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EMG – Transmission Group

COVID-19 Risk by Occupation and Workplace

1. Purpose and Scope of Paper

This paper explores the current evidence base with respect to the risks of COVID-19 infection and mortality by occupation, which may provide an indication of the risk of the virus transmission in workplace settings. The paper should be read with a number of caveats:

- Transmission is a continuous risk which can occur in any setting (including but not limited to the workplace);
- Work-related exposures have been modified over time by NPIs and lockdowns, and data from some occupations and workplaces is sparse as they have been subject to significant restrictions;
- Evidence from a range of studies needs to be synthesised to understand the complexity of transmission; all have their limitations and biases. The majority of evidence describes associations rather than causation;
- It is extremely difficult to determine how much of the transmission of SARS-CoV-2 takes place within the workplace, and how much is associated with related social, household or transport exposures;
- There is variation in the extent, quality and level of adherence to COVID secure measures within and between workplace settings. Detailed analysis of these variations cannot be readily drawn out from available data.

The paper describes risks of transmission, and mortality, within occupational groups. It is important to note that this is not analogous to the contribution that the sector within which such occupations exist makes to transmission or mortality at population level. It is also important to note that a number of occupations may combine within a single workplace (e.g. security guards, office workers, machine operators, accountants) which makes interventions targeted at single occupations extremely difficult to implement effectively.

The paper does not address school settings which are being dealt with separately.

2. Key findings

- **Age is the highest risk factor associated with mortality from COVID-19 (high confidence).**[1]

- **Transmission risk is a complex combination of environmental and human factors that are associated with the likelihood of infection**[2] **(high confidence) (see also Table 7). There is a clear interplay between occupational risk of SARS-CoV-2 transmission and socioeconomic inequities, which reflects the amplifying effects between the working environment, crowded housing, job insecurity and poverty. Factors affecting transmission include but are not limited to:**
    - Length and frequency of exposures (time);
    - Proximity or physical contact with an infected individual (non-linear relationship with distance);

4. Overview: Occupation and COVID-19 transmission.

A person's occupation may have an important impact on the likelihood that they will be exposed to the SARS-CoV-2 virus and become infected. Occupational risks are also reflected in variations in hospitalisation and mortality rates in different occupations (high confidence).

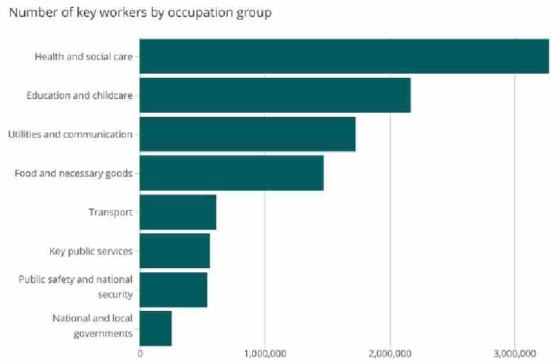
Different occupations have differing ability to work from home. Analysis of the labour force survey data from April 2020[5] (during the first lockdown) showed nearly half (46.6%) of people in employment did some of their work from home, with the vast majority (86.0%) of these homeworkers stating that this was because of the coronavirus (COVID-19) pandemic. People aged 16 to 24 years were less likely to do some work from home. Occupations requiring higher qualifications and more experience were more likely to provide homeworking opportunities than elementary and manual occupations. There were large differentials in the proportion working from home in different occupational categories.

The ability to work from home is usually not within the control of individuals and is more likely to be determined by the policies of their employer. Hence actions to encourage home working should encourage employers to enable their staff to work from home where possible.[6] In addition to reductions in risks of workplace transmission this will also reduce associated risks such as those from using public transport, and increase transport system capacity for those who have no choice but to travel. ONS data (27-31st January 2021) shows the number of people who report going to their workplace at least one day a week when they could work from home full time is 25%.[7]

Occupations that are less likely to be able to work from home have higher COVID-19 mortality rates than those that can work from home (high confidence). Those occupational categories with high rates of home working (Managers directors and senior officials, Professional occupations, associate professional and technical occupations) had markedly lower age standardised mortality rates than those occupations that rarely worked from home (process plant and machine operatives, sales and customer services occupations, caring leisure and other services occupations, skilled trade operations). Owing to small numbers, home working in elementary occupations was not reported. This group had the highest age standardised mortality rate and comprise low skilled manual labour occupations that are unlikely to be able to be conducted from home.[8]

Occupations which involve a higher degree of physical proximity to others tend to have higher COVID-19 mortality rates (high confidence). The relative risks will depend on the type of contact (colleagues/public), the frequency of contact, the duration of contact, and the likelihood that the contact is infected. The closeness of contact with others and prolonged contact in work settings varies considerably by occupation and there is evidence that occupations with higher levels of physical proximity to others have higher COVID-19 age standardised mortality rates.[9]

Figure 4. Key workers in the UK[11]



Key workers mainly in health and social care are more likely to become infected with COVID-19 than non-key workers (high confidence). During the first national lockdown the government defined a group of workers whose job was considered essential to societal functioning as Key Workers – this comprised around one third of the total workforce (10.6 million people). The largest category was Health and Social Care. 15% of key workers had chronic health conditions placing them at "moderate risk" from COVID-19 infection. Those in BAME ethnic groups were more likely to be in key worker occupations, with a particular over-representation in Health and Social Care and these groups have in general been overrepresented in mortality. Previous analysis from ONS has shown that most minority ethnicities have a higher COVID-19 hospitalisation and mortality rate relative to the white population. The REACT 1 study has shown both healthcare and care home workers, and other key workers, had increased odds of swab-positivity during lockdown compared to other workers at 1.48 and 1.35 respectively.[12]

Summary of key analyses by occupation

PHE[13]:

- Occupational exposure risks: Analysis from four contact tracing case-control studies found that there was strong evidence that people working in healthcare, social care or hospitality were more likely to be COVID cases compared to other occupations.
- Workplace setting exposure risks: settings that were found to be associated with increased risk of acquiring COVID-19 compared to a control group were: working in healthcare, social care or hospitality, working in warehouse settings, and working in construction.
- Trends over time: Warehouse settings were the only sector not to see a decline in case rates after the November lockdown, and instead showed an increase over time. It is possible that this is due to increased retail activity over the festive season.
- Outbreaks: Reporting through the PHE outbreak surveillance system shows outbreaks can occur in all workplace settings. The most commonly reported settings included health and social care, construction sites, manufacturing, warehouses, transport and restaurants and pubs.

ONS:

- Occupational exposure risks: Process, plant and machine operative occupations had the highest rate of mortality from COVID-19. Caring, leisure and other service occupations - the

major group with the next highest rate of death involving COVID-19 - had the largest number of deaths of all the major groups.[14]

- In addition to health and social care occupations a range of other occupations had increased case fatality rates with the occupations most at risk varying by gender. Some of the occupations identified as at increased risk were also consistent with other analyses including:
    - For men - those working in manufacturing, chefs, those in public-facing transport roles (including bus and taxi drivers) and security guards; and
    - For women - those working in retail and caring or personal services. Further details are provided in section 5b.

Interim analysis from University of Liverpool using Covid Infection Survey data from September 2020 onwards:

- Occupational exposure risks: For women aged 20-40, certain sectors of employment represented increased risk of COVID-19, with an increased risk of COVID-19 among individuals employed in personal services (e.g. hairdressers), health care, education and social care. For personal services, there appears to be an increase in tests positive from September 2020, with other sectors' tests positive increasing later in October and November 2020.

HSE Guidance and Compliance:

- The majority of businesses with which HSE has had contact have been able to provide assurance that they have complied with relevant guidance to introduce controls to reduce the risk of workplace transmission of COVID-19.
- Among 92,000 businesses contacted by HSE, only around 1,500 (under 2%) were found to be in breach of the regulations that require them to protect their workers from health risks and only 195 have required a formal enforcement notice in order to secure compliance.
- Although it is reassuring that businesses are reporting action to reduce COVID-19 transmission, the effectiveness of COVID-19 control measures in the workplace is unknown and the variation in the occupational mortality rates suggests that regardless of the controls that employers are putting in place, some groups of workers remain at higher risk.

5. Underpinning data and context

a. International data

Data consistently describe higher risks of exposure for those working in public facing jobs, those not amenable to remote work, often those roles associated with lower income. While the majority of prevention strategies have focused on health care institutions and long-term care facilities, other multioccupancy living settings such as homeless shelters, prisons, and migrant work camps have also been associated with large scale outbreaks amongst residents and staff.[15] In addition, there have been significant risks associated with other workplaces. In Ontario, Canada, 80% of workplace associated outbreaks were in three industry sectors: Manufacturing, Agriculture and Transportation, Warehousing.[16] In the same analysis, associated household transmission occurred among 31% of outbreak cases, and accounting for household cases among cases with a valid address increased the burden of illness associated with workplace outbreaks by 56%.

In Sweden[17], the relative risk of being diagnosed with COVID-19 differs between different occupational groups (care workers, police officers and security guards, service sector personnel, delivery workers, taxi- and bus drivers, teachers, meat packers, and cleaners). The highest relative prevalence was found among taxi drivers followed by some specific groups including bus and tram drivers, pizza bakers and

delivery persons. Another Swedish study found that taxi and bus drivers had a substantially higher COVID-19 infection and mortality risk than other workers, though this difference was diminished when adjusted for other characteristics.[18] A US study[19] assessed excess mortality (comparing with mortality rates pre-pandemic) in different essential and non-essential worker categories. Compared to non-essential workers the following essential worker groups had significantly increased excess mortality: those working in food and agriculture, transportation or logistics, facilities, manufacturing, health and emergency services and retail. For most occupational categories the risk ratios for mortality comparing pandemic to non-pandemic time were higher in non-white ethnic groups (Table 3, Table 4).

Table 3. Risk ratios for mortality, comparing pandemic time to non-pandemic time, among California residents 18-65 years of age, by occupational sector and race/ethnicity, March through October 2020[20]

	All races	Asian	Black	Latino	White
All sectors	1.22 (1.20–1.24)	1.18 (1.14–1.23)	1.28 (1.24–1.33)	1.36 (1.29–1.44)	1.06 (1.02–1.12)
Food or agriculture	1.39 (1.32–1.48)	1.18 (1.05–1.33)	1.34 (1.19–1.54)	1.59 (1.47–1.75)	1.16 (1.09–1.24)
Transportation or logistics	1.28 (1.24–1.33)	1.26 (1.12–1.44)	1.35 (1.26–1.46)	1.40 (1.31–1.52)	1.10 (1.02–1.20)
Facilities	1.27 (1.23–1.32)	1.24 (1.08–1.46)	1.25 (1.17–1.34)	1.38 (1.27–1.51)	1.11 (1.04–1.20)
Unemployed or missing	1.23 (1.19–1.27)	1.08 (1.04–1.14)	1.31 (1.22–1.40)	1.31 (1.22–1.41)	1.09 (1.01–1.20)
Manufacturing	1.23 (1.18–1.28)	1.18 (1.06–1.33)	1.13 (1.01–1.30)	1.44 (1.34–1.57)	1.00 (0.92–1.10)
Health or emergency	1.19 (1.17–1.22)	1.40 (1.33–1.49)	1.27 (1.17–1.40)	1.32 (1.18–1.51)	1.02 (0.96–1.10)
Retail	1.18 (1.14–1.23)	1.10 (1.00–1.22)	1.36 (1.21–1.55)	1.40 (1.28–1.55)	1.08 (1.04–1.13)
Government or community	1.14 (1.11–1.18)	1.22 (1.07–1.41)	1.20 (1.09–1.33)	1.42 (1.32–1.53)	0.96 (0.89–1.04)
Not essential	1.11 (1.08–1.14)	1.14 (1.06–1.23)	1.23 (1.15–1.33)	1.29 (1.20–1.41)	1.00 (0.95–1.07)

Specific occupations with increased excess mortality are shown below.

Table 4. Risk ratios for mortality, comparing pandemic time to non-pandemic time, among California residents 18-65 years of age, by occupation, March through October 2020[21]

Code	Description	Deaths[a]	Risk ratio
4020	Cooks	828	1.60
8800	Packaging and filling machine operators and tenders	172	1.59
6050	Miscellaneous agricultural workers	617	1.55
7800	Bakers	104	1.50
6260	Construction laborers	1,587	1.49
8965	Production workers, all other	452	1.46
8320	Sewing machine operators	127	1.44
5610	Shipping, receiving, and traffic clerks	146	1.44
4250	Grounds maintenance workers	712	1.40
5240	Customer service representatives	562	1.37
4000	Chefs and head cooks	532	1.35
1107	Computer occupations, all other	136	1.35
9600	Industrial truck and tractor operators	364	1.34
3500	Licensed practical and licensed vocational nurses	109	1.34
0410	Property, real estate, and community association managers	157	1.33
4230	Maids and housekeeping cleaners	378	1.33
3930	Security guards and gaming surveillance officers	707	1.32
9130	Driver/sales workers and truck drivers	1,962	1.32
9830	Military, rank not specified	111	1.32
9620	Laborers and freight, stock, and material movers, hand	2,550	1.31
5940	Office and administrative support workers, all other	123	1.30
7750	Miscellaneous assemblers and fabricators	354	1.29
2010	Social workers	217	1.28
4040	Bartenders	148	1.28
2540	Teacher assistants	183	1.28

[a] Number of deaths in pandemic time. The table is restricted to occupations with 100 or more pandemic-time deaths.

precede the increases among the other groups. Other trends observed through focusing on the sectors with the highest prevalence by November see an increase in men aged 20-40 working teaching and education, transport, social care, hospitality and personal services (with a later peak than compared to females). For females aged 20-40, it is health care, social care, hospitality and the retail sector.

This work was conducted independent of ONS methodology and analysis teams. This work was produced using statistical data from ONS. The use of the ONS statistical data in this work does not imply the endorsement of the ONS in relation to the interpretation or analysis of the statistical data.

i. HSE Context on Guidance and Compliance

HSE has published guidance for businesses on its webpages, describing how to make their workplace COVID secure. This has changed slightly over the course of the pandemic to reflect changes in the policy recommendations at the time (e.g. around use of face coverings, more recent advice to strengthen ventilation as a control). There have been 9.7 million views recorded for these pages, demonstrating a strong level of intent amongst businesses to understand what they need to do to make their workplaces secure.

Since June 2020, HSE has been conducting a spot check exercise and has completed telephone interviews with 92,000 businesses, in order to help provide assurance to businesses, regulatory bodies and the general public that employers are following government guidelines and keeping their workers safe. The interviews require employers to demonstrate their knowledge and understanding of COVID guidance and describe the measures they have put in place including risk assessments, social distancing arrangements, cleaning procedures and hand-washing facilities. In 93% of cases, businesses have been able to provide satisfactory assurance that they have appropriate controls in place.

Where HSE could not be fully confident about controls from the telephone interview, an inspector is assigned to follow up (usually with a site visit) and help the business achieve full compliance with the guidance. HSE also investigates concerns raised by workers and reports of COVID-19 cases made through the RIDDOR notification system, and has supported other regulatory bodies in the delivery of investigations of workplace outbreaks of COVID-19.

55% of businesses for which an intervention outcome has been recorded were able to demonstrate adequate controls and required no action to be taken by HSE. A further 36% of businesses have only required verbal advice in order to achieve compliance. Around 1,500 businesses have been sent a letter legally requiring them to make improvements in order to better protect their workers. This represents just under 10% of those businesses who have been the subject of an inspection or investigation, and around 1% of the total number of businesses HSE has contacted. Formal enforcement notices have been served in 195 cases.

Where inspectors have taken any enforcement action (whether that be verbal advice, written advice or a formal enforcement notice), they have recorded the single issue which was most relevant to their enforcement decision. The most common issue was social distancing, cited in just under 50% of cases, followed by cleaning regimes (just over 20% of cases) and management arrangements (around 15% of cases).

Findings have been similar in the local authority enforced sector. Of the 10,500 spot checks in this sector, 91% of businesses were able to demonstrate compliance. 900 businesses which were not able to provide sufficient assurance have been visited by local authorities, with 200 of these requiring verbal advice, a further 100 sent a letter requiring improvements to be made and 13 served with formal enforcement notices.