Int1: Welcome to this first meeting that we're doing which is a Welcome Trust funded project around the role of methane in health outcomes specifically around mental health and respiratory health. For this first session today, I have a few introduction activities so everyone knows who everyone is and I will go through a brief recap on the project. I feel like I probably spoke to everyone at various times throughout the project, but it's been a little while, so I will just go through and jog memories. The main purpose of today is to get some input of yourselves as lived experience experts in different fields and backgrounds, and we are working with this fantastic design and development group called Common Knowledge who are helping us with certain elements of this project, and we are really keen on a process called design and justice, which means they go and prepare some content for us, and then we feed that back to our experts, for you guys to think about how accessible and usable that content would be for the end users who we have in mind for this project. We will show you some of the educational content that we have been working on, and then there will be some opportunities for your feedback.

<shows ethics and consent slide> <discusses pre-survey about ethics and consent.>

Int:1 This is initial series of meetings that we're having across NE Lincolnshire, Lincolnshire and Ghana, in the future if we can identify ways to link people up then we will do so. So I thought for a little introduction, we will just go around and if you could introduce yourself with your name, where you're from and where you work, but also consider your lived experience and what you think of your most relevant area lived experience is related to this project, which is really about air pollution and health outcomes. And then this is a bit of a silly one, but I just thought to sort of gauge where everyone is at with the concept of methane because that is quite central part of this project. I will start. My name is H, I am from the university of Lincoln. I now represent the Lincoln institute for Rural and Coastal Health. I would say I'm a lived experience expert when it comes to my own experience of mental health and well-being, but also that I have worked within a wide range of communities where mental health is quite important, that's in whole lots of interesting ways in Lincolnshire that different groups address their mental health as communities of practice. For me, what comes to mind when I think about methane is just roughly the orange that I'm wearing at the moment, and it's something I can't get out of my head to the point where I asked the design and development group to put that shade of orange into this presentation for me. I will pass it on and go down the list. T?

Res1: I'm T, I am the manager here at Healthwatch, NE Lincolnshire which is very different to the Healthwatch Lincolnshire team. As far as lived experience, because here at Healthwatch, our main job is collecting the voices of the general public around health outcomes, I have quite an extensive knowledge across NE Lincolnshire regarding health outcomes. My entire remit that the government has given me is around anything that is publicly funded regarding health and social care. So my remit is quite large across health outcomes as well. Respiratory conditions impact all aspects of your life as well, so it's not just taking that into isolation, it is right across the board. So I'm hoping that I can bring that to this as well. As far as methane is concerned, I guess the only thing that springs to mind is gas. Bearing in mind, we are quite close to the refineries and some of the production here in NE Lincs. Methane, that's all I can think of off the top of my head.

Int1: That's pretty good. It is related to where you physically are in your area. J, this is his third time going through this material, do you want to briefly explain who you are in relation to this project?

Int2: I am J, I work at the university of Lincoln on this project. I have a background in nursing and public health. When I think of methane, I think about gases, production and burning of fuel, and that can result in air pollution.

Int1: Thank you very much, combustion makes a lot of sense. V?

Res3: Hi, I’m V, I'm part of the sustainability team as a sustainability officer at Lincolnshire County Council. I have met H on a project that I am just kind of closing that was a different air quality grant funded project where we launched a light touch website for everybody who can access the Internet to find out a little bit more about air pollution, sources of air pollution, and things that everybody has in their gift to be able to address their local air quality. A big part of that was working with secondary schools across Lincolnshire, asking groups of students that we were working to run campaigns in their local area to promote the education, but also to improve the air quality in their locality. So I see myself coming here as an advocate for young people, trying to be their voice in the understanding that perhaps they are not always able to attend these kind of sessions. I hope to be able to bring a young person's point of view to these conversations. When I think of methane, I think of global warming potential, cattle grazing and deforestation, and it takes me back to my science and climate change background.

Int1: Thank you. It's so good that you are here representing younger people because that is a perspective that is so important. And a bit of a wider view on methane, which is fantastic. N?

Res3: Hi everyone, my name is N. I am an associate professor of clinical psychology at the University of Lincoln, and a member of the psychological and health well-being research group here. I have a deep professional and personal interest in this area. Thinking about mental health impacts and how that might be more indirect. I had asthma when I was younger, I think about the times when I couldn't be active and join in with friends, and how it impacted on my mood and well-being. So I'm interested in the mechanisms of how air pollution might influence mental health. I suspect some of that is about demoralising perception of our environment. I'm interested in where there are areas of individual agency. So I think it's one thing to learn about this insidious effect on our environment, and how that could be having some sort of degenerative impact. There are other things we could be doing, if it comes down to something like physical activity, or to have a sense of control over our environment or advocating and feeling like we can actually engage with some of these structural issues, and affects in our environment. What comes to mind when I think of methane, is mostly cows, I think, and the ways that we contribute through industries to increasing levels of methane in the air.

Int1: Thank you, that's fantastic, and I think it's really important to talk about our own experiences to some degree as well. When we look at content like this, N and I are academics, but your own lived experiences can come into play in a powerful way too. That's great to hear we have such a range here today. Thank you for your introductions.

<Begins presentation and covers the following topics>

- Welcome Trust funded project.

- Brief Develop a dashboard to understand the impact that methane has on health.

- Prototype project for running 12 months (July 1st, 2024 – June 30th, 2025).

- Multi sector collaboration.

- A first step towards understanding the role that methane plays in health. Also improving access to health outcomes, improving access to health services for adaption, and providing opportunities to support research ecosystems in data scarce regions.

- Aims: the pilot an integrated data platform (ME-NET) for regions with varying environmental and health data availability and quality, and with varying sources of methane emitters and super emitters for a) developing data synthesis approaches that are globally applicable, and b) training methane ‘early warning’ models that are robust to regional contexts.

- Outputs: 1. Machine learning algorithms showing the links between methane, ozone and health outcomes. 2. Phone/web app for Health Protection, tracking the impact of zone on mental health and respiratory symptoms, and education in the UK and Ghana, and (including coastal sites).

- Research Questions - To what extent can deep learning be used to develop an ozone early warning system that incorporates health data into regions of the world with a) higher and, b) lower/middle income, reflecting wider global variation in data availability and quality? - What are the most relevant health measures for exploring physical and mental health emergencies associated with methane and ozone concentrations in the two regions, and is it viable to use DL to predict great server emergencies associated with air quality? - What user functions would improve the visibility of climate change impacts, and how deliverables are these, given data availability and quality in regions?

<Displays ME-NET for smart phone and web application slide> please keep in mind as we go through that there are some opportunities for feedback on this content. What are the unintended negative consequences that could emerge out of a project like this? I will go through some of the main functions, and then there is an opportunity for feedback. It's not just the images, but also the visual kind of component of this, the flyers that I've been presenting from here on in have been co designed with the wonderful group that we're working with - Common Knowledge. So this is partly helping them prototype and trial what some of the content might actually physically look like in the application. Their process is around design justice, which is about iterative design, so day presenters with some images and we take them to our stakeholder group who can then tell us how appropriate you will think that is, if it is understandable.

- Four Main functions 1. Alert Me, 2. Explore and Learn, 3. Our Data, 4. My Profile.

<Displays Explore and Learn function slide and describes function>

<Displays mobilising citizen science for global social and ecological justice slide>

< Displays My profile and Alert Me slide and describes function>

< Displays methane early warning network slide and describes function>

Int1: This is the point where I will invite you to think about the material presented so far, and if there are any questions do raise hands, but also consider the people in your life, so that could be your personal life, as well as your work life, and who might actually benefit from an application like this? What are the red flags? Take a couple of minutes to use the QR code on your phone and type the feedback. Can you please put in your responses about what the red flags might be, and I can actually see those. So stuff around panic. The need for clarity. Causing anxiety. Add a really interesting comment about making outdoor air quality more high profile than indoor air quality. You will be interested to know there's a huge comment that some of my colleagues at the Met Office also had because they have a huge project on indoor and outdoor air quality. I will open it up then. I’m particularly interested in this concern around health anxiety and panic, and producing unhelpful responses like that when obviously that is not the intention. Any thoughts on how to mitigate that sort of anxiety and panic? V?

Res2: Is there something about maybe having a data gathering period before you start getting alerts or something? A way of warming the system up to you and what you might like? Or what you might respond well to so that you maybe mitigate against some of that projected panic or anxiety?

Res3: In practice, you might do a bit of reality testing with somebody if they were anxious. When you're in those situations, what are you actually able to do and how does it affect you. If had a period of time when they were getting some data - Ok the pollution levels are so and so today, it's in this kind of amber area, previously you have been able to do this, you were able to exercise a couple of weeks ago, this is associated with slightly elevated fatigue for you. It could be kind of personalised. How it has and hasn't affected them previously.

Int1: I like the idea of actually trying to identify whether there's been an exciting response that people have. I like the idea of personalising messages. Can you imagine something like you get ozone alerts, and part of the self-reporting is an item that says something like about receiving that alert is making you feel anxious?

Res2: Puts it positively - Was it's helpful? Did you find that a lot useful today? Did you respond in a different way because you received that alert?

Res3: I think there's something in that. I like the suggestions, the idea of it not being black and white – Do go out or don't go out, exercise or don't exercise today. It could be – Think about how you could slightly adapt your routine for today. But if that part could be personalised as well, I think that would be useful, you're putting an emphasis on what people can do rather than just sort of saying - Red flag or warning today. I think when people are anxious, and them avoiding responding is quite high, they're more likely to take that as a sort of stop symbol. It could be based on their interests. If they've done something earlier on, what their usual exercise would be, if there was some data on how they would normally spend that day, just to get them some advice that is personalised, would be good. I don't know how from a system design perspective how easily that could be done, but maybe if the messaging is a bit more bespoke to each person, is probably going to be more helpful to them to think - Ok, what do I actually do with this information.

Res2: I guess in some ways the more personalised responses could be from a predetermined selection, but if you're setting up your profile questionnaire there's a bit more detail, what's your age range, have severe is your asthma, do you know what triggers you? If you're asking more detailed questions at the registration stage. Out of 30 potential alerts you are then narrowing it down to that end appropriate for this set of responses.

Res3: That could work.

Res2: You just don't want to kill people off before they have signed up because you were asking a million questions.

Res3: Massive response burden. One thing we do for people who are going through therapy - have a pre therapy preparation session at that moment. I might ask them to think about when they're struggling for some helpful advice, so they're almost sort of generating their own responses as part of like an initial induction. We have like a smart messaging service. They get these messages. They're asked if they want to see the message. It is prompted. So it might be something reminding them of what their kind of strengths are all the time when they were kind of resilient to manage to kind of weather a storm previously. They are getting that message. I think when it's based on something valuable to them, based on their own personal experience, people are a bit more willing to put the time in. But it depends on the scale, like that's an individual therapy, for something like this if you have a team hundreds of people through, you're going to be able to do it with that kind of level of specificity.

Int1: I will ask our design group because I wonder about the idea using the profile setup information to tailor the kinds of messages that you might get. If you have somebody that's registering that's 85, probably you don't need to suggest to them that they go out for a strenuous run necessarily. That could be something else about shutting the window if you are at home that might be more relevant. But saying that, I've met some 85 year olds that run like crazy, but as a generalisation, there might be tailored messaging. I will ask him if it's something they can do, I don't really understand their design elements of this myself, but I will certainly explore that, I think it's a really good idea. I also like the - Tell us what you did differently today, as part of the reporting. Also maybe, having some more ‘find out more’s about self-care support along the way. Any other comments before we move on?

Res2: The only other thing that I scribbled down was, and I don't know if it's come up already in any of the sort of the alerts that you've been drafting, but you could maybe have a time of day one, so with ozone, it will increase throughout the course of the day. So you could actually say to go for a walk in the morning, rather than waiting until after you pick the kids up from school, or after you've got home from school, that kind of thing.

Int1: That’s a really good one. So the first educational module. Common Knowledge prepared for is a set of prototype images that could go into a final educational module starting with runaround ozone and how ozone is created. I'm just going to show you the type of approach that they have had so far, and then give you the opportunity to feedback. After that, we're going to present a bit of an evidence space the links between ozone and health and ask you to suggest which bits of the evidence base it's important for you to understand. This is our attempt to identify what we think is important for people to know about ozone production, and we would just be interested to see what people think. The ozone educational module we have called the perfect storm.

<Presents on Education Modules> as follows

* The Perfect Storm
* Ozone and Health

Int1: First, we will discuss the evidence based, secondary will discuss Common Knowledge content, and then third we will ask you to evaluate the content that Common Knowledge had prepared for us. Then we will do in evaluation.

<Presents the Perfect Storm slide>

* Ozone occurs naturally in the stratosphere, making the earth habitable.
* ground level ozone occurs in the troposphere and affects the air people breathe, drives global warming and produces health impacts.
* there are no natural sources of ozone in the troposphere, it is produced from interactions between emissions from human activities and meteorological conditions.
* Specifically, ozone is created when hydrocarbons interact with nitrogen oxides and sunlight.
* Nitrogen oxides occur when fuel is burned EG car emissions and commercial, industrial and residential emissions.
* Sources of methane and non-methane volatile organic compounds (Non MVOCS) include vegetation, waste processing, fuel production and combustion.
* Maintain important because it stays in the troposphere for longer than other pollutants - up to 12 years - compared to less than one day to months for NMVOC's.
* While non methane V OCS are more reactive, accounting for a greater proportion of ozone production, methane is more abundant due to its longer atmospheric lifetime.
* Methane is also a major driver of climate change, with 80xs the warming power of CO2 background levels reflect cumulative build up.
* Methane and climate change are linked via a positive feedback loop

<Presents the Perfect Storm slide>

* <Shows image slides for Perfect storm>
* <Evaluation> take a couple of minutes to consider the people in your life who might benefit from the ME-NET application. Do you think the perfect storm module would be easy to understand for those people? Please respond to the brief survey items using the QR code.

Int1: there is a fantastic term That Common Knowledge introduced me to, and of course I can't remember, but basically it refers to design technique where you start with the simplest image, and then you have tiers of depth that you can go further into, so I thought it really interesting that a couple of people there said - You could have opportunities for people to dive deeper. But start with something simpler. So it is actually a design approach. Some comments there were – there’s nothing there that makes breathing difficult. It's too academic, too technical. Some concern about climate scepticism. Encouraging plain English. You will not be surprised to know that you are not the only ones that have come up with some of that feedback, that is a fairly unanimous position that people have being in the for a lot of people, this information wouldn't be particularly meaningful or important; certainly it's too technical; probably there's more potential to make out of images an such. Again come up I would just open it up, and we've heard a little bit about what some of the images might be. What could we do better? T?

Res1: I guess when I look at it from my population, is that those images are great, the information is great, but - so what? And I guess that's the question we keep having to ask ourselves about this, isn't it? You've given me this information, but so what? What does it mean? And that's why I put the comments around - What does it mean for somebody with breathing difficulties? Why is this information important? I'm talking about different sections of our atmosphere, what does that mean? Why is that not written in a much simpler way? What does this mean to me on the ground? Do we need all the scientific names? It is very difficult for somebody to understand; especially if you haven't studied science for last 40 years - what does this terminology mean and how is it impacting on my life? I guess are the questions. That is the bit where I am not quite understanding. We've given them all this information about methane, the atmosphere, the impact on the earth, but a lot of people are like - What does that mean for me personally? That’s the bit where I don't I think we've quite got the balance. We need to give you this information because it's going to help later but is it too technical at the beginning when people have already switched off and gone - Do you know what, I'm not even going to bother with this, if this is kind of how it starts.

Int1: Thank you, that is really valuable input to hear. Something that we actually considered that we had initially thought it would be important to have a separate bit of education purely about ozone, then a separate one about ozone and my help. But then somebody suggested to us - Why don't you have one thing, like one image that makes all the different parts link, starting and ending with the health narrative, rather than just focusing in on the environmental. I thought that was good suggestion. Right so you might start with the environmental conditions, how it can impact your health, like coughing on a day when there is bad air pollution. Where does that ap air pollution come from? Then something really simple like pictorial showing different places where it comes from, and then what can I do to protect up my health? So just really cutting out the science stuff. Saying that, having that tiered find out more, then you learn some of the stuff that we presented. What do you think of that? V?

Res2: I do think the hook needs to be that health element - Why am I invested in the app? What am I going to get from it? It answers that ‘So what’ kind of question. That probably needs to be central in as much as we might have, not necessarily additional agendas, but this extra education that we'd like to fit in there as well. That probably needs to be the deep dive or the secondary kind of things, doesn't it? Why are you going to be bothered? Why are you going to log in every day? Why do you have to have the alerts turned on? That is the motivation for the user.

Int1: That's really useful and insightful. Any other comments?

Res3: I am very much in agreement. I think it starts with the – So what. I guess not underestimating that there will be people who are interested, so being able to dive into that information, having it's available, probably makes sense but it's not where you want to start.

Int1: Again, that is very similar to other feedback that we've had. Some people actually like more detailed science-based stuff, but make it accessible to everyone first, and have opportunities to deeper dive into that. T, does that sound a bit better as an approach to you?

Res1: Absolutely. There are those people who really want to kind of find more information out about the ozone layers, what you made-up of, and all that kind of stuff, but if we are going to put a lot of people off from the very beginning, there is kind of no point in that in the end. We need to hook everybody in from the beginning, and if people do want more science information, they can further learn, and have different sections on the apps or modules and kind of learn more sections, it makes more sense to do it that way.

Res2: That could be a ‘game-acation’ kind of element: the more bits that you read, your avatar changes colour, you get trophies or badges, there might be an element of that kind of internal competition with other users.

Int1: Interesting you should suggest that because something I'm talking to with our designers is certainly for going through the modules, but also for the self-reporting assessment, was if you do it in streaks then you get rewards, you get a personalised avatar. Probably the next meeting is going to include how you motivate, what does that rewards panel have to look like.

Res2: In shops where you can buy yourself a new hat. My kids have one which is for doing their maths homework, they're all rock stars of different shape or one another, you can have a different Rockstar outfit or hairdo, this kind of thing. For younger people I think it would be a bit of a motivator.

Int1: It is a motivated by other people too!

Res2: I wouldn't like it personally, but I know my kids would like it.

Int1: I'm not into avatars, but when my running app tells me that I’m the local legend of the Washingborough run! However, I need to maintain being the local legend of the run by doing it regularly! Because I have a little rewards panel on my phone, and no matter how much I tell myself that it is completely life meaningless, I want those little gold medals. So that's something to think about for another session. Certainly, by thinking about how do you gamify and motivate with things like that. So bits of information sound like they would have a good positive effect on people come up if paired with health protection information and recommendations. But the end user might not get any benefits from or have a negative effect. A lot of this stuff is new to me, so we did a pretty rapid scoping literature review of this. What are the actual tangibles for understanding the links between ozone and respiratory health. How much would people benefit from knowing, that's another question that we're hoping he will answer.

<Presents ozone and respiratory health slides>

* WHO estimates greater than 7 million deaths per year from air pollution.
* Deaths attributable to ozone specifically during warm periods across Europe between 2015-2017 was > 100,000(Achebak et al, 2024).
* As soon as associated with approximately 0.7 million deaths per year, on average 6.3 million years of lost life related to cardiovascular and respiratory illness (Aneburg et al 2010).
* Long and short term exposure decreases lung function, particularly for children) Holm and Balmes, 2022).
* Peak daily ozone and ozone in warm months is associated with cardiopulmonary and respiratory mortality.

<Present Mental Health slide>

* Zhao et al (2018) reviewed 31 studies –> Links between ozone and cognitive function, possible links to suicide, depression to ED admission for panic attacks, notably:
* two cohort studies showing association with depression, including increased risk of reporting symptoms per 10ppb ozone exposure, association with them being concentration and suicide mortality in Belgium for all seasons except winter;
* one case control studies showing difference in ozone for days with +2 suicides (x=86.4 ug/m3) and those without (x=79.8 ug/m3)

Mental health research is less clear

<Presents Direct vs Indirect Pathways slide>

* Increasing evidence for direct impacts of pollutants on central nervous system, cerebral white matter, cortical grey matter and basal ganglia (Bernardini et al, 2020b)
* Alterations to brain regions and process is linked to psychopathology EG changes to neurotransmitters (Zundel et al, 2022).
* maybe some direct pathways to? EG possible links between respiratory systems and mental health flare ups/escalations. Biophysical effector blue inhaler salbutamol overuse EG increased heart rate, tremors, stomach acid precipitating anxiety?

<Shows some points to consider slide>

* WHO estimates that dangerous ozone concentrations are greater than 100 ug/m3.
* Thresholds might be low for mental health.
* What are the actual links, drivers and pathways?
* Much more research needed.

<Shows Ozone and your health slide>

* Think about the most important thing you have learned about ozone and health. Which bits are the most important to include an educational module ‘Ozone and your health’. Which bits should be represented visually? <Shares mages designed by Lincolnshire’s University Academy Holbeach in Kings grammar Grantham students> Picture – How bad air things get out.

Int1: Have a think, and feel free to chime in, but of all of that, do's and don'ts , what should be communicated, what shouldn't be communicated, and which bits can you imagine being done visually as opposed to text, because that seems to be something that a lot of people think could be a good way forward. So what shouldn't be communicated? What wouldn't be useful in an app?

Res3: I guess given the uncertainty around, and to health impacts now and whatever kind of mechanisms that might be there, I'm not sure if you should be sharing anything on that, or is it something you are just monitoring in terms of people's mood, and maybe something you can learn more from through the app? As you say, the evidence base has been fairly limited because of methodological flaws. From people that I do work with, there's a lot to potentially seize on once you start making those connections between. I guess if you're going to talk about any of this to really put the emphasis on what people can be doing to mitigate, or promote their health, in the context of an environment that they can't change directly.

Int1: Thank you, that resounds quite strongly with some of the other feedback that we've had. I think it's really important to recognise that if there isn't a clear evidence base, it's probably not useful to communicate those points. And actually, I was thinking that even if there is a clear evidence base, is that a safe thing to be communicating? Is it more useful to monitor and support and prompt access to services, groups and that sort of thing, rather than to prime people with those messages. I think originally, we were just going to look at the research, to see what's there, and what could benefit people to know, but we seem to be getting a pretty consistent message that there are some things that might benefit people to know, and there are other things that might have the opposite effect. Any other points?

Res2: I would tend to echo N’s points, we have to think about keeping people safe, haven't we? You don't want to prime people to respond or react in a particular way, encouraging people to turn up at A&E or take drastic action. - You feel a bit rubbish today come out try this or try this, if you still feel a bit rubbish then ring 111.

Res1: I do think that it has to be very area specific. NE Lincs, and Lincolnshire are very different, and the agencies that you would contact are very different in some circumstance. I think that it has to be very specific.

Int1: I spent only a few days in NE Lincs, but it was great to get to meet so many people and see a lot of the services there. I was very surprised to learn that the ICB is so separate from Lincolnshire, all sorts of things are different. I think that is a really important message. It links to these final points. I will send out a follow up survey in the next day or two but that point that T made about finding out more, and that needing to be very geographically specific. What I'm going to do is that if you have a sense of what you think the support network to let me know and we can have a follow up discussion about it. N, you might have some ideas about mental health, V and T you might have all sorts of ideas about your region specifically. I agree that it's absolutely critical to make them as personalised as possible. It might not just be NHS services, you might know of an asthma children's group that parents could join or something like that. We really hope this up that there is a better opportunity for people to understand their health, but once they've done that what next, what do they do next? Try and make that as useful as possible. Part of that will be what is in this follow-up survey.

<Displays Follow up Survey Screen>

- Find out more: your ideas about the links we should embed in the app.

- Opportunity to recommend additional stakeholders for the board.

- Days of the week/times of the day for future meetings.

- Further opportunity for feedback and input.

<Meeting Transcription>

- All recorded meeting will be transcribed.

- Transcriptions will be uploaded to Teams.

- Opportunity to feedback.

<Displays Future Meetings slide>

- Similar format, feedback and Co develop content for the application following the themes below

- Timeline for future meetings

<Future Themes>

- Visual self-assessment tools for MH and respiratory symptoms

- Graphing self-reported data, alert me

- Mapping observational data, explore and learn

- Prototyping functionality of alerts of the system/app

<Displays Thanks for Attending slide>

Int1: Thank you very much for your time, I'm really enjoying this process and I'm learning a lot, and I'm looking forward to sharing some of that feedback that you've had input on. See you soon.

Interview Ends