PROTOCOL

KNOW-PH (Knowledge for Public Health)

NIHR Public Health Knowledge Mobilisation team

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KNOW-PH (Knowledge for Public Health) Research Plan/Protocol
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Overview, aims and overall approach of KNOW-PH

The **aim** of KNOW-PH is to develop, design and deliver knowledge mobilisation (KMb) in local settings for the benefit of public health and to reduce health inequalities. We will do this through an approach to public health knowledge mobilisation that is:

i) Driven by coproduction,
ii) Responsive to policy and practice need,
iii) Learning- and action-oriented,
iv) Evidence and theory informed.

KNOW-PH is an experienced, **multidisciplinary** team of knowledge mobilisation experts, science communicators, community engagement and diversity specialists, public health professionals and researchers, local authority-research boundary spanners, designers, illustrators and film makers.

Our strengths in KMb include **culturally relevant storytelling** and **creativity**; these are critical mechanisms to engage diverse people in coproduction *and* to create engaging knowledge mobilisation products. The team has demonstrated the skills and capacity to deliver, teach and make creative, story-based engagements and outputs in digital and physical media. Storytelling and creativity are our **unique selling points** and form a core output from this team as we evaluate what works best for different types of evidence and for people with different needs.

We adopt a coproduce-iterate cycle, inspired by design thinking (Rowe 1987) to ensure knowledge meets the needs of users. This approach – known as 'Mode 2' KMb – is characterised by creating knowledge within the context of its use and working with those who are likely to use it, including disadvantaged communities. The team is committed to this approach and is distinguished by coproduction methods that break down commonplace distinctions between the knowledge producer and user (Evans and Scarborough 2014). As such, we are driven by non-hierarchical, relational models of KMb. This is reflected in the core building blocks of the team: a bespoke **Local Authority Reference Group** (LARG); a **Public and Community Engagement Group** (PACE); and, an overarching **Programme Steering Group** constituted of external academic advisors. KNOW-PH operates the principles of:

Agility	Tailoring	Creativity
responsive to end-user needs	customising outputs to suit end-users	human-centred, multimedia storytelling
Sensitivity	**Expediency**	**Pragmatism**
valuing skills, knowledge and context, including political and policy sensitivities	awareness of timelines and timeliness to accelerate impact	making sensible choices to mobilise knowledge for public good

Our strong track record of **social impact** from KMb (see Table 1) incorporates the interests of stakeholders, the research cycle, the coproduction process and different levels of impact (from individual to paradigmatic) (Beckett et al., 2018). It reflects the ambition our team shares with NIHR PHR: To transform public health research into evidence-informed decision making and practice.

KNOW-PH's overarching theme: health inequalities

The team plans to target its efforts across the broad field of **health inequalities**. This mirrors the clear priorities of NIHR, local authority public health and the wider local population health system (e.g. Integrated Care Systems [ICSs]). We will draw on a now substantial evidence base that needs to be brought together, synthesised and made relevant to local actors.

Developing an agenda for KNOW-PH

We have piloted a quick and low-burden mechanism for consulting with local public health teams. First, we have conducted short online discussions with public health professionals to scope the main issues concerning public health teams in current local authority contexts. From these discussions, we have created a simple short form survey that asked multiple choice questions about **health inequalities topic priorities**, how public health teams **expect to work** in the next few years and how people would like to **receive KMb support**. Colleagues were asked to identify their top three priorities in each area. We distributed the survey across ten

local authority public health teams (Kirklees, North Yorkshire, Sheffield, Rotherham, Doncaster, Hertfordshire, Hull, Leicestershire, Nottinghamshire and Lincolnshire) and the Local Government Association (LGA). Activities revealed:

1. Priority health inequalities topics were: Cost of living, followed closely by housing, and then shared interest in healthy planning and climate change and health. Other topics that were evenly spread but further down the ranking were inclusion health, food insecurity, intersectional disadvantage and poverty (& poverties e.g. fuel poverty). This even spread of priority topics together with synergies across others, offers a useful starting point for prioritisation in year one.

2. Future ways of working for local authority public health was anticipated to be dominated, firstly, by a focus on developing effective working relationships with ICSs, followed closely by whole of council approaches to public health; and, then by developing systems-level solutions to tackling inequalities. Responses offer important indicators of the *context* of knowledge mobilisation activities.

3. Preferences for the type of knowledge mobilisation support was overwhelmingly dominated by a preference for having easy access to support to co-produce a locally relevant evidence base to support policy and practice development. Other high ranked preferences included having an embedded researcher in the team and having access to whole-of-team facilitated support and training from a researcher on secondment/placement, which were separated by a single vote.

These insights have helped us build an early strategy on how to devise topics with local authorities (and to target those we might start with in discussions), how to approach the issue of embedding research in policy and practice in the context of how LAs expect to work in the coming years (as 'whole' or 'one' councils, with the wider population health infrastructure and using a systems lens) and the preferences of public health teams in building capacity for mobilising knowledge. Additionally, they challenge our early thinking about how this might be best achieved. For example, an embedded researcher model as a preferred way of building capacity in research and knowledge mobilisation in teams was a lower priority than expected. In year one we will conduct initial formative work to explore these preferences in depth with our Local Authority Reference Group, with the public/communities and with relevant actors in local systems such as anchor institutions and the third sector. We also propose that this method of prioritisation is documented, expanded on, formalised (e.g. modified Delphi) and published as part the team's work, offering new insight into how KMb work with local government can be operationalised.

These insights on topics, ways of working and KMb need to counterbalance with the interests and goals of NIHR PHR and CED which are rightly focussed on bodies of NIHR research that could be better utilised in local settings but need concerted effort to mobilise.

As such, we will direct two main *interdependent arms* to the team's work:

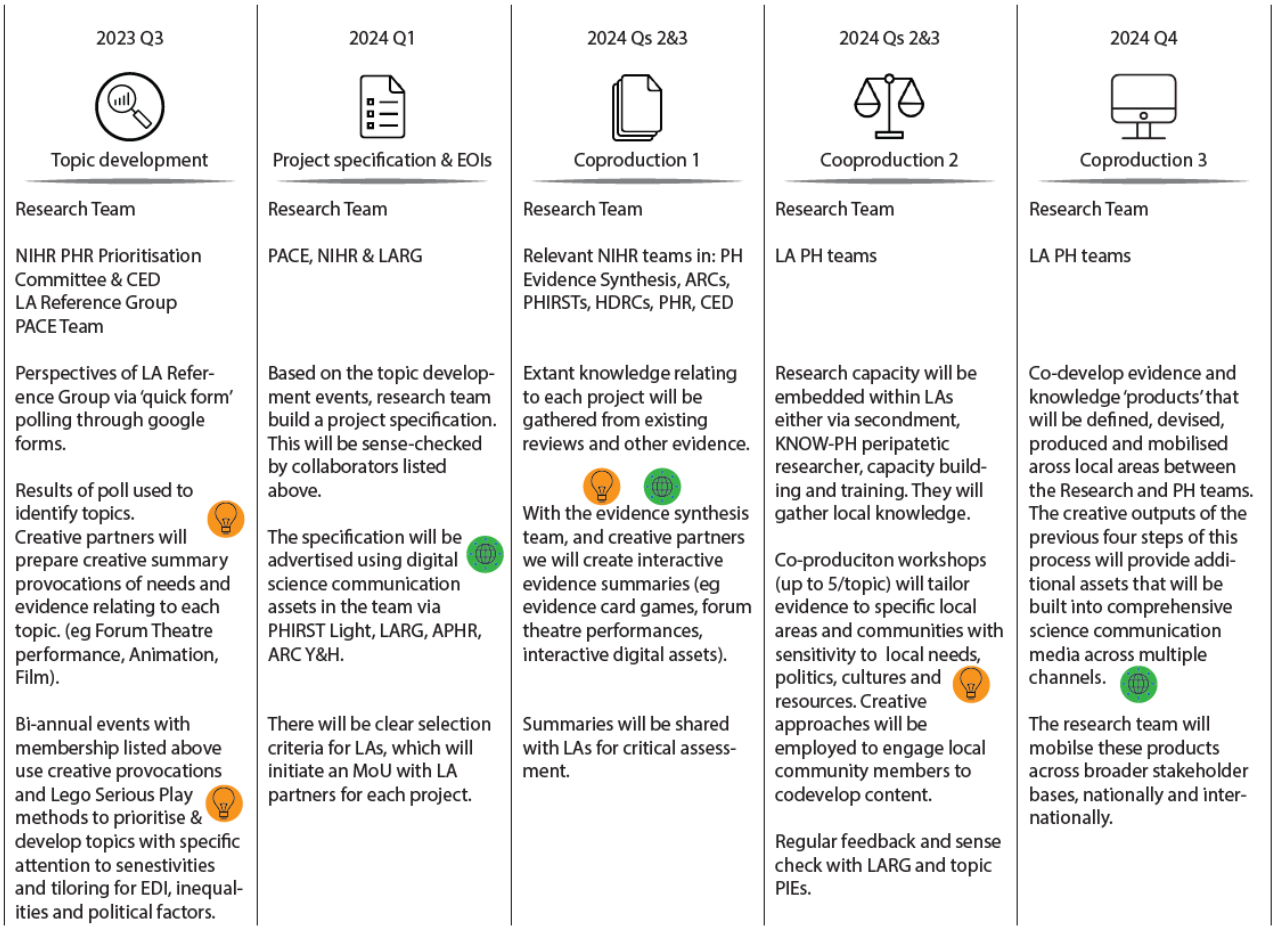
1) Longer-term thematic deep coproduction. This arm will develop impactful health inequalities knowledge mobilisation work over the three years, organised over two cycles of coproduction using creative methods with local authorities and their partners.

Each stage of the process outlined in Figure 1 will employ storytelling and creativity-based approaches founded on state-of-the-art knowledge and practice (elements of our vision are shared in a special issue of *Evidence and Policy* on creativity and coproduction edited by Co-PI Langley and CoI Cllr Smith). Coproduction Director Langley has extensive experience of applying these methods and has demonstrated how digital storytelling, forum theatre, Lego serious play, card and board games, arts based methods, interactive digital assets, business origami, and many other creative forms, can be used throughout different stages of this process to better engage diverse people in making sense of evidence, tailoring it, applying it and sharing it (Langley et al. 2020, 2022; Law et al. 2020). Cllr Smith has engaged in long-term coproduction with South Yorkshire communities, for example, using artist-led and play specialist-led workshops to identify over 300 residents' priorities for communities, leading to Levelling Up funding for green spaces to put their ideas and knowledge into action. Team members can further point to collective experience with such methods as storyboarding, graphic novel creation, vignettes, scenario-building and persona storytelling (examples: patient pathways, migrant health, GP access, palliative care, long-term conditions, reproductive health).

Such methods break down hierarchical relationships, help knowledge users to make sense of complexity, challenge local actors to think critically about evidence, how it connects with other forms of knowledge in local settings and how it can be better applied to local public health policy and practice. We will sense-check the appropriateness of different methods with the LARG, tailoring each method to ensure proposals reflect

the reality of working in LAs (e.g. time-pressured, resource-strained and politicised). We will ensure that outputs are co-designed iteratively using design sprint methods (e.g. rapid prototyping, wireframing) and user testing. Our state-of-the-art approach embodies the core ingredients of successful coproduction in KMb: that it is **design-led**, **creative (and often visual)** and **is context sensitive** (Grindell et al. 2022).

Figure 1 Process of deep coproduction (Cycle 1; two 16 month cycles in total)



Key: = creative approaches. = science communication approaches

This arm of the team's work will deliver against two primary outcomes: 1) substantive knowledge mobilisation across local authorities on key health inequalities topics, enduring over time, and 2) insight into the principles, processes and outcomes of deep coproduction at the local level as a **foundation** for the critical end-of-programme output: a guide to public health KMb for local authorities.

Our approach to topic selection and prioritisation for deep coproduction includes consultation with the LA Reference Group via quick form polling (described above) and then by discussion in bi-annual meetings. The process will include shortlisting topics with NIHR PHR/CED, topic voting with the LARG, follow-up discussion with LARG and consultation with PACE. Final decisions will optimise a mix of *evidence-focussed* and *local relevance and engagement* criteria such as:

i. Evidence-focussed criteria:

- The extent to which the volume, quality and certainty of the evidence is sufficient to support KMb
- The availability of (some) high-quality evidence syntheses, primary and secondary studies in the field of interest
- Evident or extractable theories of change (of policies, practices, behaviours) in the extant literature
- Where a coherent evidence base is incomplete, local knowledge has the potential to fill the gaps

ii. Locally-focussed criteria:

- The relevance of the topic to the goal of reducing health inequalities (with a focus on local inequalities)
- The degree of perceived need in the Local Authority Reference Group
- The presence of mechanisms for addressing the public health problem at the local level (e.g. allocated roles within local authorities are present such as within an HDRC)
- The potential of transferability of learning across local areas

- The capacity of local teams to commit to the creative engagement process over 16 months

2) The responsive arm. Shorter term (3-6 months in duration) projects will focus on NIHR and stakeholder needs to exploit 'windows of opportunity' to mobilise knowledge. They will centre on timely, emergent high priority topics for local areas across the UK at receptive moments. This arm of the programme, therefore, responds to the needs of the fast-changing politicised environments of local government where opportunities emerge to rapidly engage decision makers with evidence. One recent example is when our NIHR PH Evidence Review team Co-Is were able to exploit distinct opportunities for impact from a review of gambling harms (Blank et al. 2021). Coinciding political interest, proposed legislative reform, new clinical services and local strategies (e.g. in Greater Manchester and the Greater London Authority) created a window of opportunity for mobilising knowledge.

We will welcome direction from NIHR PHR prioritisation committee and the PHR/CED team, in the first instance, in gauging and guiding such opportunities, particularly when robust evidence exists but requires effort to mobilise. We will fortify ongoing team efforts in regular horizon scanning with timely input from the LARG and the PACE to inform the negotiation of priorities with the NIHR PHR commissioning team. We will actively seek out opportunities for synergy with the activity of NIHR Public Health Review team, PHIRSTs, HDRCs, SPHR, ARCs and the NIHR Public Health Research Programme (e.g. live or near-end projects that are best mobilised collaboratively).

The responsive arm of the programme is likely to enhance the NIHR portfolio by mobilising knowledge across projects that did not explicitly include a KMb perspective. In acknowledging the need for fidelity in translation, lead knowledge mobilisers in the team will initiate contacts with the authors of research studies to ensure the accuracy of interpretation, the appropriateness of how evidence is framed in mobilisation and to help the knowledge output production process. Appropriate engagement across projects will be managed on a project-by-project basis with the support of the NIHR PHR commissioning team where necessary.

The responsive arm will adopt a 'light touch' approach to the process outlined in Figure 2, with NIHR PHR taking the lead role in guiding priorities. These will be relayed to the LARG and PACE for discussion, iteration and refinement.

We acknowledge that disseminating evidence is a small, yet important function of our KNOW-PH team. More critical is how we will **focus on ways of supporting users to access evidence, make sense of it, integrate it into their contexts of practice or daily life and apply it**. This can involve: training, learning and capacity building (e.g. the team have formal arrangements to provide bespoke training to two local authorities); evidence interactions for sense making; and collaborative intervention design and implementation. Our work impacts at different scales (individual, organisational, regional, national and international. See Table 1) and for different beneficiaries (for policy makers, professionals and practitioners, individuals and communities).

The KNOW-PH team – depth, breadth, and leadership, skills, capacity

Our KNOW-PH team is **multidisciplinary** and engages with the complex fields of public health research, policy and practice as well as KMb, science communication and public involvement. **Our breadth of expertise in public health** brings an optimal mix of professional and disciplinary backgrounds, connections to the public health landscape and diffuse topic expertise. Team members have worked towards health inequality reductions both inside the 'traditional' health sector (e.g. local authority public health, NHS, Public Health England, Department of Health and Social Care) and outside it (e.g. services such as Department for Work and Pensions, Fire and Rescue, Police, National Crime Agency and the Home Office). Non-clinical and clinical experts sit alongside health inequalities researchers and knowledge mobilisers working in local government and the third sector. Our depth and breadth of experience acknowledges the complexity of public health in policy, practice and research. Our locations across the North of England and the East Midlands give us access to diverse, and many socioeconomically disadvantaged, areas. Our public and community engagement leadership team is based in London and Manchester and is closely connected to ethnically diverse communities.

<u>Leadership (the Directorate)</u>

Recent NIHR KMb Research Fellow, Liz Such [LS] will lead the team as Director with the support of two expert Co-PIs from the fields of creative design-led KMb (Director of Coproduction; Joe Langley [JL]) and science communication, digital and social media specialist (Director of Science Communication, Andy Tattersall [AT]). LS will take overall responsibility for the programme and lead the responsive KMb arm. She will also lead EDI aspects of the programme, reflecting her expertise (e.g. NIHR EDI Advisory Group). She has 20 years'

experience of leading researchers and cross-disciplinary teams inside universities and in the UK government (social policy, public health). She is a past cohort of the NIHR's Future-Focussed Leadership programme and will be mentored by Professor Sir Jonathan Van Tam (recent Deputy Chief Medical Officer) to further support leadership skills development and science communication excellence.

Co-PI JL is a former NIHR KMb Research Fellow who will lead deep coproduction. An expert in design-led and creative knowledge mobilisation, JL will coordinate all stages of the deep coproduction process. Co-PI AT will lead science communication strategy, partnership and evaluation; a role that extends his 20 years' experience in media communications, open research, multimedia and scholarly communications, public engagement, social media and Altmetrics. AT's role includes developing a social media strategy to create a wide reaching KNOW-PH following across the sector. This strategy will be informed by best practice in social media using gov.uk's social media playbook. All three leaders (LS, JL, AT) will work hands on in coproduction and peripatetically to ensure KNOW-PH's ethos is demonstrated through leadership (agility, tailoring, pragmatism, creativity, expediency, sensitivity).

The core KNOW-PH team

The core members of KNOW-PH span public health practice, local government (including an elected member and officials), epidemiology, implementation science, evidence synthesis, the third sector and public and community engagement. We also include **field specialists** in core health inequalities fields including public mental health, physical activity and healthy weight, social prescribing, behaviour change and inclusion health (see attachment 2). The roles of the team are:

- Modupe Debbie Ariyo [MDA] **Role**: Public and Community Engagement lead. MDA is a third sector leader with expertise in community engagement in research and equalities. Supported by Naeema Ahmed [NA] **Role**: Public and community engagement manager and administrator
- Dr Susan Hampshaw (Public Health Practitioner & Director of Doncaster HDRC [SH]) **Role**: NIHR HDRC link. Practitioner-research boundary spanner. LARG Chair
- Dr Jo Morling (Consultant in Public Health [JM]) **Role**: Public engagement academic lead.
- Professor Elizabeth Goyder (Professor of Public Health [EG]). **Role**: Link to Regional PH Research Hubs, NIHR SPHR, NIHR PH Review Team, wider NIHR infrastructure (BRCs, ARCs), ICSs
- Dr Elizabeth Orton (Consultant in Public Health for Leicestershire County Council [EO]) **Role**: ICS link for the East Midlands. Link to NIHR PHIRST Light
- Cllr Sarah Smith (Councillor at Doncaster Council and Chair of Health and Adults Social Care Overview and Scrutiny Panel [SS]) **Role**: LARG facilitator, link to elected members
- KMb Fellow TBC **Role**: peripatetic knowledge mobilisation role across local stakeholders and administrative support

Our topic/field specialists will offer expert advice on prominent public health topics, methodologies and knowledge mobilisation approaches: Professor Mike Slade [MS]: public mental health; Professor Maddy Arden [MA]: behaviour change and maintenance; Professor Chris Dayson [CD]: social prescribing; Professor Rob Copeland [RC]: physical activity & healthy weight; Professor Andrew Booth [AB]: evidence synthesis/knowledge translation; and, Professor Stephen Timmons [ST]: implementation science. We will assemble additional domain experts within the programme depending on the topics and methods chosen throughout the three years.

All members of KNOW-PH can point to their extensive experience in managing, developing and sustaining evidence-in-policy/-practice relationships. Selected examples are identified in Table 1.

Wider partnerships

The team is closely connected to all main parts of the existing **NIHR public health research infrastructure**. For example, NIHR Health Determinants Research Collaboration (HDRC) Doncaster is led by SH (SS is a Councillor; EG, AB are embedded Co-Is); the current NIHR Public Health Review team is led by EG (Co-I AB). Team members include a Chief Investigator (EO) and an institutional lead (EG) for two NIHR Public Health Interventions Responsive Studies Teams (PHIRST) and for the NIHR School for Public Health Research (EG). AB is co-director (with EG) of the new EnSygN NIHR Evidence Synthesis Group. We are also closely linked through our Co-Is (JM & EG) to the Public Health Research Hubs in both the East Midlands and Yorkshire & Humber (Practice and Research Collaborative Hub) and are actively involved in the development of the new national network of Public Health Research Hubs which aims to have a key role in sharing good practice in KMb across regional networks. These will be accessed at appropriate stages during KNOW-PH's work.

The team also has strong, active working relationships Academic Health Science Networks, Clinical Research Networks, Integrated Care Systems (e.g. EO linked to ICSs in the East Midlands; EG to ICSs in Yorkshire and the Humber) and several other NIHR structures and programmes (e.g. NIHR Biomedical Research Centres in Yorkshire and the East Midlands [LS, EG, MS], NIHR ARCs [EG, MS]) and external regulatory bodies (e.g. Medicines and Healthcare products Regulatory Agency [JL]). Close involvement in over 20 other public health networks among team members offers considerable national reach (e.g. Advanced Wellbeing Research Centre, the Yorkshire and Humber Behavioural Science Hub and the national Behavioural Science in Public Health Network [RC, MA, CD]). LS and JL are founder members if the UK's Knowledge Mobilisation Alliance; a key **community of practice** within which to develop KNOW-PH.

Our alliances with **creative industries** offers opportunities for **innovation** within the team. Our flexible budget allows for bespoke creative collaborations between the core team, local beneficiaries and creative innovators. Nifty Fox, Cardboard Citizens and Optical Jukebox support the bid (see letters) and have considerable experience of working with researchers, end users and citizens to generate novel knowledge outputs using creative engagement practices. We will be further advised on creative opportunities by Dan Masterson (Jönköping University, Sweden) on our steering group.

Our collective portfolio (examples in Table 1) demonstrates our record in mobilising knowledge to address health inequalities through collaboration. Our expertise spans work funded by NIHR, Health Foundation, Economic and Social Research Council, Natural Environment Research Council, Arts and Humanities Research Council, UK Prevention Research Partnership, NHS England, Wellcome, Medical Research Council, EU Horizon 2020 and charities such as the Alzheimer's Society, Epilepsy Action and Yorkshire Cancer Research.

Table 1 Examples of breadth and depth of KNOW-PH team

Title	Partners	Reach of KMb	Outputs/outcomes/impact
Framing the wider determinants of health in local government [LS]	Hertfordshire County Council Health Foundation	Public health practitioners n= 14-26 in Herts in 4 phases Health Foundation webinar >500	Change in PH team practice – reframed wider determinants narratives for local action LGA publication; Co-authored journal paper
Public health, loneliness and minority ethnic populations [SL, AB]	Multiple local authorities and community orgs NiftyFox	Sector professionals n=50 Public consultation panels n=34 Full digital reach	Multiple digital outputs: microsite https://www.social-iso.co.uk/ video, toolkit/resource
Oral public health literacy [JL]	FDI World Dental Federation Colgate The Design Clinic	Dental clinical academics in UK /overseas involved in co-design Citizen science project involving >1000 participants	Oral health information for sense-making; interactive and dialogical KMb products. Codesign capacity-building among oral health professionals. Mouth Health Digital Activities app
FaME intervention toolkit (falls prevention management) [EO]	Nottingham Healthcare NHS Foundation Trust 15 English local authorities + Greater Manchester Combined Authority NIHR ARC East Mids	National guidance and toolkit for commissioners available online	Toolkit downloaded over 2,000 times. Doubling of FaME classes available in Devon
'FAIR STEPS' A Framework Addressing Inequities in pRimary care using STakEholder Perspectives [AT]	NHS Health Education England General Practice at the Deep End	Sector professionals <100 Research, clinical practice	Clinically focused primary healthcare resource for current and future practitioners to address health inequalities. Creation of a bespoke information animation to reach targeted audience to promote and inform as part of the study.
Communicable Research podcast [AT]	ScHARR, University of Sheffield	18 podcasts on wide range of public health topics e.g. alcohol consumption, smokefree campuses.	>1200 plays; >120 subscribers on Spotify.
A public health approach to modern slavery **[LS]**	Public Health England UK Independent Anti-Slavery Commissioner	Sector professionals, including LA officers >300 15 Welsh, Scottish government officials Home Office (& agencies) n=10	High level strategy influence: a public health approach evident in early drafts of Home Office strategy. Sector-wide impact e.g. West Mids Police and Crime Commissioner, Leeds City Council

Home safety intervention for families with young children [EO]	Nottingham City Council, Nottingham City Care partnership, Framework Housing Association, Child Accident Prevention Trust	70 health and care professionals trained to use the intervention. Over 1000 families received the intervention to date	Safer homes in some of the most disadvantaged areas of Nottingham and England. Implementation toolkit to support future rollout.
migrant.health **[LS]**	Doctors of the World Health Foundation Yoomee (digital creative)	100+ face-to-face 000s on-line	National reach of emergent practice in supporting migrants in primary care. Contributed to shifting debate about migrant access to healthcare
NICE guideline mobilisation in care homes **[JL]**	Care Homes in Yorkshire The ENRICH Research Ready Care Home Network	3 codesign workshops in 4 care homes.	Extended reach of the project through the codesign of a national gov.uk resource: Care Home Oral Care Toolkit
Mental health recovery [MS]	Multiple global, national, regional, local partners	219 knowledge exchange activities 2020-2023	123 lay publications, 18 media appearances, 90 talks (e.g. Pint of Science). Recovery Research thought leadership
Social prescribing for public health [CD]	Rotherham Social Prescribing Service, Doncaster Better Care Fund, National Academy for Social Prescribing	> 2,000 policy makers and practitioners attended dissemination events	Influenced national social prescribing policy and guidance (e.g. NHS, King's Fund).
Move more**: mobilising physical activity [RC]**	Sheffield City Council, Advanced Wellbeing Research Centre, local NHS Trusts, commissioners	000s of residents across 3 Move More facilities in the city of Sheffield	Co-location of leisure and health facilities benefit more than 100,000 people a year. UKActive & Sport England advocate for model, based on supporting evidence
Vaccine uptake among NHS employees [MA]	Public Health Wales Cwm Taf Morgannwg University Health Board Nifty Fox	35 healthcare workers; coproduction workshops. Outputs with broader reach across the healthcare system in Wales	Infographics and support material for healthcare workers. Webinar to support implementation

Local Authority Reference Group (LARG)

The Local Authority Reference Group will play a key role in developing the KMb programme and supporting its work. The LARG will sense-check topics, identify what might be feasible and appropriate KMb activity in a LA setting, facilitate connections with LAs across the UK and promote the work of the team. The group will include 7-10 members who will rotate/in out of the group over three years to prevent over-burden. A range of roles at different levels of seniority (from practitioner to Director) will be represented. KNOW-PH will also draw from Doncaster HDRC, LS's membership of the LGA's Health in All Policies Network, Co-I's links to PHIRSTs and the national network of regional Public Health Research Hubs where appropriate.

Steering Group

Our academic Steering Group will meet twice a year and will advise on the work of KNOW-PH. It includes knowledge mobilisation, local government research, creative coproduction and public health specialists. Confirmed members are: Professor Annette Boaz (Chair), Professor of Health and Social Care, KCL; Dr Helen Baxter, Research Fellow in Knowledge Mobilisation and Implementation, Bristol Population Health Science Institute & NIHR ARC West; Professor Fiona Cowdell, Professor of Nursing and Health Research and KMb specialist, Birmingham City University; Dr Peter van der Graaf, Associate Professor in Knowledge Mobilisation, Northumbria University and NIHR ARC North East & Cumbria; Dr Jennifer Lynch, Reader in Social Care, Technology and Knowledge Mobilisation, University of Hertfordshire; Professor Katherine Smith, Professor of Public Health Policy, University of Strathclyde; Dr Dan Masterson, Assistant Professor, Centre for Coproduction, Jönköping University, Sweden; and Professor Jane West, ActEarly, Bradford Teaching Hospitals NHS Foundation Trust.

Public Involvement and Engagement

Public involvement, alongside consultation with public health teams in local authorities, has informed the form and nature of this protocol. We have devised an outline strategy for Public and Community Engagement.

Led by our community sector Co-I, MDA and managed by NA, we will:

i) Establish a bespoke Public Advisory and Community Engagement core group (PACE)
ii) Develop Public Involvement and Engagement (PIE) mini-groups for each project

PACE will include up to 10 public and community sector contributors who will meet up to five times per year to provide guidance on the coproduction arm of the team's work and the delivery of PACE in the individual projects. Selected PACE members (1 or 2 per project) will volunteer to support the individual projects and will be linked to PIEs; this model has been successfully used in PHIRSTs. The number, frequency and intensity of inputs will be monitored by MDA to avoid contributor over-burden.

Members of PACE will co-develop a full strategy which will be made publicly available on the team's website. We will recruit members via our established public involvement groups including: 1. AFRUCA/Black and minority ethnic research panel, 2. Doncaster HDRC public group, 3. Recovery Research Team Lived Experience Panel, 4. Public Health Review team PPI group, 5. PHIRST-LIGHT Advisory Group, and 6. Advanced Wellbeing Research Centre public involvement group. We will ensure adherence to the UK Standards for Public Involvement in Research and follow NIHR guidance on coproduction and public involvement.

JM as the academic lead for public involvement; she already serves as the academic lead for public and community involvement in PHRIST Light. Shared arrangements will accrue cost efficiencies across programmes and reduce the burden of PIE for public and community sector contributors.

Dissemination, outputs and anticipated impact

Our primary concern is that both arms of the team's work deliver 1. **Learning and action** in local systems to improve public health and reduce inequalities across topics and projects and, 2. That the team provides **overarching, evidence-based guidelines** on how best to mobilise knowledge across the local public health infrastructure in the UK (especially in local government).

1. Delivering project-by-project outputs

Outputs will be specific to the projects undertaken and will include diverse activities and product formats. Outputs will be co-produced whenever capacity allows and will extend beyond immediate partnerships. We will include **face-to-face interactions** such as facilitated training, knowledge sharing events, local authority 'roadshows', deliberative dialogue and implementation walk-throughs; and **on-line interactions** including training, webinars, seminars and discussion groups (using innovative methods such as live polling and easy-to-use software aids such as Padlet, Jamboard and Flip). For each project, the team aims to engage in multiple live interactions that, with permission, can be recorded and hosted on the KNOW-PH website.

In addition to live interactions, we will use **multiple digital formats** to accompany learning including: podcasts, recorded webinars and short summary live action and animated videos (e.g. for training or the explanation of research findings). The team has produced many such outputs for projects including those in Table 1. **Interactive digital outputs** will also be explored, including gamified learning outputs (e.g. quizzes, 'fun facts', interactive games cf. the Whole Mouth Health Arcade [JL]), interactive toolkits and microsites (e.g. A local public health approach to modern slavery: A guide [LS]) and emergent innovations such as sharable interactive systems diagrams, evidence maps and data visualisation (e.g. using software such as, Eppi Mapper, Genial.ly and D3 for data visualisation).

We will produce online publications on a project-by-project basis e.g. explainers, factsheets, Plain English summaries, infographics, policy and practice briefs, toolkits, full reports and linked publications. We will use a design and user-led approach to organising such material to ensure discoverability and useability. Fundamentally, the KNOW-PH website will function as a **Knowledge Mobilisation Library** or a full digital repository as a legacy for the KMb community. We will produce paper-based materials whenever there is expressed demand and where appropriate (e.g. in the case of local partners working with citizens or elected members). We will explore possible synergies with NIHR Evidence.

2. Overarching public health knowledge mobilisation insight

The team's ongoing work will provide cumulative insight into the ways to better engage local partners with evidence in practice and decision making. Collective learning will be established through: i) regular reflective dialogue (documented) with the LARG and within the project team, and ii) pragmatic evaluation of the process and outcome of coproduction and responsive KMb throughout the lifetime of the team (see evaluation and learning plan). We will produce two core outputs:

i) **A comprehensive guide to public health knowledge mobilisation in local government settings**. This will be designed to meet the needs of local actors (especially local government) and their research/KMb partners. The first such guide in the UK, this will be theory-informed, action-oriented and will use the knowledge

gained throughout the lifetime of KNOW-PH. In the spirit of KNOW-PH, we will coproduce the guide with team partners. We will offer this guide in diverse presentation and mobilising formats.

ii) **A guide to using creative methods in public health knowledge mobilisation**. This guide – creatively designed – will support the use of creativity and innovation in mobilising knowledge in public health for addressing local health inequalities. It will cover which methods work / do not work for different audiences, what different sorts of evidence are appropriate and how to reconcile different types of knowledge to promote action to reduce health inequalities. We will use case studies from KNOW-PH to illustrate practice and produce supporting materials (e.g. prompt cards, activity plans and 'how tos').

Established academic publications: As well as a publication for the NIHR PHR journal, we will produce peer reviewed journal articles on methodological and substantive insight developed by KNOW-PH. These remain an important means of documenting the science and art of knowledge mobilisation and ensures necessary academic scrutiny and development of the field.

Conference presentations and public engagement events: Presentations, including those with coproducers, are planned at both researcher, creative and practitioner conferences to reach our broad audiences. As with all our activities, we seek a variety of outlets to optimise reach, including traditional public health events (e.g. LGA and NIHR events); knowledge mobilisation events (e.g. UK Knowledge Mobilisation Forum) and creative outlets (e.g. National Centre for Creative Health webinars). In addition, we will communicate our work at local and national festivals and events such as the Festival of Debate and Pint of Science as well as other community and public engagement events across the UK. We will work with PACE to deliver such engagements. Our longer-term social media campaigning strategy will secure a broad audience for KNOW-PH work.

Evaluation, learning plan and developing KMb capacity

We will undertake pragmatic evaluation of KMb outputs and activities. We have a short, medium and long-term strategy for evaluation (cf. Brownson et al. 2018). In the short term (led by AT) we will use developmental evaluation techniques (Patton 2010) and quick-time methods such as after-action review to formatively monitor and report on factors such as awareness of evidence-based policies/practices, knowledge about evidence-based policies/practices and self-efficacy in using evidence. In the medium term, we will collate data on indicators such as the use of analytic tools to inform practice, the presence of evidence in development of policy proposals and document narrative examples of scientific evidence used in policy/practice discussions. In the longer-term and in our summative evaluation we will use methods such as contribution analysis to identify if/how changes in practice and policy have been supported. Qualitative impact stories will be documented. In this we will explore any improved uptake of evidence-based interventions in LAs, the termination of ineffective interventions, enactment of evidence-based policies and any ongoing evaluation of enacted policies. We will also focus evaluative activity on understanding which creative KMb methods work best in different contexts and their underlying mechanisms. KNOW-PH will host evaluation meetings every 2 months with relevant partners to ensure documentation of the process and outcomes of the team's work.

We view evaluation and learning as a virtuous circle and as integral to our coproduction-iterate approach. Learning *from* evaluation and *for* evaluation will be continually shared across the team and collaborative partners. This will also extend KMb capacity within LA teams as sharing evidence and knowledge becomes more deeply ingrained in practice. In addition to these exposure-based learning and capacity-building practices, our plan will include face-to-face and online facilitated training for LA teams and their partners on specific topics, KMb techniques and how to optimise ways of working for KMb. These will be offered at opportune moments for different groups and will be 'roadshowed' nationally where appropriate (e.g. with the LGA). Our approach is, once again, partner-led and demand driven to ensure high interest and uptake.

Ethics

KNOW-PH has been granted overall ethical approval through the University of Nottingham, Faculty of Medicine and Health Sciences Research Ethics Committee. While there is low ethical risk overall across the programme, we recognise specific challenges for local government engagement in terms of reputational and professional risks. In addition, we will consult with local authorities on internal processes of governance and ethical approval at very early stages of each project to ensure we can work collaboratively and in a timely manner with partners.

Equality, Diversity and Inclusion

KNOW-PH Director will lead on EDI with support from community partners MDA and NA. All have worked together on EDI in research with minoritised communities. LS has also worked for the NIHR EDI Advisory Group. We intend to engage in processes and create outputs that are as accessible as possible; we seek to be inclusive by design. To ensure this, we will codevelop a set of EDI principles for KNOW-PH to mobilise across the team at an early stage and include EDI practice assessment in PACE, LARG and team meetings. We will document and purposefully assess their application these throughout the programme, using an adapted approach of rapid equality impact assessment designed by NIHR ARC East Mids (NIHR ARC EM 2021).

Table 2 GANNT and key deliverables

Activity or Output	-Q1	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12
Deep coproduction arm:	DC Project 1						DC Project 2						
Scoping & topic selection													
Specification & EoI													
Coproduction 1													
Coproduction 2													
Coproduction 3													
Deliverables & outputs													
Social media campaigns													
Process evaluation data collection													
Responsive coproduction arm:		RC Project 1		RC Project 2		RC Project 3		RC Project 4		RC Project 5		RC Project 6	
Scoping & topic selection													
Coproduction													
Deliverables & outputs													
Process evaluation data collection													
Formative evaluation:													
Design data collection tools													
Periodic data analysis													
Concluding data analysis & development of guidance													
Public & Community Engagement:													
PACE membership recruitment													
PACE strategy													
PACE/PIE input													
Local Authority Reference Group:													
LARG membership recruitment & Terms of References													
Deep coproduction arm input													
Responsive coproduction arm input													
Management & Governance:													
Ethics													
Equality, Diversity & Inclusion principles													
Contracting arrangements													
MoU's with LA's engaged in Deep coproduction arm													
NIHR performance reviews													
NIHR PHR Commissioning team meetings													
Advisory group meetings													

Disclaimer

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