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A COVID-19 National Core Study

Thematic Analysis of HSE Workplace Outbreak Investigation data

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Theme 1 of the PROTECT study includes rapid on-the-ground investigations (known as the COVID-OUT study) of COVID-19 outbreaks in workplaces, as well as comprehensive analysis of outbreak data collected by UK Health Security Agency and regulatory bodies

This work was supported by funding from the PROTECT COVID-19 National Core Study on transmission and environment, managed by the Health and Safety Executive on behalf of HM Government.

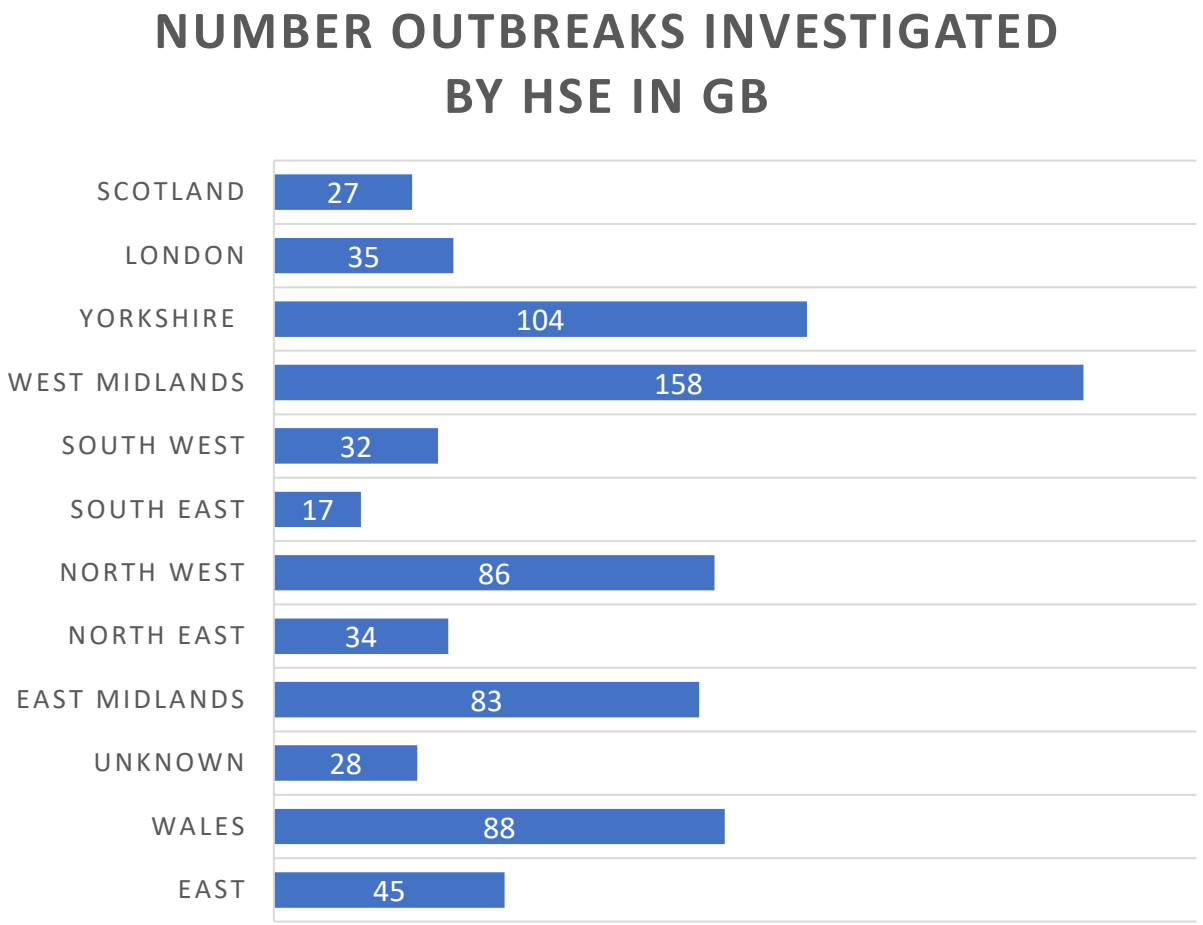
Research Questions

What are the risk factors associated with outbreaks of COVID-19 in workplaces according to the joint investigations by HSE?

How do the themes identified in the thematic analysis change over the time period June 2020 – June 2021?

Is it possible to identify from the data if factors associated with outbreaks are different between sectors/regions?

What lessons can be learnt from the HSE outbreak management data for future emergencies?



Outbreak Investigation in Workplaces

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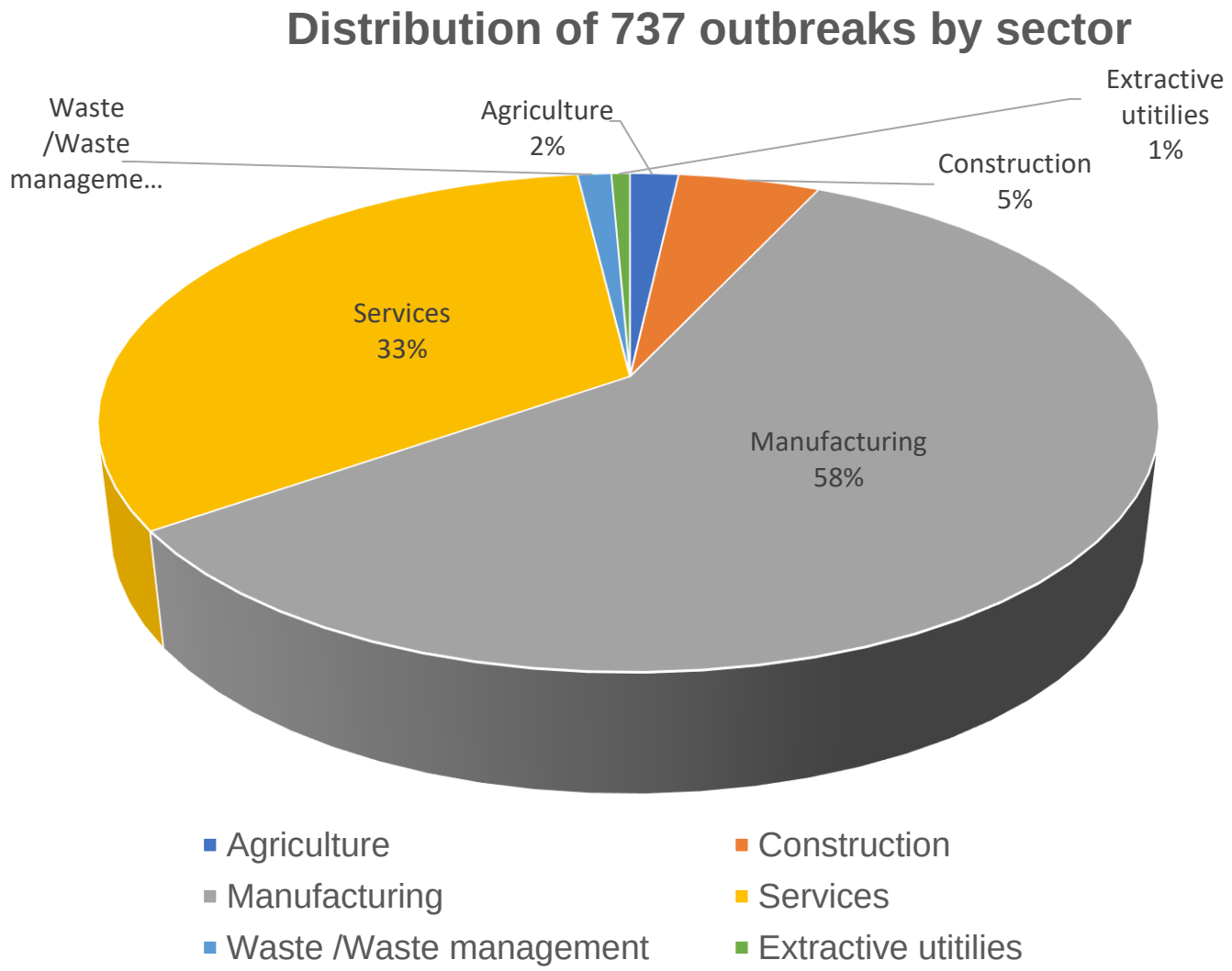
Objectives

Using qualitative methods identify factors that might be associated with outbreaks of COVID-19 in the workplace

Undertake qualitative analysis of secondary data collected as part of COVID-19 outbreak response



Distribution of Outbreaks in higher risk sector by SIC

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Manufacturing accounted for 58% of total outbreaks in dataset

- ❑ 169 manufacturing of food products (SIC10)
- ❑ 19 manufacturing of rubber and plastic products (SIC22)
- ❑ 28 manufacturing of motor vehicles, trailers and semi-trailers (SIC29)
- ❑ 17 wholesale trade, except of motor vehicles and motorcycles (SIC46)
- ❑ 8 warehousing and support activities for transportation (SIC52)
- ❑ 16 postal and courier activities (SIC53)

Thematic Analysis method

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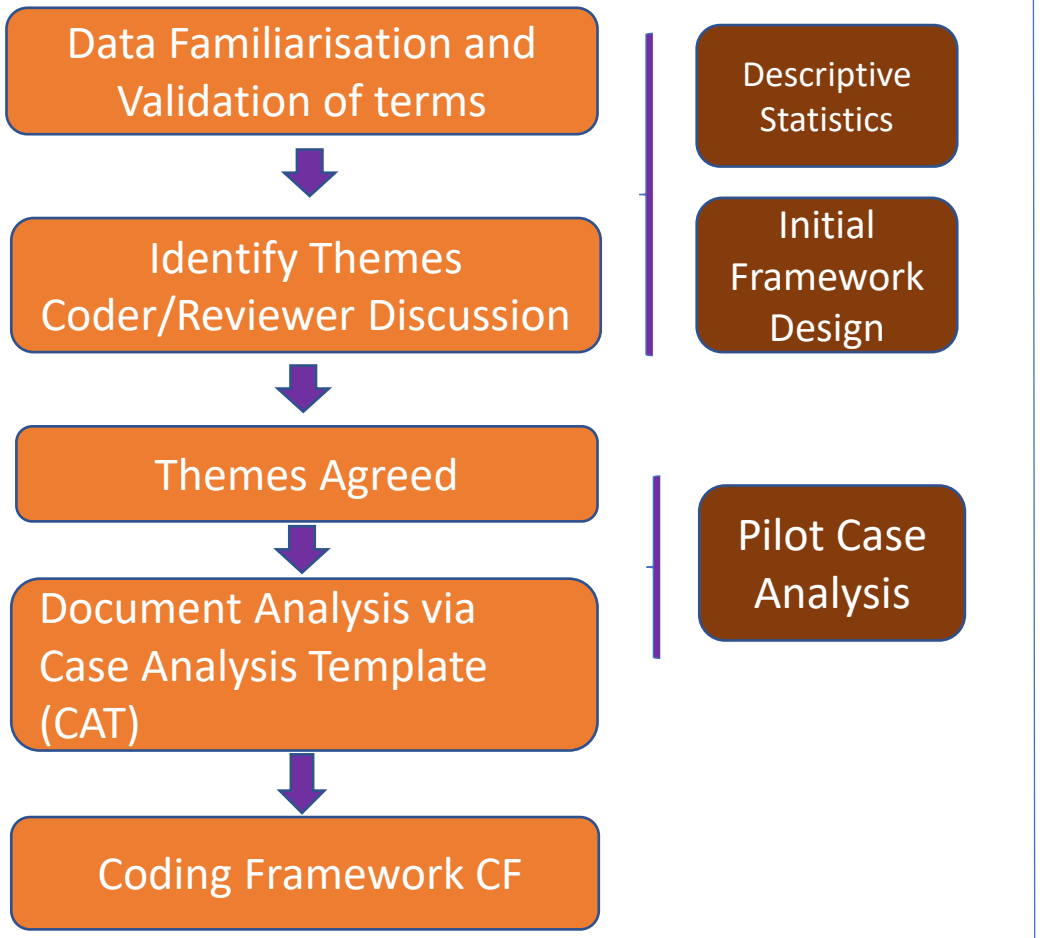
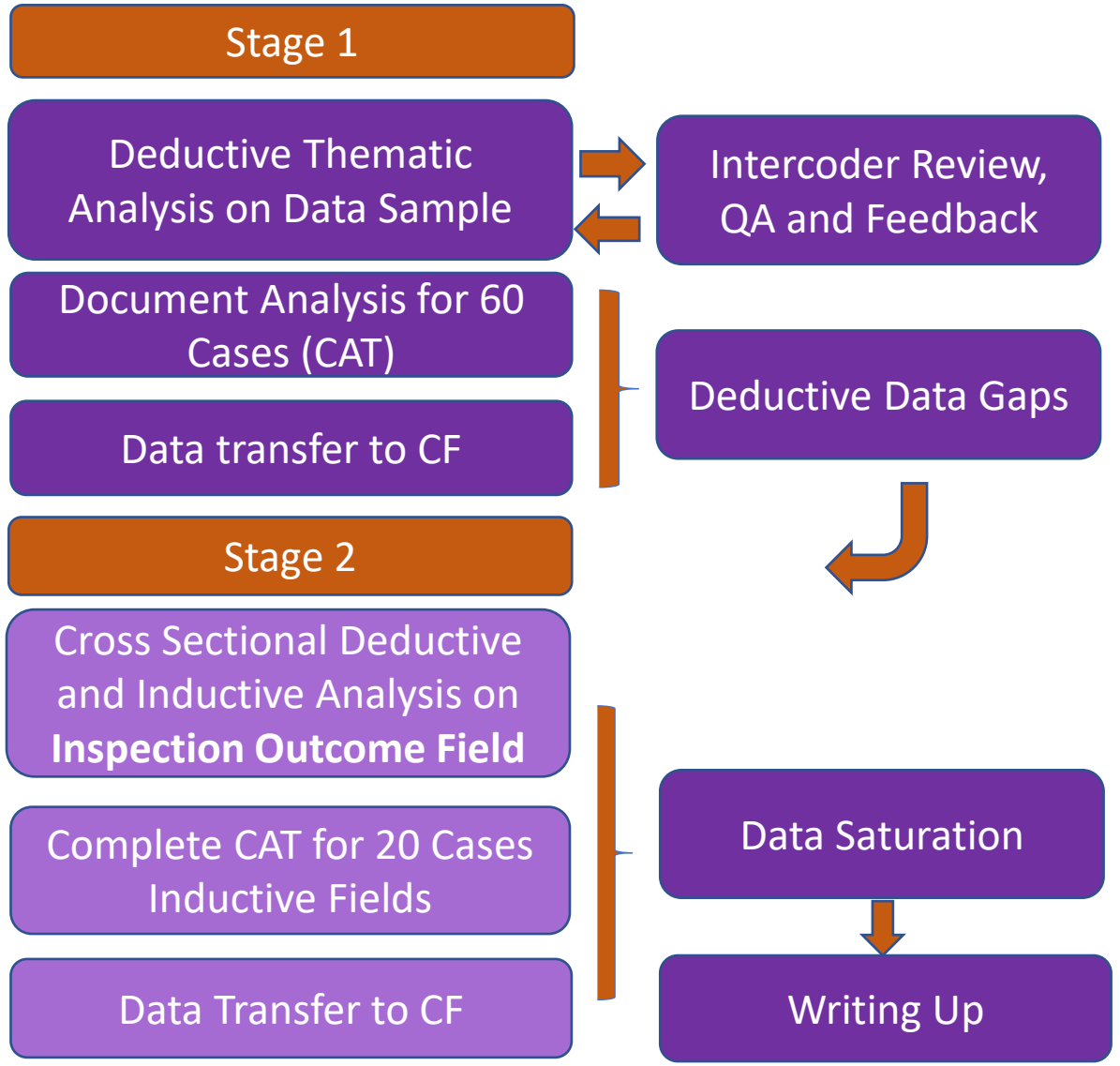
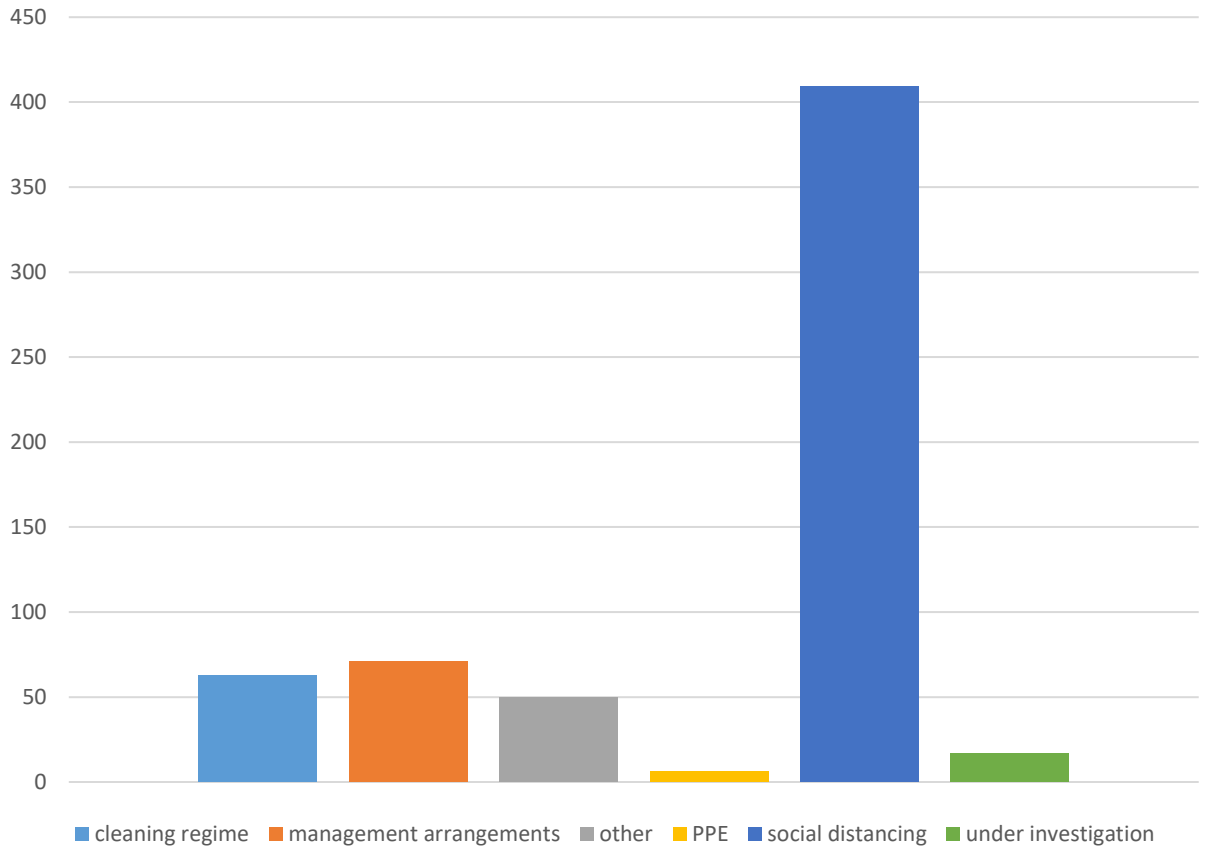




Early Findings

Dataset Analysis

- Extracted field data summaries from existing documents collated during outbreak investigations in priority sectors
  - (i) descriptive statistics from records from 700+ occupational settings
  - (ii) Allowed for some categorisation, for example by nature of concern, visit type, SIC and adherence to COVID-secure guidance
- Considerations
  - Other and Unknown are likely related to organisational, environmental (ventilation) and cultural factors
  - PPE and mask wearing/face covering distinction varied/unclear/limited data

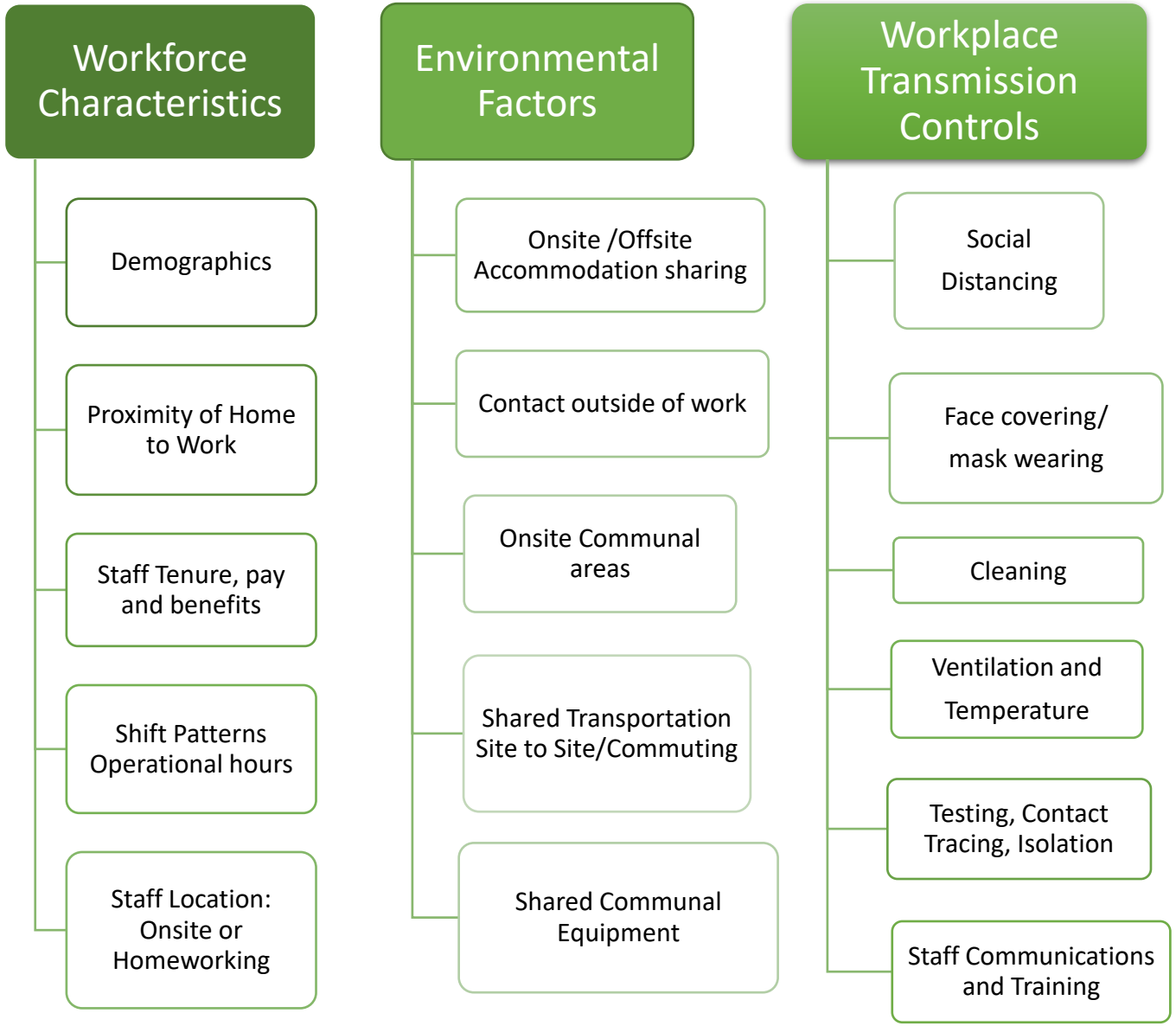


A priori themes from Thematic Analysis to inform Factor Analysis

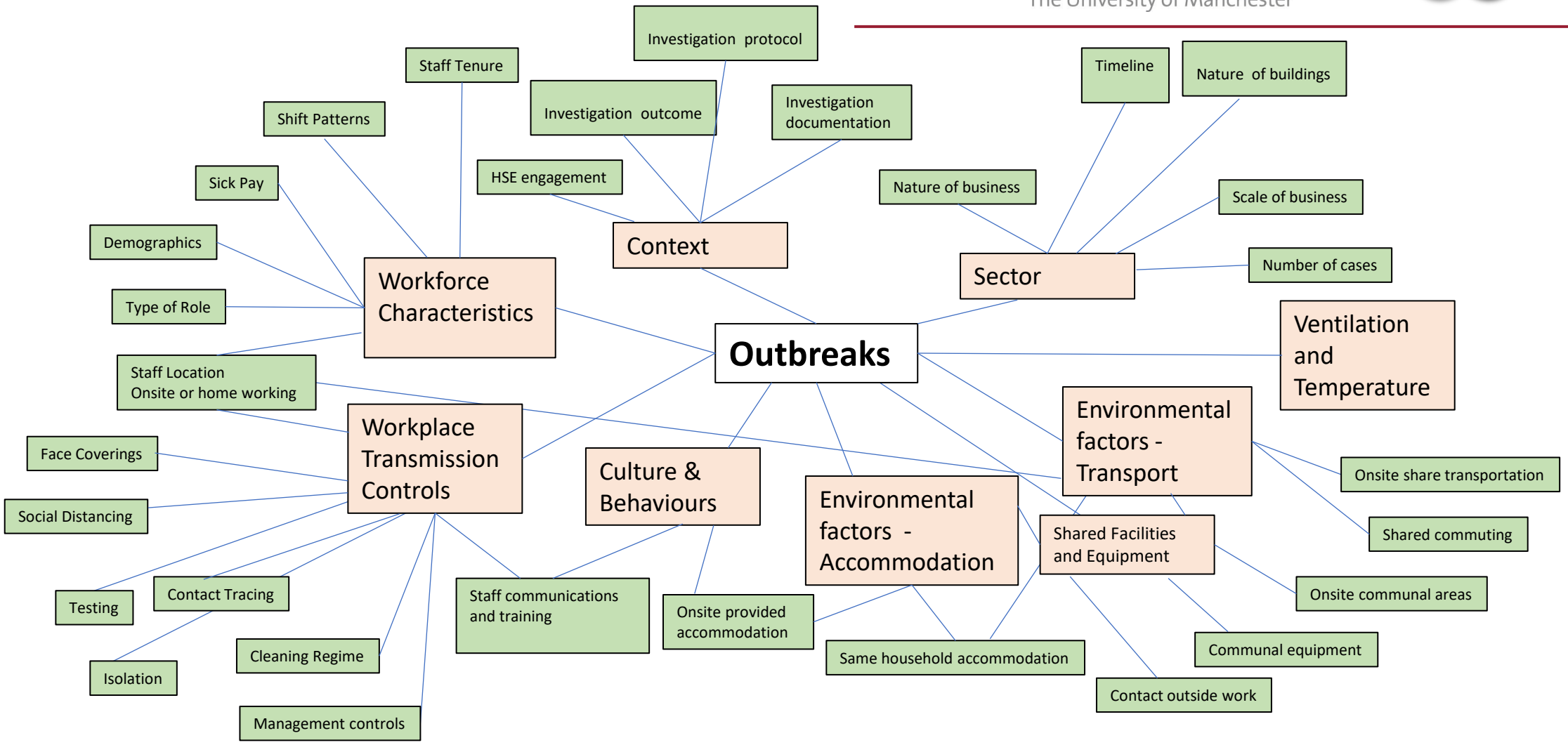
Examples of Coding and Themes

Deductive and purposive

- **Stage 1** - In-depth qualitative analysis of 60 reports randomly selected from the key occupational settings determined by Theme 1 findings
- Mapping of thematic analysis
- **Stage 2** - Identify relationships with the variables to inform future practice/preparedness



Thematic Analysis Map of risk factors



A priori themes from Thematic Analysis to inform Factor Analysis

Document Analysis

Stage 2 Inductive Analysis and Interpretation

- Analysis of 20 cases using four outcomes recorded in the reports for maximum variation
  - no further action
  - verbal advice
  - written correspondence
  - enforcement notice
- To reach Data Saturation (Miles and Huberman 1994)
- Use data to further interpret and corroborate existing and any new codes and themes

Findings and Future Work

Preliminary findings

- Structural factors appear to be important in communicable disease transmission.
  - Number of Temporary, Agency and Seasonal staff e.g. SIC 10, SIC 53
  - Sickness absence pay arrangements in addition to SSP
  - No ability to work from home
  - Proximity of home to work and shared short car journeys and shared workplace transport
  - Shared Accommodation
- Indicators are that managing environmental factors to minimise transmission was very challenging for workplaces

Future Work

- Developing qualitative research methods for retrospective deductive and inductive data analysis on secondary data sets
  - Local Authority EHO inspection data
  - PHE/UKHSA Data
  - HSE data
- Inform harmonised data collection methods for workplace infectious disease management and epidemic preparedness
- Improve understanding of why practices/behaviours are occurring

Qualitative analysis of large scale secondary data sets

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Opportunities

- Opportunities to glean knowledge and understanding from large scale secondary data sets such as investigation reports
- Rapid review of intelligence from large datasets
- Learning to inform future data systems

Limitations

- Using a specific data set that is not designed for data to be collected in response to a specific research question
- Do not have enough data about individual roles and activities
- We cannot comment on behaviours but we can comment on observations about behaviours

Challenges

- Data Saturation
- Extremely variable data quality and quantity per outbreak investigation
- Useful to reflect on what we cannot know from the data
- Methods of inquiry are not well understood within quantitative research community

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Thank you

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How much do I touch my face? Modellers want to know

Miranda Loh
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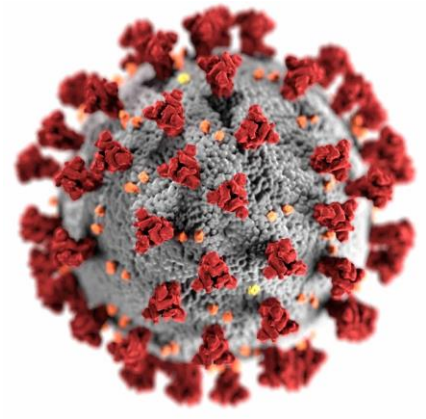
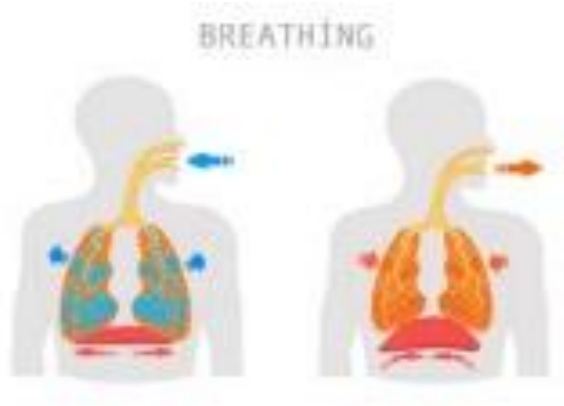
Contacting the virus





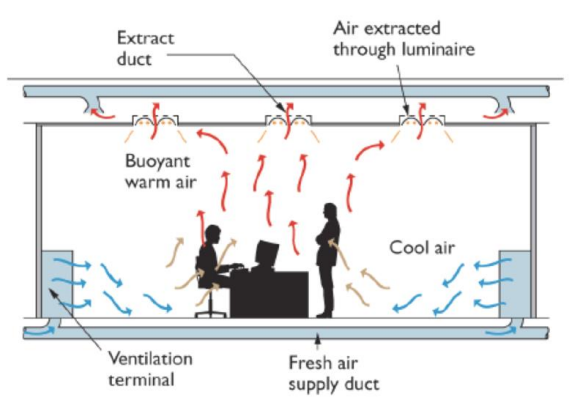
How do we quantify infection transmission risk?

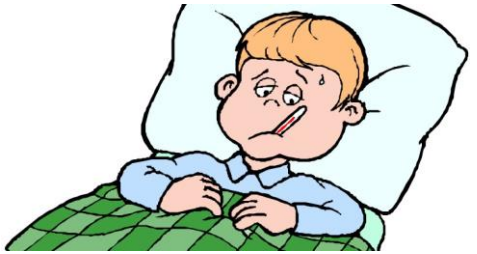
Quantitative Microbial Risk Assessment (QMRA) Modelling

What it is

- A tool for estimating health risks of infection from exposure to pathogens
- Mathematical model that provides a numerical risk estimate
- Possible to estimate impact of interventions along routes of transmission

What is a QMRA model composed of?





Where does face touch data come from?

Group	No. studies	Setting
Occupational	9	Manufacturing and engineering, healthcare, agriculture, laboratories
Office	9	
Lecture/seminar/conference	5	
General public	8	Dentist waiting room, senior welfare centre, parks, banks, outpatient clinics, bus stations, travelling on buses, airport, bar, church, classroom, food court, museum, public and university libraries, sporting events, zoo
Designed experiment	5	Doing nothing, listening to music, listening to lecture, paperwork, telephone conversation, office-type work, train simulation

What kind of data do we want for modelling?

We want a distribution of data

The probability that a person will touch their face in a specified amount of time

- 9 studies with individual data (N=2,161)
  - Excluded “eating” (N=95)
  - Excluded left/right hand (N=36)
- Analytical sample (N=2,030)
  - All had setting and face
  - 4 studies recorded gender of the participant
  - 2 studies recorded facial hair and glasses

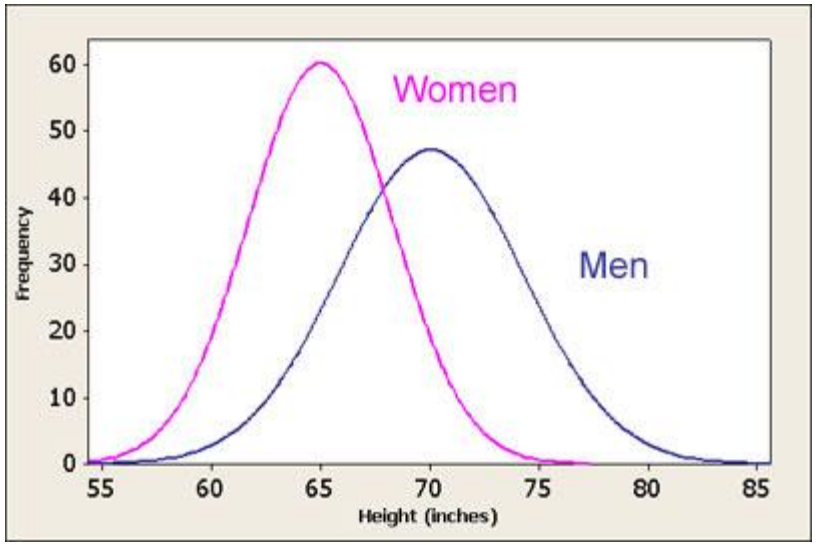
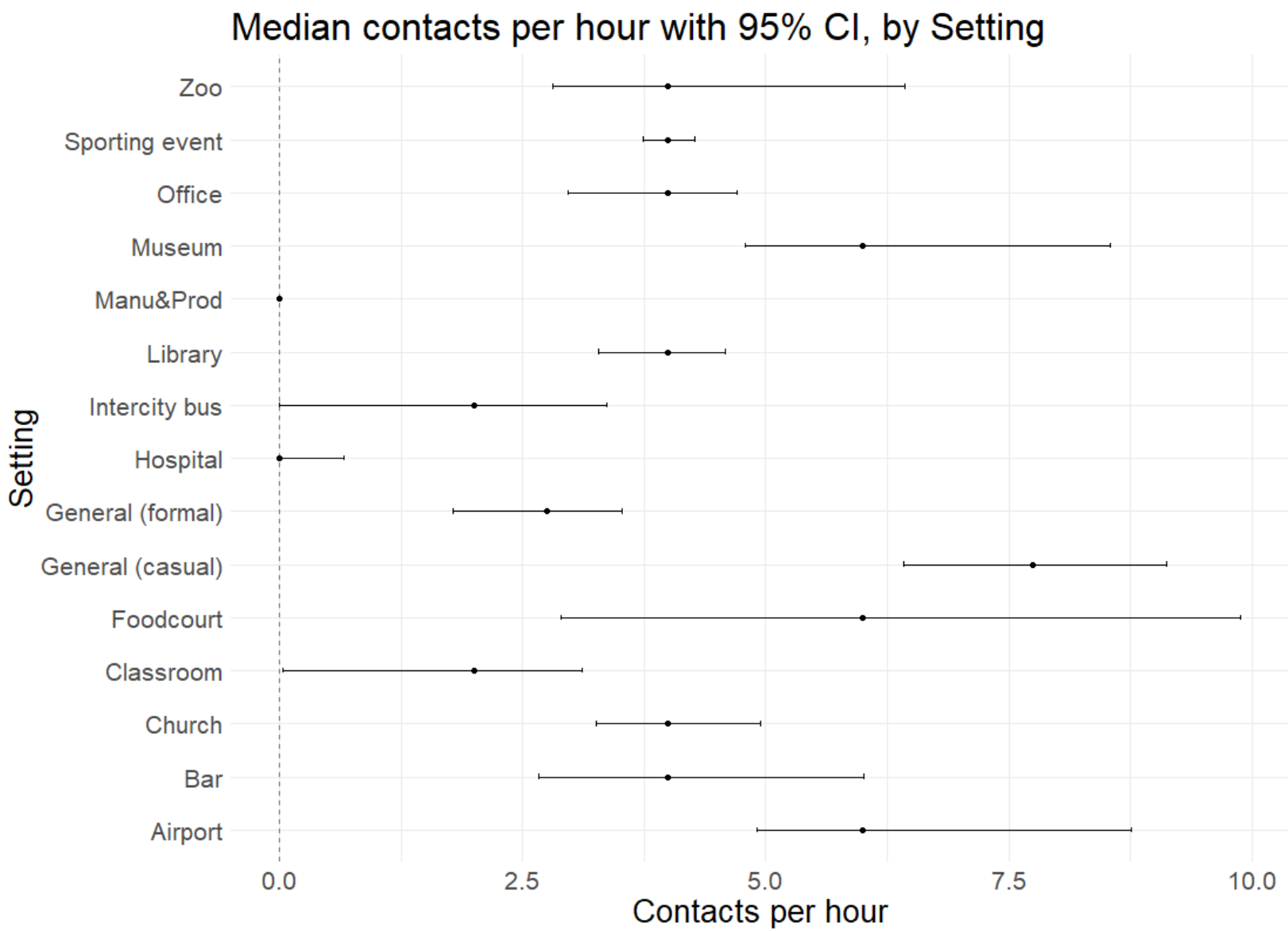
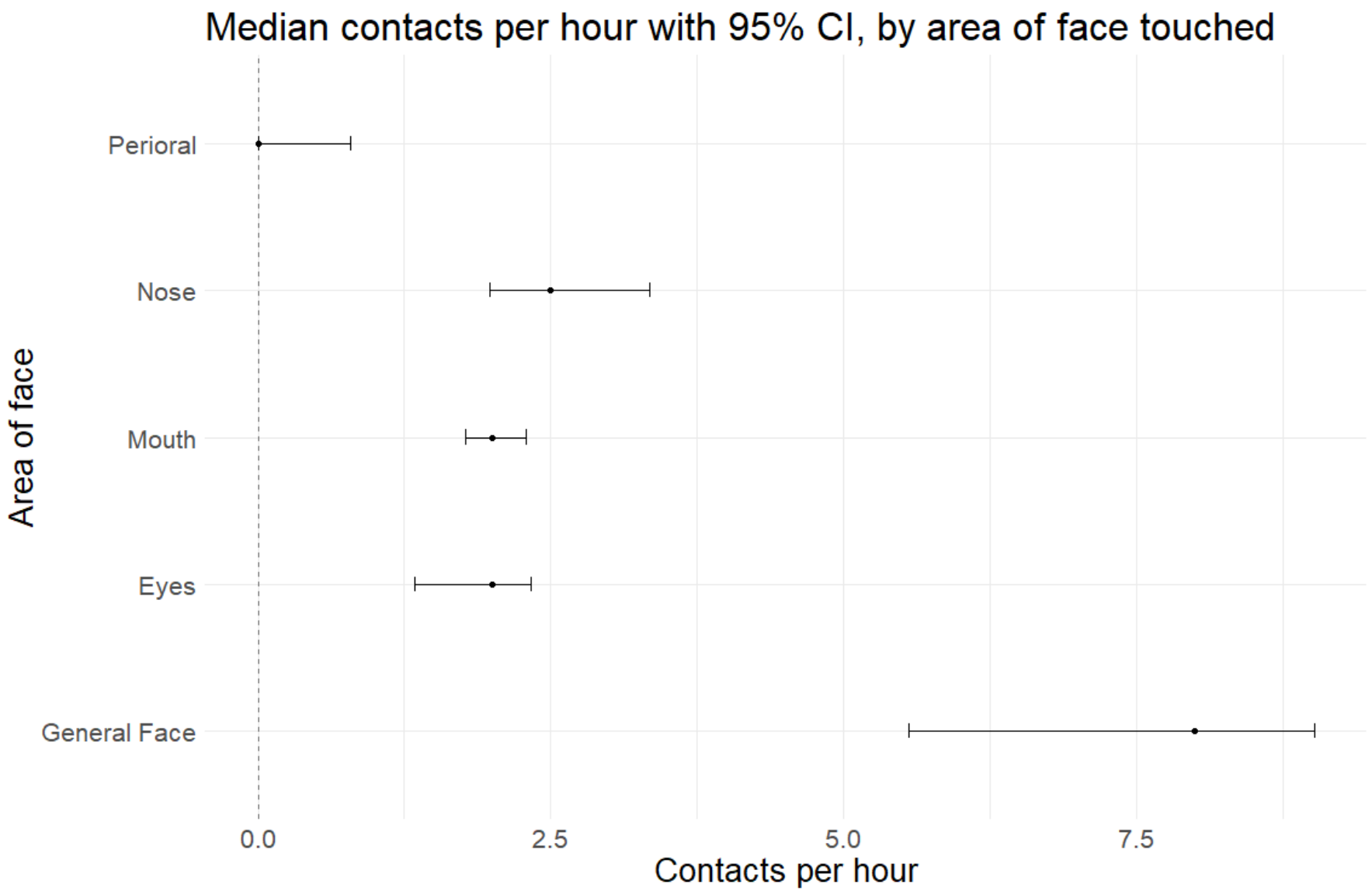
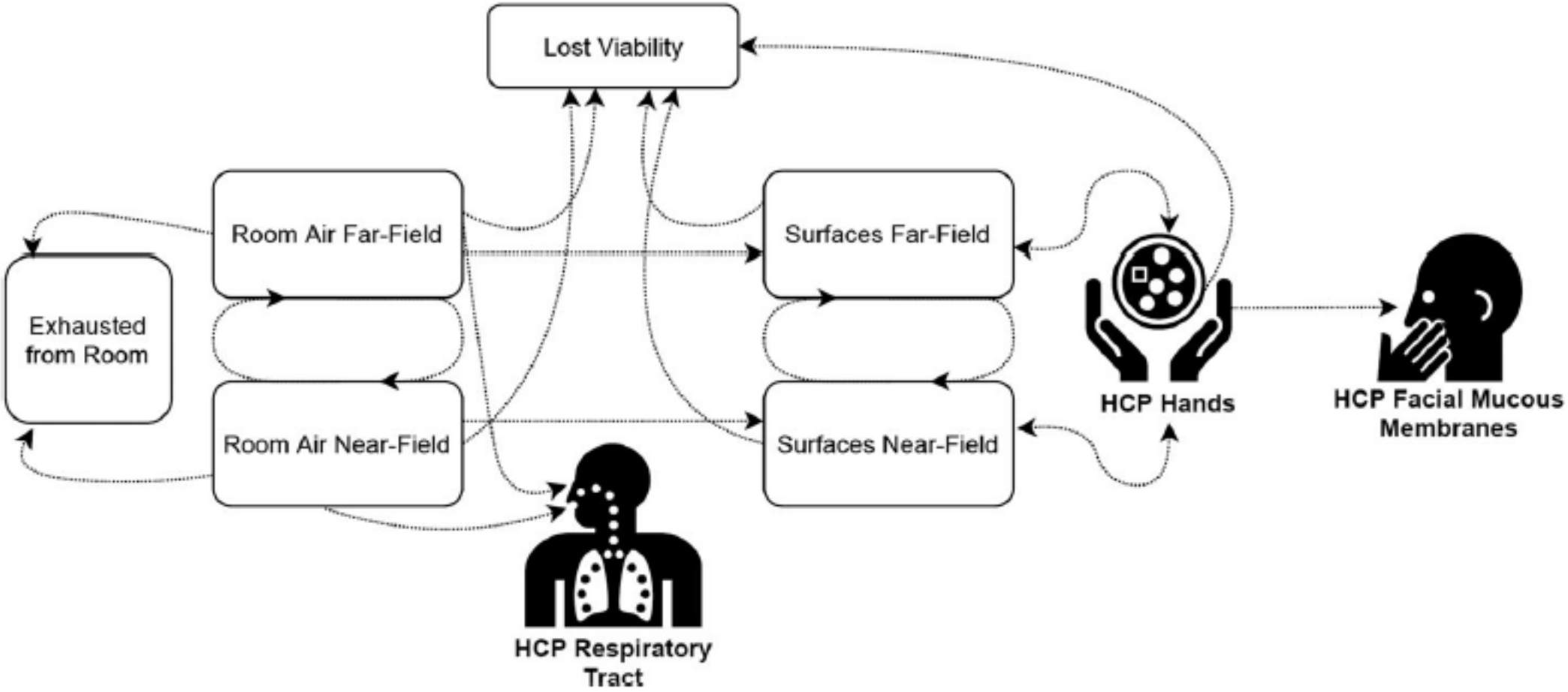


Image from:
https://www.usablestats.com/lessons/normal


Median contacts per hour with 95% CI, by Setting
Zoo
Sporting event
Office
Museum
Manu&Prod
Library
Intercity bus
Hospital
General (formal)
General (casual)
Foodcourt
Classroom
Church
Bar
Airport
Setting
0.0
2.5
5.0
7.5
10.0
Contacts per hour

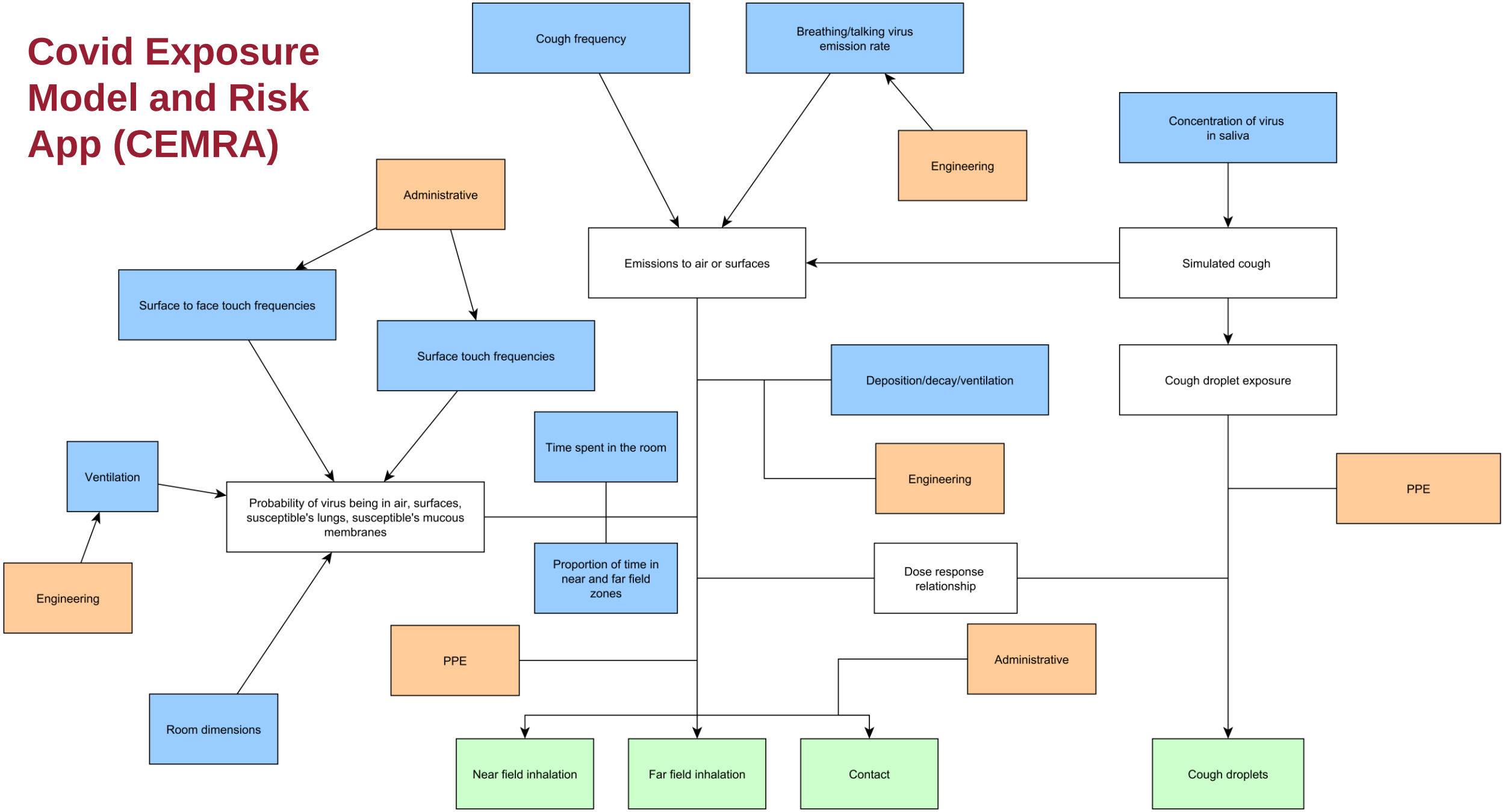

Median contacts per hour with 95% CI, by area of face touched
Perioral
Nose
Mouth
Eyes
General Face
Area of face
0.0
2.5
5.0
7.5
Contacts per hour

Model structure



Jones, R.M., 2020. Relative contributions of transmission routes for COVID-19 among healthcare personnel providing patient care. *Journal of Occupational and Environmental Hygiene*, *17*(9), pp.408-415.

Covid Exposure Model and Risk App (CEMRA)



CEMRA

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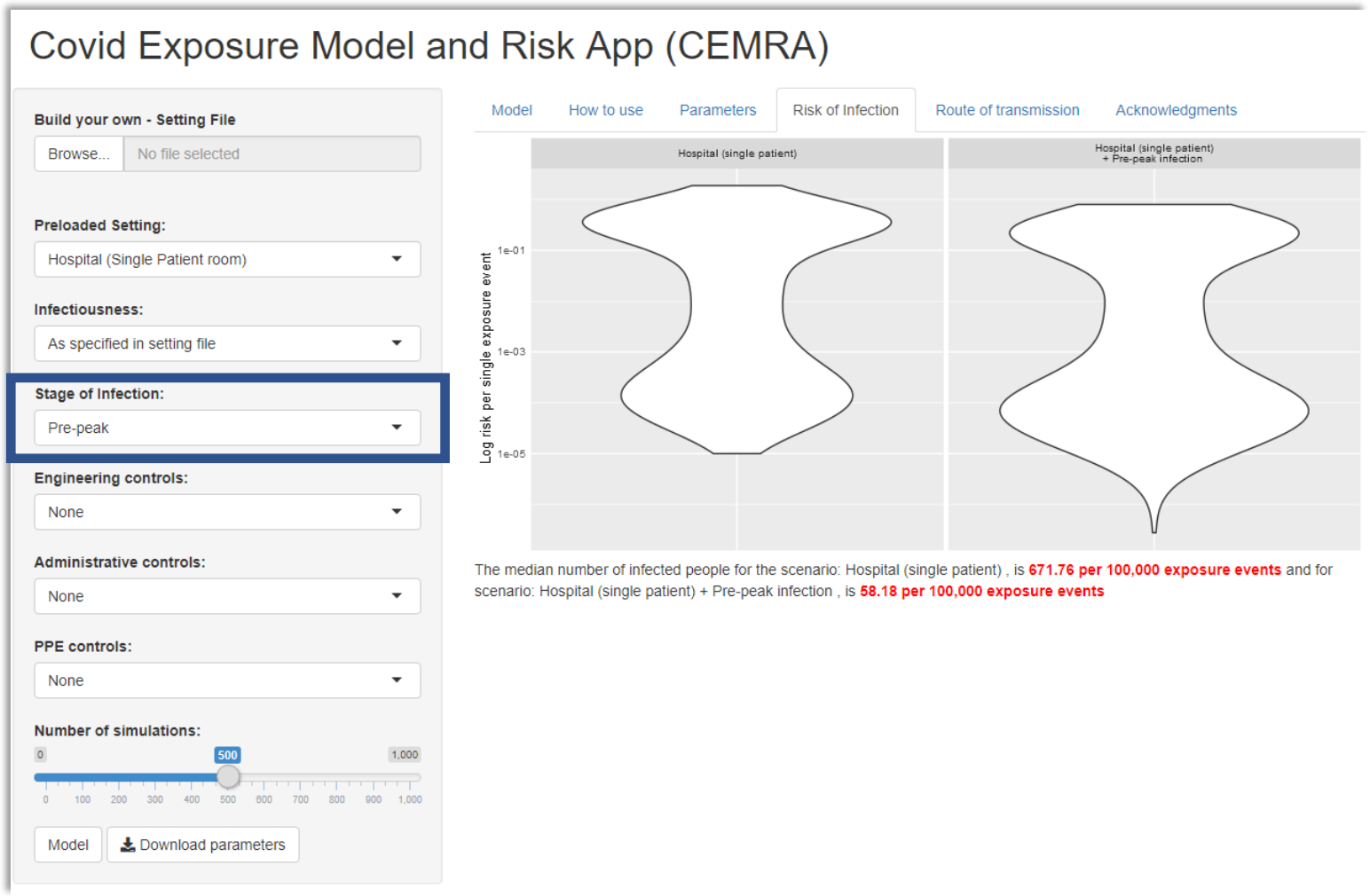
Overview

- Setting
- Infectiousness
- Stage of Infection (added using HCS data)
- Controls
  - Engineering
  - Administrative
  - PPE



Predicted routes of infection

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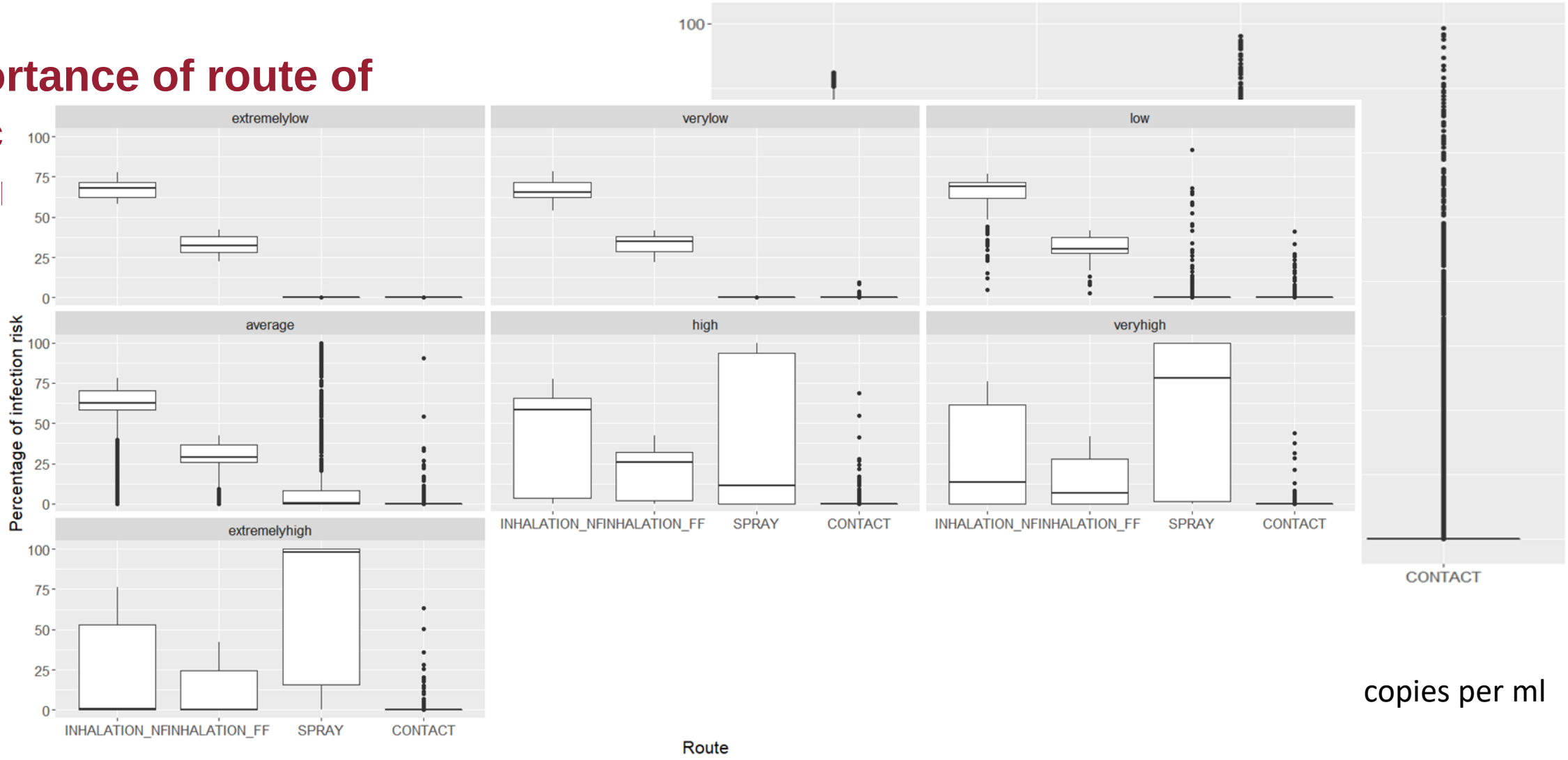
Importance of route of infec seve



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PROTECT QMRA Models

IOM – CEMRA

DSTL - Multiroute Mechanistic Model for Indoor Viral Transmission (M3IVT)

University of Leeds – QMRA/Reservoir Model

Models originally developed to investigate virus transmission and infection risk in e.g. healthcare settings, underground, toilets

Currently being adapted to examine a set of scenarios

Acknowledgements

Mark Cherrie (IOM) – Development of CEMRA

Anne Sleeuwenhoek (IOM) – Face touch review

Additional team members:

Cath Noakes (Leeds), Simon Parker (DSTL), Lee Bensen (Leeds), Marco-Felipe King (Leeds), Rohan Prasad (Leeds)

CEMRA was originally developed under COV/IOM/Portfolio from Scotland CSO

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Contributing factors and mitigation strategies for areas of enduring Covid-19 prevalence: a qualitative study with Directors of Public Health

Professor Sheena Johnson, Professor of Work Psychology and Wellbeing, and Cath Lewis, Research Associate, Thomas Ashton Institute for Risk and Regulatory Research.

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On behalf of the enduring prevalence group:

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University of Manchester:

Professor Sheena Johnson, Dr. Angelique Hartwig, Cath Lewis, Dr. Anna Coleman, Dr. Nicola Gartland, Professor Chris Armitage, Professor David Fishwick, Professor Martyn Regan (also with PHE), Dr. Eleanor Roaf (also DPH), Janet Ubido, Dr. Amit Gaokar, Professor Arpana Verma, Professor Martie van Tongeren.

Health and Safety Executive (HSE):

Professor Andrew Curran, Professor David Fishwick (dual affiliation).

Methodology

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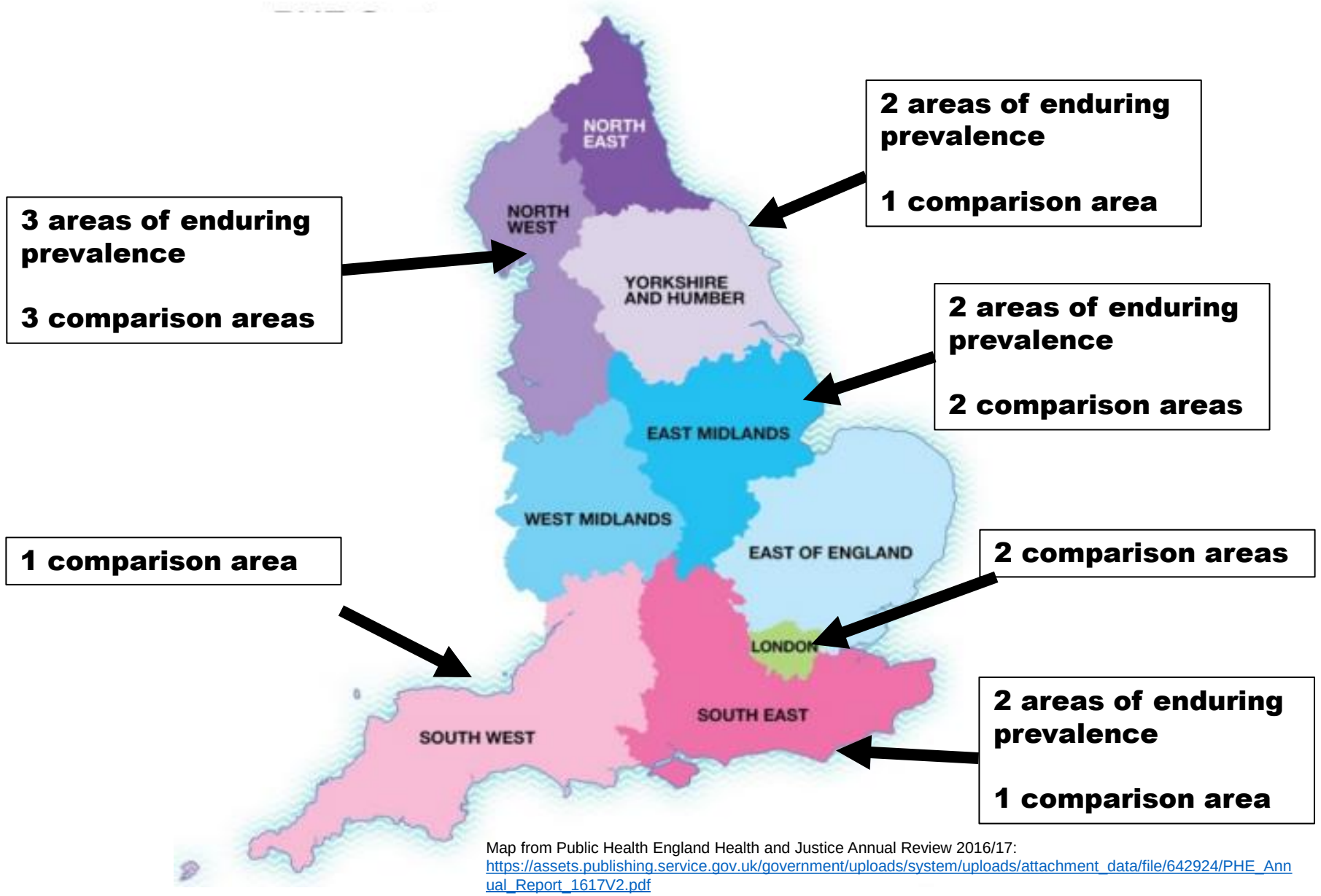
- **Research aim:** To gain an understanding why certain places appear to have consistently high prevalence of COVID-19 infections compared to other places and which local strategies are effective in preventing or reducing prevalence

- **Design:** Qualitative semi-structured interviews with Directors of Public Health and local stakeholders from areas of varying prevalence

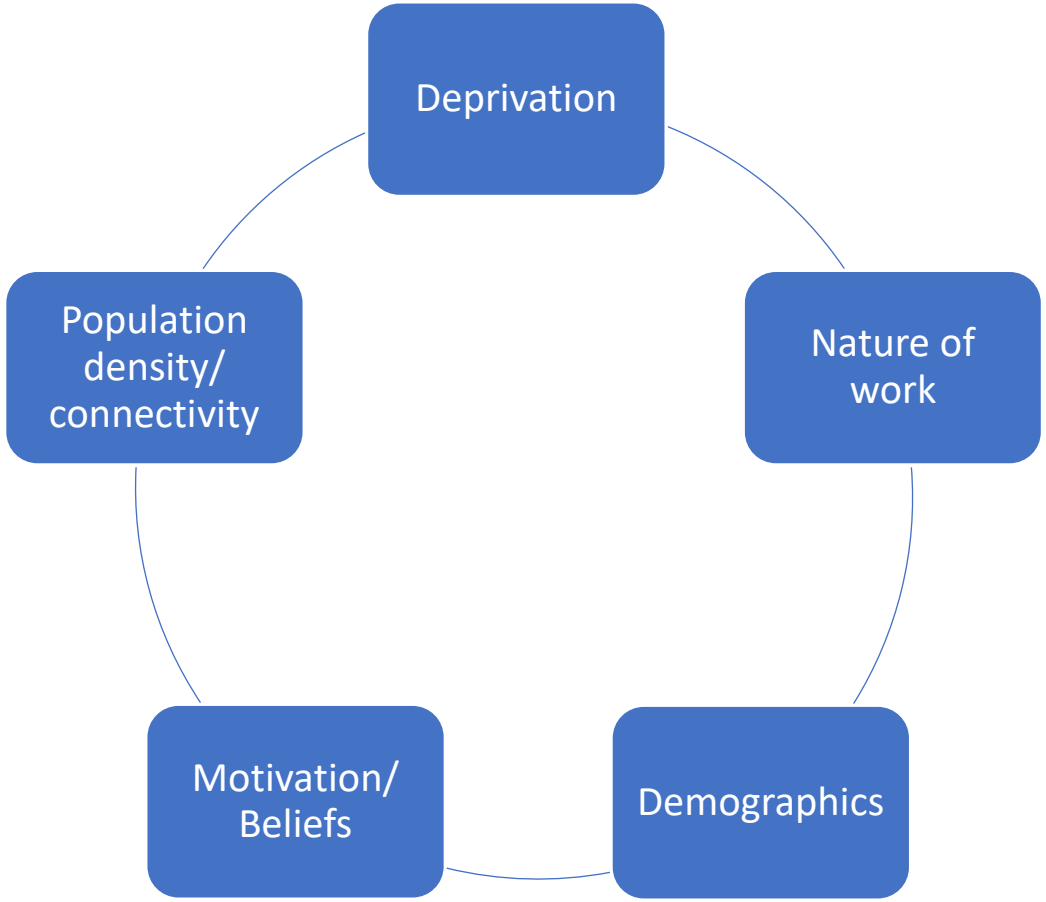
- **Sample:** High prevalence local authority areas were identified by PHE as having spent the highest number of days in an epidemic phase. Comparison' areas were also identified by PHE, DsPH and ADPH, including areas with less explosive rise in cases or less enduring transmission, and comparison areas to areas of enduring prevalence, e.g. statistical neighbours.

Progress update:
19 interviews have been carried out



Map from Public Health England Health and Justice Annual Review 2016/17:
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/642924/PHE_Annual_Report_1617V2.pdf

Factors contributing to enduring prevalence (1)



Factors contributing to enduring prevalence (2)

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"So I think we had quite a lot of people, where isolation was difficult financially, in terms of zero hours contracts and not getting paid holiday and sick time and all of those issues, which I guess, led to some reticence to get tested, some reticence to use lateral flow testing particularly. So people who felt well, didn't want to be told that they weren't well, and that they were carriers. I think people had the, if I'm symptomatic, I'll get tested, rather than going for asymptomatic testing. And that was something we worked really hard on pushing, asymptomatic testing in some of our more deprived wards, and some of our higher prevalence wards throughout"

(DPH, comparison area).

Factors contributing to enduring prevalence (3)

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- Prevalence rate variability within LA: prevalence varied across different areas/wards of the local authority – it was higher in more deprived wards, for example
- DPH have an excellent understanding of their local authority and anticipated areas of high prevalence.
- Although there were a few surprising findings these were in the minority. These included:
  - One area with high levels of deprivation saw less explosive rises in prevalence. One reason suggested by DPH was high quality of housing in the authority
  - Persistently higher rates in more affluent suburb areas with professional population in one local authority.

Local strategies to reduce prevalence

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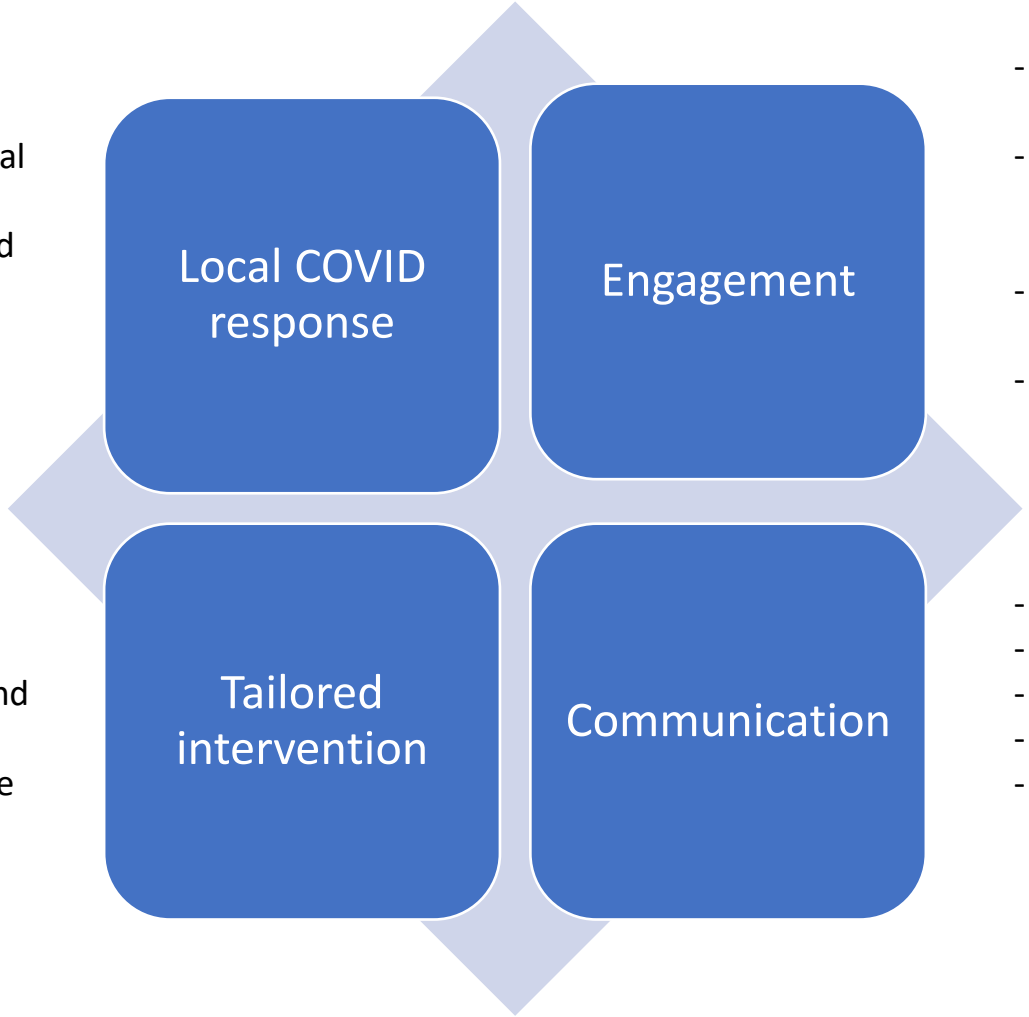
- Local contact tracing
- Restructuring of LA to enable local response
- Building on existing networks and partnerships
- Isolation support
- Local vaccination sites
- Team working.



- Engaging with employers, communities, schools
- Using and further developing existing links with community and voluntary organisations
- Engaging with local leaders and vulnerable groups
- Engaging with faith leaders to encourage COVID safe behaviour/vaccination uptake

- Close co-operation with communities
- Understanding people's needs and concerns
- Empowering communities to take control.

- Consistent, continuous communication
- Two way communication
- Promoting social cohesion
- Myth busting
- Communication campaigns.

Strategies employed by Directors of Public Health

" And then the other bit we've been doing more recently, which again I would have loved to have the capacity to have done a year ago but it hasn't happened, is things like testing. We've been going out and making really good positive links between faith settings and also between faith settings and some pharmacists who actually show people how to use the tests and have those conversations and give out the test kits…So that's relatively early days but seems to be really good buy in….It's been very much a focus on us working with to support the communities rather than doing things for them…It's really been trying to do it at quite grassroots level"

(DPH, area of enduring prevalence).

Barriers to reducing prevalence (1)

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- Systematic inequalities and deprivation
- Issues around testing including ability to self-isolate, financial barriers to self-isolate, issues related to employment such as lack of sick pay and insecure contracts
- Issues around local testing strategy including lack of national testing strategy, limitations of lateral flow tests and issues around registering test results
- Issues around vaccination including competing priorities, lack of accessible vaccination sites, hesitancy to get vaccinated
- National contradictory messaging/lack of trust, blaming certain groups
- National “one size fits all” approach e.g. definitions of a household, social norms in community etc.
- Gaps in data or delayed access to data.

Barriers to reducing prevalence (2)

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“

Covid has highlighted and exacerbated existing health inequalities:

“And it’s just been played out very fast through the medium of an infectious disease, but if you look at non-infectious disease, if you were to look at non-infectious disease prevalence over, you know, over a long…your timescale’s longer, but you see exactly the same death rate patterns. So, there’s nothing different about COVID, apart from the timescale….”

(DPH, comparison area).

Summary of suggestions for further research

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- Multivariate analysis – how do multiple factors interact in predicting transmission?
- Understanding the challenges that the communities face
- Developing the evidence base for effective interventions and communication strategies
- Building on partnerships/networks established during the pandemic
- Longitudinal work on the long term impacts of the pandemic and how areas recover
- Developing long-term resources to prepare for future pandemics/health crises.

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Provisional further approaches (1)

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Mixed method studies (combined qualitative and quantitative approaches) could address the following;

- Assessment of the specific role of geography (land bound, sea bordered, transport links) between areas of high (enduring) and low prevalence
- Exploring the role of geography and social connectivity in driving infection rates. Community based deep dive qualitative study of attitudes and beliefs
- Assess the role of mass movements of individuals including students into and out of areas of high prevalence
- Deprivation and vaccination behaviours; vaccination rates could be assessed as a function of voting patterns and welfare / benefit receipt
- To develop a consistent messaging approach through qualitative research to increase health up peoples' priorities. Community based deep dive qualitative study of attitudes and beliefs relating to COVID 19, vaccination and testing to inform future strategy.

Provisional further approaches (2)

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- Further assessment of the role of the workplace for messaging important contact tracing; how best is this achieved and who best regulates this area
- Expanding the concept of social interconnectivity to understand how to maximise its benefits whilst minimising transmission risks
- Developing approaches to engage those who currently perceive themselves to be disconnected from the state
- A short survey to ascertain what training / expertise / advice the DPH received in relation to behavioural science to help them roll out interventions during the pandemic.
- Developing approaches to assist those with high volume occupancy housing to sensibly self isolate
- Developing a set of local community-based guidance with the assistance of local faith and community leaders that can be rolled out nationally
- As Covid rates/deaths are associated with the already known links between inequalities, non-infectious disease and death rates, exploration of this association further may be a way if identifying groups/areas to target with interventions.