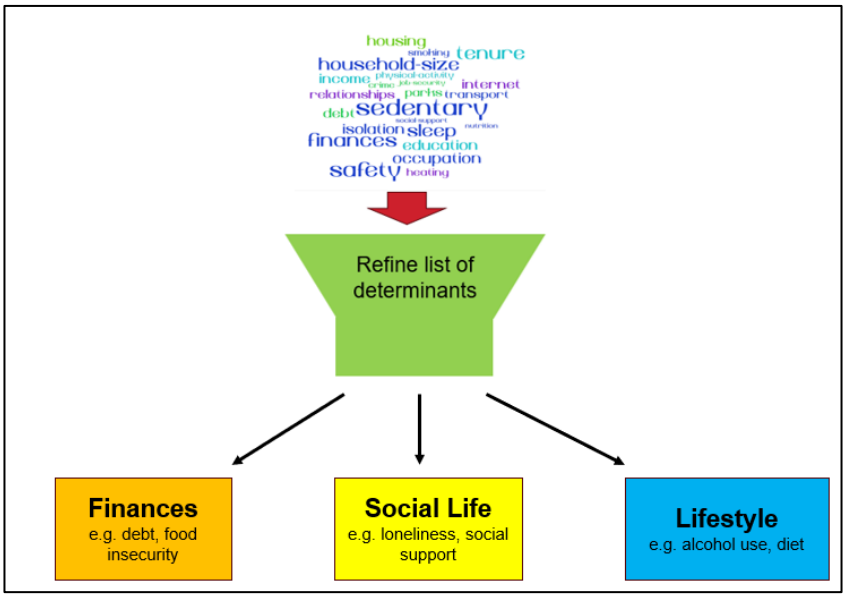

Figure 2: Process of turning keywords into themes

Cite as: McPherson S, Wicks C, Booker C, Kumari M (2026). CoSign: A Community-Based Signposting Tool for Mental Distress Technical Report and Guidance. University of Essex.

The themes and keywords identified at this stage are listed in Table 1. Each keyword had between 1 to 20 possible UKHLS items linked to it.

7.3 Item selection

To decide which UKHLS items to include in the tool, data analysis was undertaken using data from UKHLS. Data were used from waves 9-14 of UKHLS.

7.3.1 *Principal Component Analysis*

Principal component analysis (PCA) was conducted to reduce the number of items within each keyword and to identify the item(s) that contributed the most to the variation within each keyword. In cases where keywords consisted of solely continuous variables, linear PCA was conducted. However, several keywords had only categorical variables and in these cases tetrachoric PCA was conducted. Where a keyword was represented by a combination of continuous and categorical variables, continuous variables were converted into categorical variables, usually based on the median value.

Table 1: Initial themes and keywords

Themes	Keywords	Keywords
Your lifestyle	Alcohol use	Physical inactivity
	Gambling	Poor diet
Your job	Worries about work	Lack of support at work
	Poor management at work	Job insecurity
	Workload	Employment
	Meaningful employment	
The people you live with	Family dynamics	Caring responsibilities
	Relationship status	Domestic abuse
Your social life	Loneliness	Self-isolation
	Lack of digital connectivity	Access to personal vehicle
	Social support	Relationship status
	Social isolation	Barriers to language & communication
	Lack of local connections	Low literacy skills
Your experiences of discrimination	Experiences of discrimination	Stigma/discrimination due to sexual orientation
	Racial discrimination	
The home you live in	Lack of space in accommodation	Housing tenure
	Damp in home	Quality of accommodation
Your finances	Debt	Food insecurity
	Poverty	Unemployment
	Lack of income	Finances
	Financial benefits	
The area you live in	Poor public transport links	Community safety
	Pollution	Lack of belonging to place
	Vandalism	

After the PCA was conducted, project team members reviewed the outcomes and discussed whether certain items should be excluded or combined with others. These decisions were primarily based on two criteria: firstly, how much the item contributed to the keyword variance and secondly whether

questions/items could be combined, since the way they are asked in UKHLS were sometimes too detailed or complicated for use in a signposting tool. Thus, several items were dropped or combined for the second round of PCA.

After these decisions were made, a second round of PCA was conducted with 45 keywords represented by 136 questionnaire items. Discussions were held with the project team to review the PCA outcomes and identify the items which contributed most to the variation or were deemed to be important items to include in a community signposting tool. Results of the PCA were discussed by the research team who examined factor loadings and considered which items to retain for the next stage of development. For most keywords, items that were retained were those where there was a single item only; or where the item had the highest factor loading within each of the factors identified. In some cases, additional reflections on face validity of the item to properly reflect the keyword led to the team selecting an item with the second highest factor loading rather than the highest factor loading. At the end of this stage, there were 79 UKHLS items remaining.

7.3.2 Linear Regression

The next step was to identify which of the remaining items were highly associated with mental health. The 12-item GHQ scale was used as the primary indicator of mental health. The continuous Likert scoring method was used (0-36) with higher scores indicating more psychological distress. Data for the mental heath variables came from wave 14.

Each of the 8 themes (containing 79 UKHLS items in total) were regressed against GHQ-12. All themes had at least one keyword that was significantly associated with the outcomes. Fifty-four items were significantly associated with GHQ-12. A second round of linear regression models were run including only the significant keywords, per outcome, from the previous round. The findings were similar to the first round, however there were no keywords within the discrimination theme that were significantly associated with either outcome. Overall, 31 items were associated with GHQ-12.

7.3.3 LASSO Regression

A second variable reduction method was conducted as a comparison to PCA. LASSO regression is machine learning model used to reduce variables in a model while producing a predictive model. LASSO, also known as L1 regularization for linear regression, introduces a penalty constraint λ (lambda) to adjust the complexity of the least squares estimation of the regression model which can avoid problems of overfitting. We used LASSO as an alternative variable reduction method due to its ability to eliminate multicollinearity issues through its ability to address data such as that used here that has many dimensions and where there are high levels of correlation between variables being included in the regression model. Models were estimated separately for each mental health outcome using 136 variables which were taken from the variables included in the second step PCA due to changes in variables included in the first step.

In the GHQ-12 LASSO regression model, 100 items were identified as having a significant association with mental health. Broadly, there was considerable overlap in terms of items identified by linear regression and items identified by the Lasso model.

7.3.4 Final item selection

To select items for the final Tool, the research team discussed each theme in detail, taking into account the importance of having at least one item within each theme; representing as many keywords within each theme as possible; ensuring good face validity of the items selected; and where the above conditions were met, picking the item with the strongest association with the GHQ-12. Priority was

given to items which met all of the above criteria and which were also identified by the Lasso model. For most themes and keywords, it was clear which item best met the criteria to be selected for the Tool. Some items required further discussion. For example, having to skip a meal (representing the keyword "food insecurity") was the only item for this keyword but was not identified as significant in linear regression or Lasso modelling. This item was retained because the keyword had been flagged as critical by stakeholders and wider literature indicated this was increasingly an area of high need linked to mental health presentations. The research team considered that emerging patterns in service use may be important to take into account given the changing social and economic conditions in the UK which may have escalated since the UKHLS data were collected. Since the Tool will be piloted and subject to further live evaluation and data collection, it was felt that it would be feasible to keep some items like this which could be removed in future stages of development if there continued to be no association with mental health.

8 Questionnaire Flow

The final tool contains 31 UKHLS items across the eight themes, plus the screening questions below required for certain items which are situation dependent. Responses to the screening questions determine which of the items are shown to an individual using the tool:

- What is your current relationship status
- Which of the following best describes your current employment situation?
- Do you have any immediate family?
- Do you have caring responsibilities for people that you live with?

The tool also includes brief explanatory information at the start giving users information about how data will be used and who the tool is aimed at. It includes statements about when the tool is not suitable i.e. when someone feels they are experiencing trauma-related distress or are at risk of harm.

Signposts provided when an individual scored high on any item were collated using local asset maps for community mental health services and support. Signposting messages incorporating these services were designed by the research team in collaboration with local stakeholders.

The final prototype for the tool included the following components:
31 UKHLS items (some with slight modifications to simplify and enable binary responses)
Questionnaire flow components (e.g. user information, option to give feedback etc)
Signpost messages based on local services and support

This prototype was assembled on Qualtrics and presented to stakeholders who provided feedback on the overall design and flow. This feedback was used to refine the prototype.

9 Publications

Wicks, C., Booker, C., Kumari, M. *et al.* Community engagement and involvement in developing a community-based signposting tool for mental distress. *Res Involv Engagem* **12**, 111 (2026). https://doi.org/10.1186/s40900-026-00939-9

Booker C, Wicks C, Kumari M, Clarke P, McPherson S (under review). "Developing a community-based signposting tool for mental distress from Understanding Society items using traditional and machine learning analysis"

10 UKHLS Item Sources

The full list of UKHLS items and their source is provided below. See Main survey - Understanding Society for further details and documentation specific to Understanding Society.

10.1 Items in "Your Lifestyle" category

Question	Variable	UKHLS Module	Source	Modifications made for Signposting Tool
Six or more drinks frequency	Auditc5	Alcohol Consumption Audit-c Module	AUDITC	None
Moderate Exercise METs	Mdrt_MET	Exercise module	IPAQ	Changed from:" How much time in total did you spend over the last 7 days doing moderate physical activities" TO: "On average, do you do at least 150 minutes of moderate intensity physical activity per week (e.g., brisk walking, cycling) OR 75 minutes of vigorous intensity per week (e.g., running, sports)". (Yes/No)
Days each week eat vegetables	wkvege	Nutrition module	Adapted from HILDA	None

10.2 Items in "your job" category

Question	Variable	UKHLS Module	Source	Modifications made for Signposting Tool
Job Anxiety (combine depenth1-3)	jb_anx	Work conditions	Skills Survey	Derived from Job-related Wellbeing Scale: Anxiety subscale. Question reworded: "Thinking of the past few weeks, how much of the time has your job made you feel tense, uneasy or worried."
Job Depression (combine depenth 4-6)	jb_dep	Work conditions	Skills Survey	Derived from Job-related Wellbeing Scale: Anxiety subscale. Question reworded: "Thinking of the past few weeks, how much of the time has your job made you feel depressed, gloomy or miserable."
Flexible Working (combine jbflex4-6)	FlxAFWA	Work conditions	DWP/BERR	Reworded from: "I would like to ask about working arrangements at the place where you work. Which of the following arrangements are available at your workplace?" TO: "If you personally needed any of these, are any of the following flexible working arrangements are available at your workplace? Flexi-time, working compressed hours, working annualised hours." (Yes/No/I don't know).
Job satisfaction	jbsat	Jobsatisfaction	BHPS adapted	None
Would like: Work related training	Jblkchb	Work conditions	BHPS	None
Job security in next 12 months	jbsec	Work conditions	Adapted from HILDA	None
Would like: New job with a new employer	Jblkchc	Work conditions	BHPS	None

10.3 Items in "People you live with" category

Question	Variable	UKHLS Module	Source	Modifications made for Signposting Tool
Can rely on family	scrrely	Social support	ELSA/HRS	None
Spouse criticises me	pcritic	Social support	ELSA/HRS	None
Caring prevents paid employment	aideft	Caring	FACs	Response changed to yes / no

10.4 Items in "Your social life" category

Question	Variable	UKHLS Module	Source	Modifications made for Signposting Tool
How often feels lonely	Sclonely	Loneliness	ELSA	None
Has WiFi access at home	Homewifi	Household	BHPS	None
Can rely on spouse/partner	prely	Social support	ELSA/HRS	None
Talk regularly to neighbours	nbrhdh	Neighbourhood	UKHLS W1 Self-Completion Questionnaire	None
Difficulty speaking day to day English	engspk	Language	UKHLS	None
Type of impairment: communication	disdif7	Disability	FRS (adapted)	Reworded from: "you have any health problems or disabilities that mean you have substantial difficulties with any of the following areas of your life?" TO: "Do you have any health problems or disabilities that mean you have substantial difficulties with communication or speech?" (Yes/No)
Active in organisations	orga1-16	Groups and Organisations	BHPS	Combined into 1 item: "Are you a member of or do you join in the activities of any local organisations on a regular basis e.g. sports groups, community groups, political parties, parents groups etc?" Yes/no

10.5 Items in "Experiences of discrimination" category

Question	Variable	UKHLS Module	Source	Modifications made for Signposting Tool
Have you experienced discrimination based on any of your personal characteristics?	N/A	N/A	N/A	Developed for questionnaire

10.6 Items in "The home you live in" category

Question	Variable	UKHLS Module	Source	Modifications made for Signposting Tool
Damp-free house	pdeph	Household	Department for Work and Pensions	Response options changed: Yes / No
Adequate heating	hheat	Household	FRS	"Doesn't apply" response option dropped
Does the number of people living in your house mean more than two people have to share a bedroom?	N/A	N/A	N/A	Originated from hhsize - wording changed to: "Does the number of people living in your household mean more than two people have to share a bedroom?"

10.7 Items in "Your finances" category

Question	Variable	UKHLS Module	Source	Modifications made for Signposting Tool
Your finances				
Money for self: a small amount of money to spend each week on yourself (not on your family)?	matdepi	Household	FRS	Response options changed: Yes / No
Keep up with bills	matdepj	Household	FRS	Changed from: "Do you (and your family/partner) have... Keep up with bills and regular debt repayments?" TO: "Sometimes people are not able to pay every household bill when it falls due. May we ask, are you up to date with all your household bills such as electricity, gas, water rates, telephone and other bills or are you behind with any of them?" Response options: up to date with bills / behind with some bills / behind with all bills.
Receives core benefits (combined benbase1-4)	Core_ben	Benefits	UKHLS	Changed from "First, are you currently receiving any of these payments (list provided)" TO: "Please think about ALL of the extra sources of income you receive, as well as any benefits or tax credits. We'd like to remind you that all of your responses are completely confidential. Are you currently receiving any of these payments: Income Support, Job Seeker's Allowance, Child Benefit, Universal Credit." (Yes / No).
Had to skip a meal	skipmeal	Household	UN Food Insecurity Experience Scale	None
Would like a regular paid job	Julkjb	Non-employment	BHPS	Changed slightly: "Although you are not looking for paid work at the moment…" TO "Although you are not in employment at the moment…"

10.8 Items in "The area you live in" category

Question	Variable	UKHLS Module	Source	Modifications made for Signposting Tool
Standard of public transport	Locserc	Local neighbourhood	BHPS adapted	None
Extent of worry about crime	Crwob & Crworb	Local neighbourhood	BHPS	Two items combined to create: "Do you ever worry about the possibility that you, or anyone else who lives with you, might be the victim of crime? If so, is this a big worry, a bit of a worry, or an occasional doubt?" Response options: big worry, a bit of a worry, or an occasional doubt, I do not worry about this (additional response added).
Belong to neighbourhood	scopngbha	Nieghbourhood	UKHLS W1 Self-Completion Questionnaire	Changed slightly: "Here are some statements about neighbourhoods. Please answer how strongly you agree or disagree with each statement." TO: "To what extent do you agree that you feel like you belong to your neighbourhood?"