COVID-19

Identifying insured customers more at risk

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Abstract

COVID-19 is a disease that is targeting certain segments of the population. We have reviewed some of the key studies available to date to understand insights into the impact on mortality and morbidity at a high level from the perspective of an insurer. We have also considered how COVID-19 may impact insured populations and which customers are likely to be most at risk.

While older ages, male lives and co-morbidities will be important factors in determining the impact on insured lives, there are also a range of other factors that should be considered including unintended consequences and potential economic consequences on the health and wellbeing of our insured customers.

Given our understanding of COVID-19 disease is rapidly evolving over time, we consider some key limitations and unknowns which will impact on assessing future mortality and morbidity rates.

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1   Introduction

We are gaining a better understanding of the COVID-19 disease as more medical research into the SARS-CoV-2 virus is carried out, but we are still at an early stage of this global pandemic and there are many unknowns and uncertainties. Certain segments of the population may be more vulnerable to severe symptoms and mortality; this includes those with underlying co-morbidities, older age groups, certain occupations and less affluent socio-economic groups.

Identifying who is vulnerable to COVID-19 is important for governments to be able to offer advice to help shield segments of the population that are at a higher risk from becoming infected and for insurance companies to understand their risk. Over the coming month this will become particularly important as strategies around relaxing lockdown are introduced at a time when a large proportion of the population remains susceptible to the virus.

This report will consider the potential impact of COVID-19 on insured customers that are more vulnerable to COVID-19 by considering:

- Available data sources
- Insurer considerations for managing risk and calculating expected claims
- Key limitations and unknowns

2   Available data sources

Ideally an insurer will want data based on insured lives. However, at this early stage such data is unavailable so the next best data sources will be data that is available at the population level: covers all-cause mortality/morbidity; allows for the confounding factors; and stratifies by socio-economic group.

2.1   Data Limitations

Data and models describing populations are likely to be quite different from insured populations and as published data is usually aggregated it can be challenging to identify underlying patterns in different population segments. It is important to keep in mind that data bias can impact analysis results, for example:

Deaths data:

- There may be reporting delays
- Different countries have different definitions of death and sometimes regional differences within countries
- COVID-19 deaths may not always be identified as cause of death due to lack of testing
- Some countries do not include COVID-19 deaths that occur outside of hospital e.g. at home or in residential/nursing homes
- Differences arising from recording dying '*with* coronavirus vs recording dying *from* coronavirus'

Case data:

- Variations in the prevalence of testing
- There may be reporting delays
- Ascertainment bias – more people with severe symptoms are tested
- Asymptomatic people and those with mild symptoms (not hospitalised) are generally not tested, leading to under-reporting of population that have been infected

2.2   Population level – hospital-based studies

Recently released studies that provide useful insights into possible risk factors, including co-morbidities, are multivariate analysis studies using data from UK (Appendix 1 - Figure 6 and Figure 7) and New York City(Appendix 1 - Figure 8).

The 1st UK multivariate study (Figure 6) characterised the clinical features of 16,749 patients with severe COVID-19 that were admitted to hospital in the UK.

The 2nd UK study (Figure 7) identified factors associated with COVID-19 related hospital deaths in the linked electronic health records of 17 million adult NHS patients.

Whilst these studies may not reflect all deaths in the UK population, they are large comprehensive studies that can be useful in terms of providing insights into the various risk factors including co-morbidities.

The 3rd study (Figure 8) identified the factors associated with hospitalisation and various critical illness types among 4103 patients with COVID-19 in New York City.

The analysis from these three studies suggest that the following factors are associated with increased mortality risk:

- Older age
- Male sex
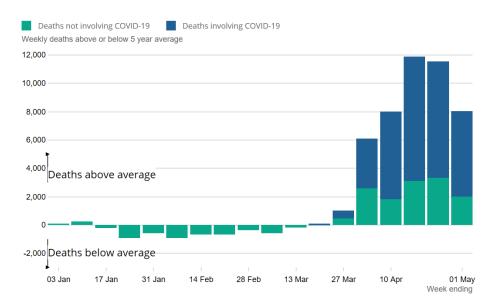- Obesity - with a clear correlation as obesity class increases

- Ethnicity -those from Black, Asian and Minority Ethnic (BAME) backgrounds appear to be at greater risk compared to those who do not
- Level of deprivation - risk increases by Index of Multiple Deprivation (IMD) quintile
- The existence of co-morbidities - including diabetes, cancer and respiratory conditions
- Smoking status – counter-intuitively, smoking appears to lead to better outcomes and more analysis is required to understand this observation more fully.

Multivariate analysis provides insightful results as this approach allows for the consideration of confounding effects that can lead to incorrect interpretations. For example:

- As COVID-19 mortality is heavily concentrated in the older ages and in male lives, many seemingly important risk factors could be due to correlations e.g. hypertension is a common co-morbidity that can be explained by other risk factors such as age (Figure 7).
- The multivariate model for 17k hospitalisation patients in the UK study shows strong effects of age and gender (Figure 6). Co-morbidities are also important risk factors but perhaps not as large as expected once age and gender are accounted for (up 39% additional risk).
- It is better to include interactions between age and gender (to account for different gender effects between the young and the old) and given that age and gender are key risk factors we ideally want to have these factors at a more granular level.

2.3   Population level – all cause mortality studies

Given that a significant proportion of deaths in the community aren't recorded as COVID-19, it is useful to consider excess deaths in the population by all-cause mortality (Figure 1). As the chart shows, since late March/early April, there has been a dramatic increase in excess deaths that are both COVID-19 and non-Covid_19 related.

Figure 1: Excess deaths split by whether they are considered to involve COVID-19, England & Wales

Source: Office for National Statistics

Age specific analysis suggests that there has been an increase in excess deaths in those aged 45 and above for both males and females and that the increase is greater for males compared to females

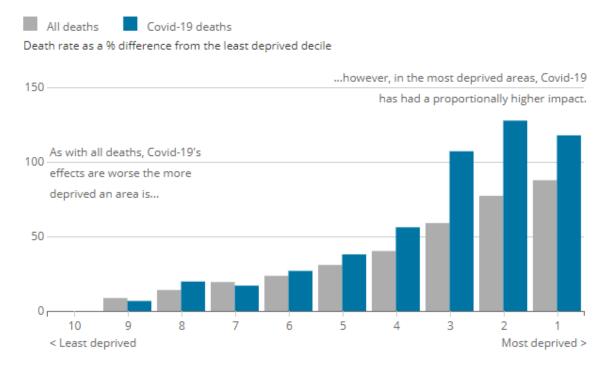except for age 85+ (Figure 2). The percentage of "Excess divided by expected" also increases significantly at the older age bands.

Figure 2: Comparison of actual, expected and excess registered deaths by age-band in week 18 of 2020 (1st May)

	Male				Female			
	45-64	65-74	75-84	85+	45-64	65-74	75-84	85+
"Expected"	833	1,101	1,755	1,764	521	790	1,529	2,712
Actual	1,183	1,571	2,760	3,095	714	1,030	2,382	4,814
"Excess"	350	470	1,005	1,331	193	240	853	2,102
Excess divided by expected	42%	43%	57%	75%	37%	30%	56%	78%

Source: England & Wales mortality monitor – COVID-19 update – week 18 of 2020

2.4   Population level – socio-economic impacts

The Office for National Statistics (ONS) publishes analysis on the impact of COVID-19 by socio-economic group (Figure 3). The analysis shows that the impact is more significant in the more deprived areas. This is an important observation for insurers is their portfolio of insured lives tends to be skewed towards the more affluent groups where the impact of COVID-19 is shown to be much less. The extent of the impact his depends on the line of business being considered as well as the customer segment that purchase their products. For example, Guaranteed Whole of Life, that is sold with lower sums assured direct to customers, will have more business in the lower socio-economic groups compared to a fully underwritten product sold through an intermediary.

Figure 3: The coronavirus (COVID-19) has had a proportionally higher impact on the most deprived areas, England & Wales

Source: Office for National Statistics – Deaths involving COVID-19

2.5   Other considerations

There are overlaps between insured populations and higher risk groups by occupation class:

- Health and care workers are more at risk due to their potential exposure to COVID-19
- Other occupations considered as "key workers", who have an elevated exposure to COVID-19 due to having more contact with the general public or in situations where social distancing is difficult to achieve, including:
    o   Supermarket staff
    o   Delivery drivers
    o   Bus/train drivers
    o   Teachers
    o   Construction or utility workers

There are people that are essential for society to continue during lockdown, so they are less able to protect themselves by staying at home. As the governments around the world relax restrictions the profile of the population at risk may change.

From an insurance perspective, group life business may have concentrations of people from more risky occupations.

3   What does this mean from an insurance perspective in terms of managing risk and calculating expected claims?

3.1   Key rating factors

The key ratings factors insurers use in valuing or pricing their business include:

- Age - We have good insights on age as it is a key risk factor from our available data sources
- Gender - This is a key rating factor as males appear to have greater mortality risk compared to female lives.
- Smoker category – Base on the latest data, if they don't have underlying co-morbidities, smokers don't appear to have an elevated risk.

In addition, for gender neutral pricing, the mix of business by gender will be important.

3.2   Do males have poorer experience compared to females?

When we consider:

- mortality experience = likelihood of getting infected *x* likelihood of dying if infected

"Likelihood of dying if infected":

- The UK ISARIC Study (Figure 6) shows 25% more risk for males dying once hospitalised
- The NYC study (Figure 8) shows 180% higher male hospitalisation risk than female hospitalisation
- Analysis of intensive care COVID-19 admissions in the UK shows that 71% are male and 29% are female compared to a benchmark comparator cohort of patients with viral pneumonia in which 54% are male and 46% are female (Figure 9).

The Global Health 50/50 Tracker compiles publicly available sex-disaggregated data on COVID-19 reported by national governments. They report highly variable rates of cases and deaths by gender among different countries but suggest that overall, where data is available, among confirmed cases men are consistently dying at a higher rate across countries.

While it is difficult to draw any strong conclusions from this data, the likelihood of a male or female life becoming infected is more balanced. There will be underlying reasons why certain countries have a higher percentage of a certain gender being higher which could be due to a variety of factors, including socio-economic and cultural factors.

3.3   Key co-morbidities

We know that people with underlying co-morbidities are at increased risk over and above age so insurers with protection business may want to consider rated business experience separately from non-rated if they have some information on co-morbidities provided at the underwriting stage (Figure 6, Figure 7 and Figure 8).

Also, for the more mature portfolios where the business has been in-force for a long period of time, insurers may wish to estimate the proportion of their portfolio with underlying co-morbidities.

There is a wide range of medical sources across several countries that provide a split of impact by underlying co-morbidities. A high proportion of people hospitalised have one or more underlying conditions. According to CDC's (Centers for Disease and Prevention), Morbidity and Mortality Weekly Report (Figure 4), circa 90% patients hospitalised from COVID-19 have an underlying condition, which is a good reference for insurers as it helps to stratify co-morbidity by age. According to the CDC studies the prevalence of the following 5 conditions appears to vary by age group:

- Hypertension
- Obesity
- Chronic metabolic disease e.g. Diabetes Mellitus
- Cardiovascular disease
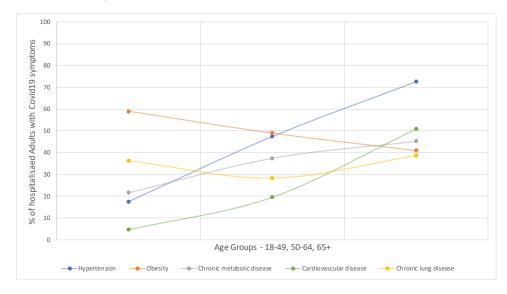- Chronic respiratory disease e.g. Asthma, COPD

Figure 4: Key underlying conditions and symptoms among adults with coronavirus (COVID-19) - associated hospitalisations - COVID-NET, 14 states, March 1-30, 2020

Source: CDC – Morbidity and Mortality Weekly report (MMWR)

According to the CDC study (table 1), the underlying conditions vary by age group:

Table 1: Underlying conditions that impact COVID 19 associated hospitalisations by age group

Age group	Underlying condition (in order of importance) that impact COVID 19 associated hospitalisations
Younger 18-49	obesity; chronic lung disease (27.3% asthma, 0% COPD); chronic metabolic disease (19.6% Diabetes); hypertension; and cardiovascular disease.
Middle aged 50-64	obesity; hypertension; chronic metabolic disease (32.1% diabetes); chronic lung disease (13.3% asthma and 5.7% COPD); and cardiovascular disease.
Older aged 65+	hypertension; cardiovascular disease; chronic metabolic disease (31.3% Diabetes); and chronic lung disease (12.9% asthma, 22.6% COPD).

According to CDC, the proportion of people with underlying conditions increases by age: where approximately 85% of the younger and middle age groups have an underlying condition; and about 95% in the older age group (>=65).

Comparing these results with the multivariant analysis (Appendix, Figure 7), hypertension can be explained by correlations with other factor such as age. Other conditions, such as obesity, chronic metabolic disease, cardiovascular disease and chronic lung disease remain risk factors even after controlling for age.

A further factor to consider is the number of co-morbidities. According to a study in Italy which provided information on the most common comorbidities observed in SARS-CoV-2 positive deceased patients by gender, they observed the following:

Table 2: Number of comorbidities by gender (Italy)

Number of co-morbidities	Women	Men
0	1.6%	4.5%
1	13.5%	14.9%
2	22.5%	19.9%
3	62.3%	60.8%

Source : ISTITVVTO SVPERIORE SANITA

3.4   Socio-economic factors

As previously mentioned, socio-economic status is an important risk factor to consider in an insurance portfolio (Figure 7 and Figure 9). The spread of insured lives by socio-economic status tends to be towards the lower (more affluent) groups than the general population. The lower socio-economic groups tend to have fewer co-morbidities and lower levels of obesity, so given the observations on co-morbidities in Section 3.3, we would expect any impact of COVID-19 on insured lives to be materially lower than impacts across the general population.

3.5   Unintended consequences

Due to the Government and NHS focus on tackling COVID-19, many of the non-COVID-19 ongoing medical conditions are being severely and negatively impacted according to the Health Service Journal who stated that the "Coronavirus response could create 'very serious unintended consequences'". For example:

- Elective activities cancelled/postponed – the planning required to restart these will be challenging and the long waiting lists will delay getting back to previous "normal" levels
- Dramatic reductions in A&E attendance, particularly for those with chest pain and myocardial infarction symptoms
- UK has three cancer screening programmes for breast, bowel and cervical cancer. Due to COVID-19, invitations and follow-up appointments are being delayed.

- GP visits significantly down on expected volumes
- Cancer referrals and other referrals are down on expected volumes
- Mental health issues exacerbated by social isolation caused by lockdown measures
- Diet/nutrition and exercise habits damaged by lockdown conditions

This could result in more severe disease being identified at a later and less treatable stage, leading to potentially increased mortality and morbidity. This will have an impact on insured lives.

We previously referred to the ONS mortality analysis (Figure 1) that showed excess deaths for both COVID-19 and non-COVID-19 causes being reported. When considering this data, it is important to be aware that there may be under reporting of COVID-19 deaths due to a lack of testing so the excess non-COVID-19 deaths could be a mixture of COVID-19 deaths and deaths due to unintended consequences. Over time we would expect the impact of the unintended consequences to have a greater impact as delays in operations or cancer treatment is likely to lead to higher mortality.

3.6   High level view of the impact on an insured portfolio

Actuaries over the coming months will have to consider a wide range of factors to estimate the short- and long-term impact on mortality and morbidity due to COVID-19 on their business. We have attempted to consider a range of factors in the short and long term split by age group at a high level (Table 3).

Please note that there is a lack of data and significant uncertainties/unknowns in terms of the long-term view.

Table 3: High level overview of short- and long-term factors that may impact Life and Health & Care business

	Short Term (COVID-19)	Longer term (post-COVID-19)
Young to middle ages (<45) Products WOL, Term, PMI	- Less risk in this group - Customers with co-morbidities or less healthy will be more impacted but for an insurance portfolio this will be less than the general population due to underwriting and socio-economic differences - There could be more suicides and mental health conditions due to isolation and potential concerns over economic environment - May be more exposed to being infected as they are less at risk and so more likely to ignore government guidelines related to lockdown and socio distancing.	- Expect this group to be less impacted - Little change in mortality - Consequences of poor economic conditions (including higher rates of unemployment) may impact health and wellbeing so possibly higher mortality and morbidity claims due to this. - Possibly higher demand for PMI in the UK if NHS waiting lists increase significantly.
Middle age (45-74) Products WOL, Term, LTC, PMI	- Middle age group mortality will be impacted: excess deaths according to CMI (Figure 2) - Healthy and more affluent insured customers will be less impacted as less exposed - This group is likely to be more conservative compared to the younger group and may be less likely to become infected. - Poor economic conditions will have an impact but perhaps to a lower extent for insured customers - In UK PMI business, possibly more PMI claims for elective treatment due to longer waiting lists in the NHS or reduction in capacity of private providers if they are	- Expect some impact - For those who were infected with severe symptoms, there may be longer term mortality/morbidity implications - Consequences of poor economic conditions may impact health and wellbeing but expect this to be to a lower extent compared to younger lives. - Possibly higher demand for PMI in the UK if NHS waiting lists increase significantly.

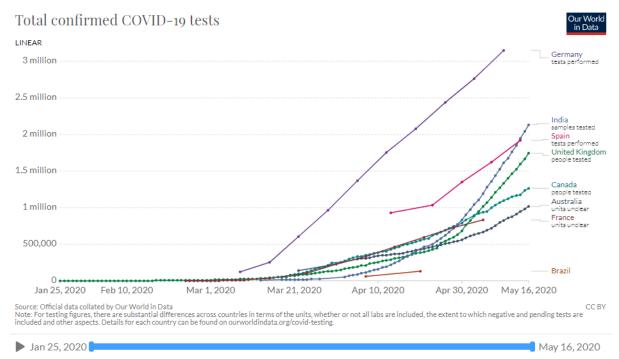|	providing back-up support to the NHS for urgent treatment.	
Older ages (>=75) Products WOL, Term, LTC, Annuities	• Given age is a key rating factor for COVID-19 this age group has a higher risk. According to the CMI excess deaths are significantly higher (Figure 2) • Insured and more affluent customers will be at a lower risk compared to the general population, but we still expect a significant increase in mortality/morbidity rates • Likely to be much more conservative around government rules and keeping safe so perhaps less risk of being infected. • Some customers may have co-morbidities and will be highly vulnerable leading to a significantly higher risk of mortality • Those in care homes are particularly vulnerable given co-morbidities and concentration of people in one place	• More acceleration of deaths • Perhaps lower longer-term mortality as those that survive with mild symptoms may have high life expectancy. • Economic conditions may have significant consequential impact on the socio care sector including domiciliary, residential and nursing care • Mental health could be an issue • Unintended consequences will have a higher impact on this group

4   Key limitations and unknowns

At the start of the pandemic, WHO said "Our key message is: Test, test, test". Many governments across the globe have increased their capacity in this area which will be key to understanding COVID-19 and controlling it.

There are many key limitations and unknowns from an insurance perspective that we list below (non-exhaustive list):

- Reporting of statistics on COVID-19 has been focused on hospitals and not on the whole population which introduces significant limitation of the various data sources. This will improve over time as testing capabilities improve (Figure 5).
- Lack of test capabilities have prevented random antibody testing of the population to understand who has had COVID-19 and proportion of population that is asymptomatic.
- Relaxation of lockdown measures will impact the R number (the effective reproduction number of the virus) which in turn could lead to further waves of the COVID-19. There are many uncertainties in how this is measured
- Population behaviour overtime may become less compliant with government guidelines.
- Once people are infected, we don't know if they are immune to COVID-19 or if their immunity is limited to a short period of time. People who have been infected may still be susceptible to further infections.
- Uncertainty about how long COVID-19 will be actively circulating within our communities
- It is unknown if a vaccine will be developed and how long this will take
- It is unknown if drugs can be developed to control the severity of the COVID-19 and how long this will take
- The potentially significant implications of extreme economic conditions on population health and wellbeing is unknown

Figure 5: Total confirmed COVID-19 tests up to 16 May 2020

Total confirmed COVID-19 tests

Source: Our Word in Data, excluding the US

5   Conclusions

COVID-19 is a disease that is targeting certain segments of the population. We have reviewed some of the key studies available to date to understand insights into the impact on mortality and morbidity at a high level from the perspective of an insurer. We have also considered how COVID-19 may impact insured populations and which customers are likely to be most at risk.

While older ages, male lives and co-morbidities will be important factors in determining the impact on insured lives, there are also a range of other factors that should be considered including unintended consequences and potential economic consequences on the health and wellbeing of our insured customers.

Given our understanding of COVID-19 disease is rapidly evolving over time, we consider some key limitations and unknowns which will impact on assessing future mortality and morbidity rates. As testing capacities and research being carried out increases, our level of knowledge and insights will improve over time as more data and research is released.

Future bulletins on this topic could cover the following areas in more detail:

- Mental illness
- Diabetes
- Vaccines and drugs

6   Bibliography

1   Figure 1: Deaths registered weekly in England and Wales, provisional: week ending 1 May 2020
https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/bulletins/deathsregisteredweeklyinenglandandwalesprovisional/weekending1may2020

accessed: 16/5/2020

2   Figure 2: England & Wales mortality monitor – COVID-19 update – week 18 of 2020
https://www.actuaries.org.uk/learn-and-develop/continuous-mortality-investigation/other-cmi-outputs/mortality-monitor

3   Figure 3: The coronavirus (COVID-19) has had a proportionally higher impact on the most deprived areas, England & Wales

https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/bulletins/deathsinvolvingcovid19bylocalareasanddeprivation/deathsoccurringbetween1marchand17april

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4   Global Health 5050: COVID-19 sex-disaggregated data tracker
http://globalhealth5050.org/covid19/#1586352650173-d9a8b64b-670a

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5   Figure 4: CDC – morbidity and mortality weekly report (MMWR)
https://www.cdc.gov/mmwr/volumes/69/wr/mm6915e3.htm?s_cid=mm6915e3_w#F2_down

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6   Table 2*: ISTITVVTO SVPERIORE SANITA*, Characteristics of SARS-CoV-2 patients dying in Italy Report based on available data on April 16th , 2020
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https://www.hsj.co.uk/policy-and-regulation/coronavirus-response-could-create-very-serious-unintended-consequences/7027321.article?utm_medium=Social&utm_source=t.co&utm_campaign=newsfeed&mkt_tok=eyJpIjoiWkdKaE5qRmxPR05tWXpOayIsInQiOiJnejJKdno3NnFLYUo4alwvdWZKSzZuc1RjRE41SWJSdkRLQWt4Wmc0Sm96Y1hZTjZ2MEJMd2VHOG5JalhcLzdhMzhcL2ZCNlRzYWs4aVBETE1VaFlGZHhFTlBvcFVNaFo4dVF0aTRTWHhQeEVXZDdldTBOY2FIZGZnNGJ4bUpRcjN4ZyJ9

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8   Our Word in Data
https://ourworldindata.org/coronavirus-data-explorer?testsMetric=true&totalFreq=true&smoothing=0&country=GBR+CAN+BRA+AUS+IND+ESP+DEU+FRA

accessed: 17/5/2020

9   Figure 6: Features of 16,749 hospitalised UK patients with COVID-19 using the ISARIC WHO Clinical Characterisation Protocol

https://www.medrxiv.org/content/10.1101/2020.04.23.20076042v1.full.pdf

accessed: 16/5/2020

10   Figure 7: OpenSAFELY: factors associated with COVID-19-related hospital death in the linked electronic health records of 17 million adult NHS patients

https://www.medrxiv.org/content/10.1101/2020.05.06.20092999v1

accessed: 16/5/2020

11   Figure 8: Factors associated with hospitalization and critical illness among 4,103 patients with COVID-19 disease in New York City

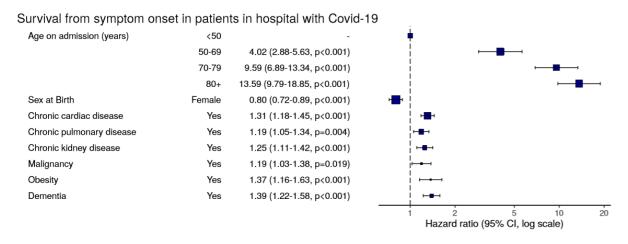https://www.medrxiv.org/content/10.1101/2020.04.08.20057794v1.full.pdf

accessed: 16/5/2020

12   Figure 9: ICNARC report on COVID-19 in critical care 15 May 2020

https://www.icnarc.org/Our-Audit/Audits/Cmp/Reports
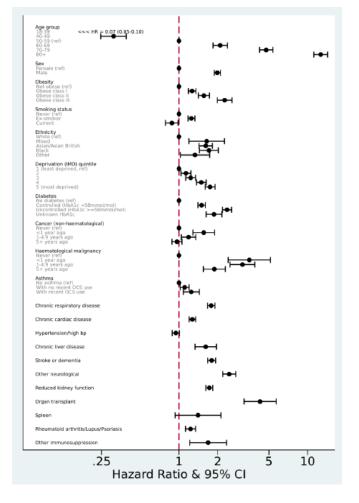
accessed: 19/5/2020

Appendix

Figure 6: Multivariate analysis stratified by age, gender, and comorbidities

Survival from symptom onset in patients in hospital with Covid-19

Age on admission (years)	<50	-
	50-69	4.02 (2.88-5.63, p<0.001)
	70-79	9.59 (6.89-13.34, p<0.001)
	80+	13.59 (9.79-18.85, p<0.001)
Sex at Birth	Female	0.80 (0.72-0.89, p<0.001)
Chronic cardiac disease	Yes	1.31 (1.18-1.45, p<0.001)
Chronic pulmonary disease	Yes	1.19 (1.05-1.34, p=0.004)
Chronic kidney disease	Yes	1.25 (1.11-1.42, p<0.001)
Malignancy	Yes	1.19 (1.03-1.38, p=0.019)
Obesity	Yes	1.37 (1.16-1.63, p<0.001)
Dementia	Yes	1.39 (1.22-1.58, p<0.001)

Hazard ratio (95% CI, log scale)

Source: Features of 16,749 hospitalised UK patients with COVID-19 using the ISARIC WHO Clinical Characterisation Protocol

Figure 7: Estimated Hazard Ratios (shown on a log scale) for each potential risk factor from a multivariable Cox model

Source: OpenSAFELY: factors associated with COVID-19-related hospital death in the linked electronic health records of 17 million adult NHS patients

Figure 8: Multivariable regression results, hospitalisation

Characteristic	N (%)	Odds ratio (95% CI)	p
Age, years			
0-18	53 (1.3%)	4.96 (2.75-8.98)	<0.001
19-44	1501 (36.6%)	Reference	<0.001
45-54	694 (16.9%)	2.57 (2.06-3.2)	<0.001
55-64	767 (18.7%)	4.17 (3.35-5.2)	<0.001
65-74	577 (14.1%)	10.91 (8.35-14.34)	<0.001
≥75	511 (12.5%)	66.79 (44.73-102.62)	<0.001
Cancer	185 (4.5%)	1.24 (0.81-1.93)	0.329
Chronic kidney disease	215 (5.2%)	3.07 (1.78-5.52)	<0.001
Coronary artery disease	235 (5.7%)	0.88 (0.57-1.4)	0.590
Diabetes	614 (15%)	2.81 (2.14-3.72)	<0.001
Male	2072 (50.5%)	2.8 (2.38-3.3)	<0.001
Heart failure	131 (3.2%)	4.29 (1.89-11.18)	0.001
Hyperlipidemia	738 (18%)	0.67 (0.51-0.87)	0.003
Hypertension	983 (24%)	1.23 (0.97-1.57)	0.094
Obesity			
BMI <30 kg/m^2	3003 (73.2%)	Reference	<0.001
BMI 30-40 kg/m^2	915 (22.3%)	4.26 (3.5-5.2)	<0.001
BMI >40 kg/m^2	185 (4.5%)	6.2 (4.21-9.25)	<0.001
Pulmonary disease	312 (7.6%)	1.33 (0.96-1.84)	0.087
Race			
White	1812 (44.2%)	Reference	<0.001
African American	655 (16%)	0.88 (0.69-1.11)	0.280
Asian	284 (6.9%)	1.44 (1.04-1.98)	0.026
Other/Multiracial	927 (22.6%)	1.99 (1.62-2.45)	<0.001
Unknown	425 (10.4%)	0.9 (0.67-1.21)	0.501
Tobacco use (current or former)	878 (21.4%)	0.71 (0.57-0.87)	0.001

Source: Factors associated with hospitalization and critical illness among 4,103 patients with COVID-19 disease in New York City

Figure 9: Patient characteristics: demographics

Demographics	Patients with confirmed COVID-19 and 24h data (N=8699)	Patients with viral pneumonia (non-COVID-19), 2017-19 (N=5782)
Age at admission (years) [N=8692]		
Mean (SD)	58.6 (12.5)	58.0 (17.4)
Median (IQR)	60 (51, 67)	61 (48, 71)
Sex, n (%) [N=8694]		
Female	2513 (28.9)	2641 (45.7)
Male	6181 (71.1)	3141 (54.3)
Currently or recently pregnant, n (% of females aged 16-49) [N=598]		
Currently pregnant	23 (3.8)	56 (7.4)
Recently pregnant (within 6 weeks)	32 (5.4)	29 (3.8)
Not known to be pregnant	543 (90.8)	674 (88.8)
Ethnicity, n (%) [N=7852]		
White	5242 (66.8)	4951 (88.4)
Mixed	134 (1.7)	52 (0.9)
Asian	1191 (15.2)	325 (5.8)
Black	780 (9.9)	155 (2.8)
Other	505 (6.4)	117 (2.1)
Index of Multiple Deprivation (IMD) quintile *, n (%) [N=8530]		
1 (least deprived)	1267 (14.9)	873 (15.3)
2	1387 (16.3)	999 (17.5)
3	1671 (19.6)	1115 (19.5)
4	2077 (24.3)	1232 (21.6)
5 (most deprived)	2128 (24.9)	1489 (26.1)
Body mass index *, n (%) [N=8012]		
<18.5	53 (0.7)	310 (5.5)
18.5-<25	2044 (25.5)	1933 (34.2)
25-<30	2819 (35.2)	1691 (29.9)
30-<40	2484 (31.0)	1330 (23.5)
40+	612 (7.6)	394 (7.0)

Source: ICNARC report on COVID-19 in critical care 15 May 2020

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