

## RAPID RESEARCH IN COVID-19 PROGRAMME

Identifying community Covid-19 cases and exploring differences with patients diagnosed in healthcare settings

### AIMS

We wanted to see if people who stayed at home with COVID-19 differed from those who were taken to hospital. We planned to use information collected from a COVID-19 tracker (c19Track.com) to identify patients who caught COVID-19 but did not need to be taken into hospital.

### KEY FINDINGS

- Our analysis suggested that people who were older, more deprived, with more long term illnesses and use of medications were at higher risk of catching COVID-19. They may also be more likely to need hospital treatment or die from COVID-19. Other larger studies have shown these same things that we found using information from NHS Tayside and Fife.
- Across both regions there were differences in the percentage of people catching COVID-19, needing hospital and dying from it when we looked at small neighbourhood areas.
- As part of this project we created a safe way to collect information from a web site and link it into health records. This data can then be anonymised and used for medical research if the person has agreed to this.
- There were not enough people using c19track.com to use it to identify people who caught COVID-19 but stayed at home.

### WHAT DID THE STUDY INVOLVE?

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BlueHat Associates created and launched a COVID-19 tracker website in March 2020. They wanted people to sign up and give information about the presence of COVID-19 infection in all members of the household. Everyone who took part was also asked if a University could contact them to do more research.

After getting funding for the project in May 2020, we developed a detailed study plan and got University Research Ethics approval on 4<sup>th</sup> June 2020. The team at the University of St Andrews worked with BlueHat Associates and the Health Informatics Centre (HIC) at the University of Dundee. We made a web site that allowed us to securely transfer information to HIC on people who had taken part in c19track.com and were happy to also take part in medical research. HIC holds health records for all residents within the NHS Fife and NHS Tayside areas. They are allowed to share these with researchers at Universities who need to get permission to use the data for specific medical research projects. The team at HIC would contact people who used the tracker and ask for their permission to use this data with their health records. We developed a process that also allowed them to give permission to link data on any children in the household. We had a separate process to allow other adults within the household to be asked for permission to link data from the tracker with their health records.

HIC made a dataset of all people living in Tayside & Fife and provided access to an anonymised version of this to the research team. Within the data, we were able to see what drugs each person was taking, whether they had been in hospital and if so, what was it for, and if they had tested positive for COVID-19 and been taken to hospital. All of the data was anonymised so although we knew about peoples' medical history and whether they had COVID-19 we did not know who each person in our dataset was.

Throughout this time BlueHat tried to recruit people to the tracker. The research team also used the University newsletters and Press office to place local news stories to encourage people to take part. However, there were not many people in Scotland who took part in c19track.com. When we transferred data for people in Tayside and Fife in September there were only 43 households from these regions. We felt there was a danger that individuals within this small number might be more easily identified and so decided not to use this information.

We also approached eDRIS (Electronic Data Research and Innovation Services) to ask about using information on people who had used the ZOE tracker. We were aware that Wales had tried to link information collected in ZOE to people's health records there but had only managed to do this for around 50%. Unfortunately, at our last discussion with eDRIS, they had still not received data on people in Scotland who had used ZOE in a way that could be linked to their health records and so we were unable to progress with this.

With the information we held, we identified all those people who were known to have had COVID-19 based on tests and whether they were admitted to hospital. We also knew if anyone died and whether it was due to COVID-19. We were able to split everybody into 4 different groups. There was one group of people who had no record of having COVID-19 and three groups who did: people who did not need to go to hospital; people who were admitted to hospital and people who died.

We looked at each of these groups to see if they were different based on age, sex, social class (using a score based on home postcode), number of long term illnesses they had from previous hospital records and also the number of drugs they were taking. We also looked at all the groups based on where they lived so we could see if there were differences by neighbourhood between these groups.

## WHAT WERE THE RESULTS AND WHAT DO THEY MEAN?

We had data on 745,558 people in the study and reported numbers and percentages by sex, age, social class, number of long term illnesses and number of different medications in the six months prior to the start of the pandemic in March 2020 (see Table1).

Table 1: Distribution of the Participants

Characteristics	n	%
<b>Health Board</b>		
Fife	353390	47.40
Tayside	392168	52.60
<b>Age</b>		
0-4	16985	2.28
5-9	40804	5.47
10-19	81861	10.98
20-29	86815	11.64
30-39	93948	12.60
40-49	94132	12.63
50-59	114218	15.32
60-69	97078	13.02
70-79	76752	10.29
80-89	35827	4.81
>=90	7138	0.96
<b>Sex</b>		
Female	377903	50.69
Male	367655	49.31
<b>Deprivation</b>		
Most deprived	138318	18.55
2	136666	18.33
Middle	137931	18.50
4	137781	18.48
Least deprived	142641	19.13
Missing	52221	7.00
<b>Number of Health Conditions</b>		
0	679195	91.1

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1	34174	4.58
2-3	25460	3.41
4+	6729	0.90
Number of medications		
0	253525	34.00
1	110627	14.84
2-3	149227	20.02
4-9	180594	24.22
10+	51585	6.92
Total	745558	100

There were a total of 3,251 (0,4%) people who were identified as having COVID-19 within the study. This is around 4 people in every thousand. Within that group over the period of the study 896 were admitted to hospital and 229 died (see Table 2).

Looking only at people who caught COVID-19 there were differences again between Tayside and Fife in who were admitted or who died as shown in Table 2. There were also differences between males and females, by age group, by social class, by numbers of conditions and also by numbers of drugs being used.

Table 2: Distribution of hospitalization and deaths among COVID-19 cases

<i>Characteristics</i>	<i>COVID-related death</i>	<i>COVID-related hospital admission</i>	<i>No death/admission</i>	<i>Number with COVID-19</i>	<i>Chi-test</i>	<i>P-value</i>
<i>Health Board</i>						
<i>Fife</i>	7.71	25.00	67.29	1608	10.77	0.005
<i>Tayside</i>	6.35	29.89	63.76	1653		
<i>Age</i>						
<i>0-9</i>	0.00	28.57	71.43	14	653.41	<0.001
<i>10-19</i>	0.00	18.00	82.00	50		
<i>20-29</i>	0.00	10.07	89.93	278		
<i>30-39</i>	0.00	11.94	88.06	335		
<i>40-49</i>	0.60	22.29	77.11	495		
<i>50-59</i>	1.42	24.41	74.17	635		
<i>60-69</i>	6.52	43.61	49.87	399		
<i>70-79</i>	12.85	47.61	39.55	397		
<i>80-89</i>	20.90	33.48	45.63	469		
<i>&gt;=90</i>	22.58	15.59	61.83	186		
<i>Sex</i>						

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<i>Female</i>	5.01	21.54	73.45	2075	160.92	<0.001
<i>Male</i>	10.54	37.86	51.60	1186		
<i>Deprivation</i>						
<i>Most deprived</i>	5.90	28.37	65.73	712	25.57	0.004
2	6.38	31.31	62.31	674		
3	8.08	23.30	68.62	631		
4	9.06	25.51	65.43	541		
<i>Least deprived</i>	7.88	29.09	63.03	495		
<i>Missing</i>	2.40	25.96	71.63	208		
<i>Number of Health Conditions</i>						
0	2.64	15.81	81.55	2163	798.5	<0.001
1	9.62	54.81	35.58	416		
2-3	17.24	50	32.76	464		
4+	23.85	43.12	33.03	218		
<i>Number of medications</i>						
0	1.15	16.92	81.92	520	340.9	<0.001
1	0.57	16.15	83.29	351		
2-3	2.06	21.31	76.63	582		
4-9	8.96	31.63	59.41	1116		
10+	15.8	39.71	44.49	690		
<i>Total</i>	7.02	27.48	65.50	3261		

Looking more closely only at the people that were hospitalized for COVID-19, there were differences in the proportion that died between Tayside and Fife (higher in Fife) as shown in Table 2. There were also differences in COVID-19 deaths by age group (higher among older people), by social class (higher among least deprived people), by numbers of conditions (higher among people with more conditions) and also by numbers of drugs being used (higher among people with more drugs).

Table 3: Distribution of COVID-19 related deaths among COVID-19 hospitalization

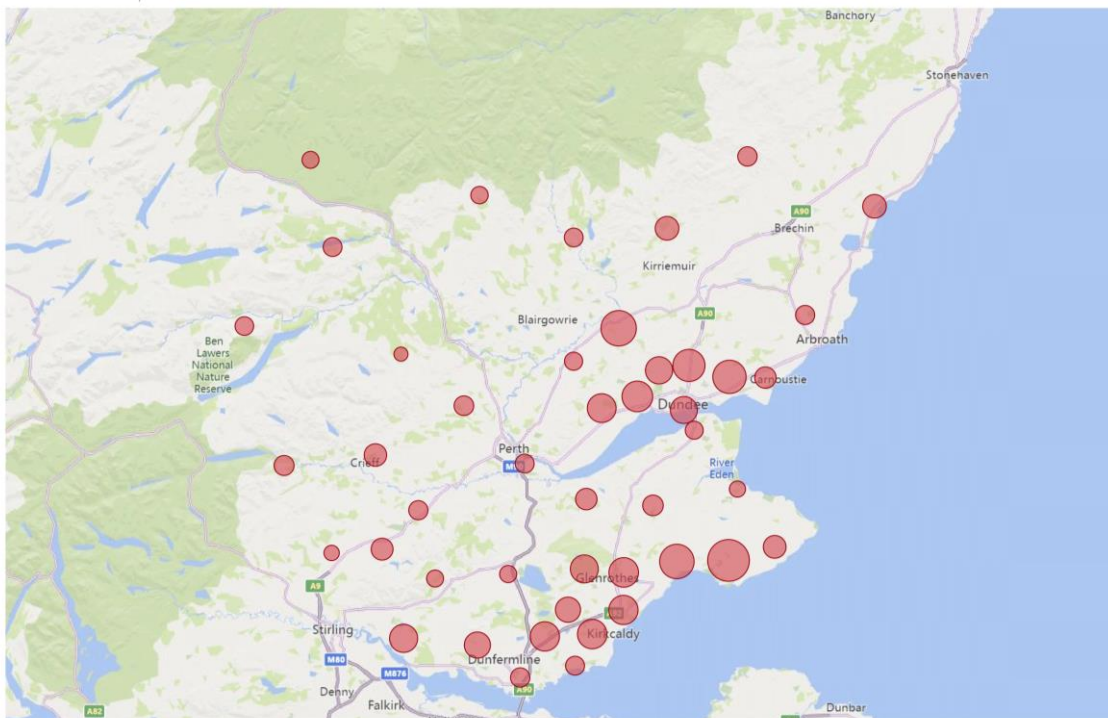
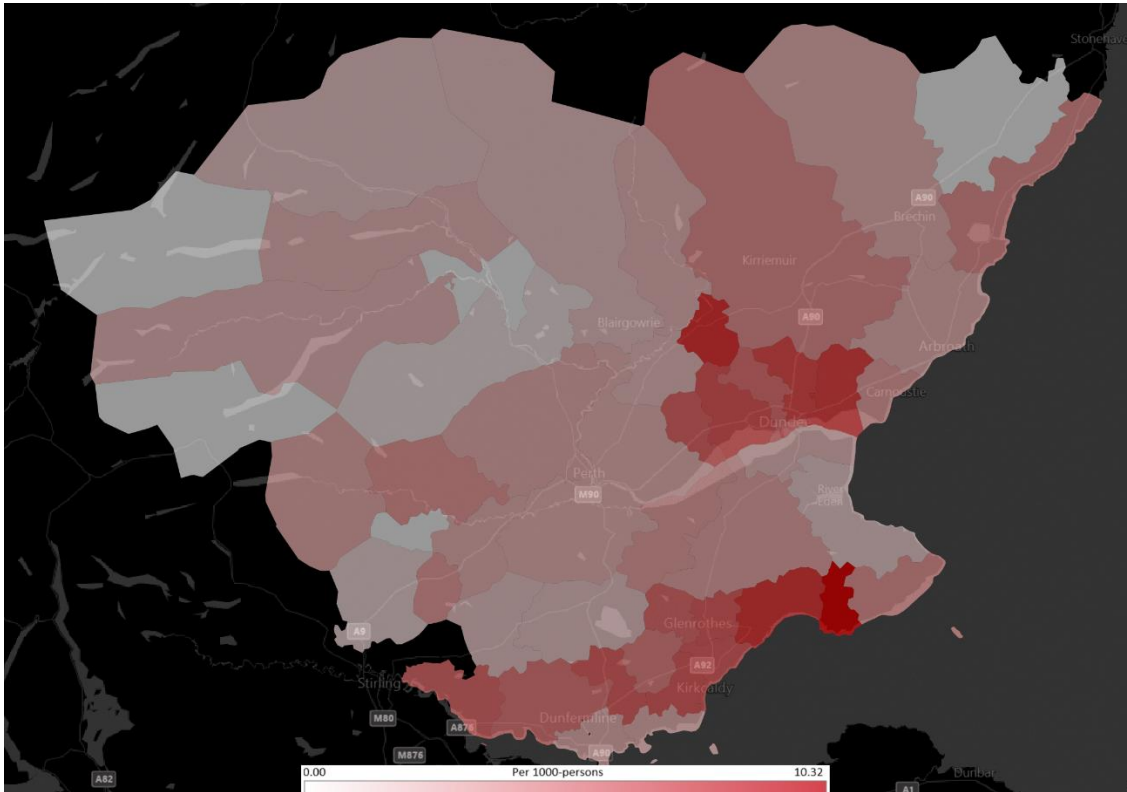
<b>Characteristics</b>	<b>Covid-death</b>	<b>Alive</b>	<b>Number of COVID hospitalization</b>	<b>Chi</b>	<b>P-value</b>
<i>Health Board</i>					
<i>Fife</i>	23.57	76.43	526	6.312	0.012
<i>Tayside</i>	17.53	82.47	599		

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<i>Age</i>						
0-9	Na	100.00	1	189.266	<0.001	
10-19	Na	100.00	3			
20-29	Na	100.00	9			
30-39	0.00	100.00	28			
40-49	0.00	100.00	40			
50-59	2.63	97.37	114			
60-69	5.49	94.51	164			
70-79	13.00	87.00	200			
80-89	21.25	78.75	240			
>=90	38.43	61.57	255			
	59.15	40.85	71			
<i>Sex</i>						
Female	18.87	81.13	551	1.46	0.227	
Male	21.78	78.22	574			
<i>Deprivation</i>						
Most deprived	17.21	82.79	244	16.07	0.007	
2	16.93	83.07	254			
3	25.76	74.24	198			
4	26.20	73.80	187			
Least deprived	21.31	78.69	183			
Missing	8.47	91.53	59			
<i>Number of Health Conditions</i>						
0	14.29	85.71	399	40.3	<0.001	
1	14.93	85.07	268			
2-3	25.64	74.36	312			
4+	35.62	64.38	146			
<i>Number of medications</i>						
0	6.38	93.62	94	49.3	<0.001	
1	3.39	96.61	59			
2-3	8.82	91.18	136			
4-9	22.08	77.92	453			
10+	28.46	71.54	383			
<b>Total</b>	<b>20.36</b>	<b>79.64</b>	<b>1125</b>			

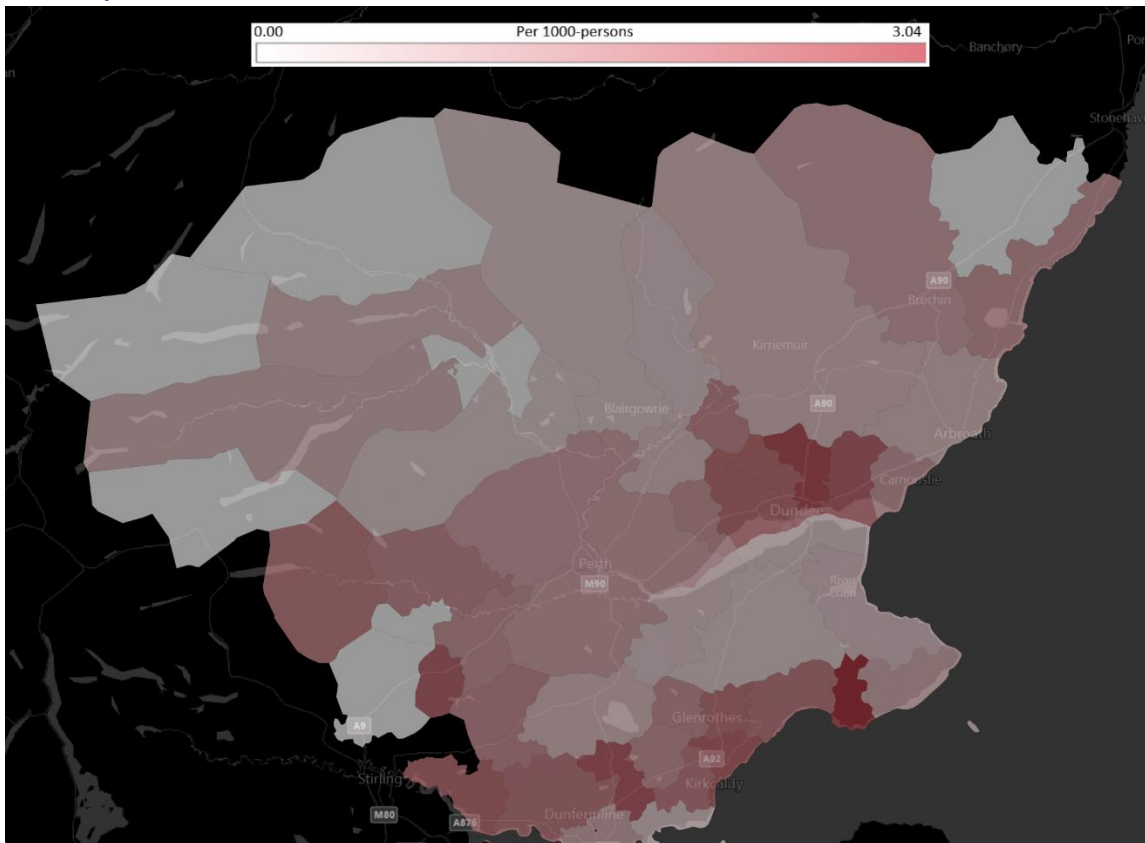
Our first figures below shows the number of COVID-19 cases per 1000-persons by post code area in Fife and Tayside. In the first figure (Figure 1a), the darker the red colour, the higher the rate of COVID-19 cases in area. In Figure 1b, the bigger the size of the bubble, the bigger the rate of COVID-19 cases in each area. Across all the postcode districts the rate of COVID-19 cases ranged from 0 to just over 10 people in every 1000.

Figure 1 (a & b): Distribution of COVID-19 Cases per 1000-persons by Post Codes in Fife and Tayside

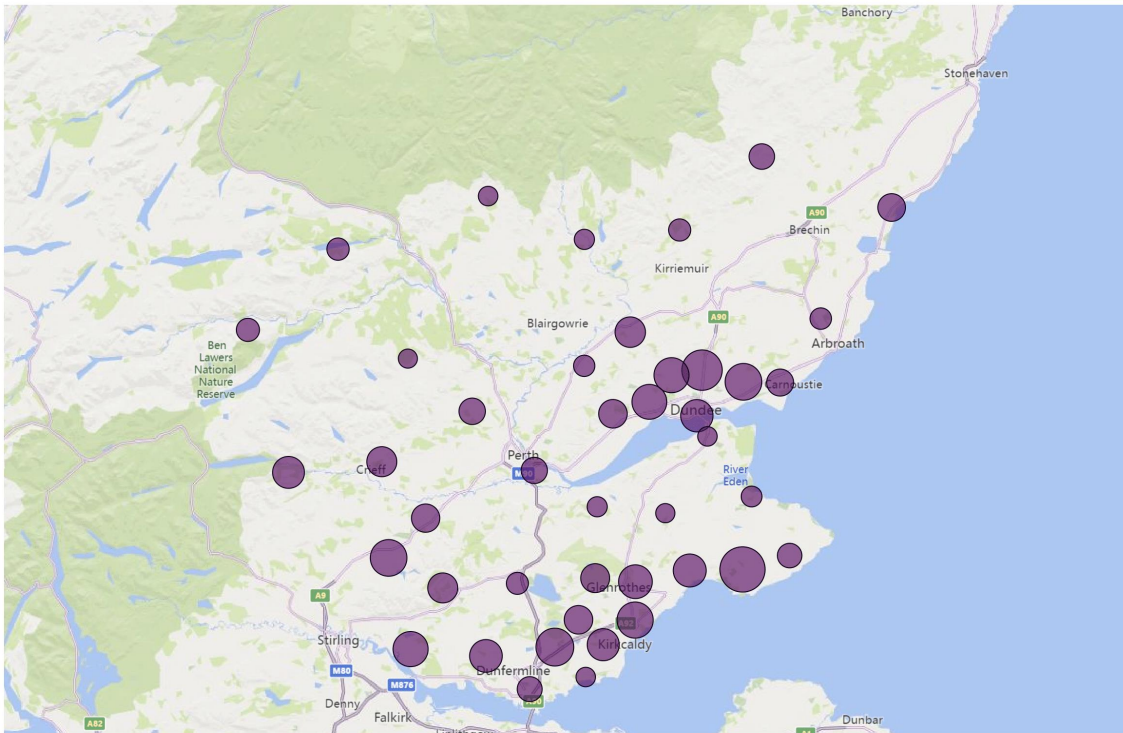


of the next figures show the number of people taken to hospital with COVID-19 per 1000-persons by post code area in Fife and Tayside. In the first figure (Figure 1a), the darker the red colour, the higher the rate of COVID-19 hospitalisations in the area. In Figure 1b, the bigger the size of the bubble, the bigger the rate of COVID-19 hospitalisations in each area. Across all the postcode districts the rate of COVID-19 hospitalisations ranged from 0 to just over 3 people in every 1000.

Figure 2 (a & b): Distribution of COVID-19 hospitalization per 1000-persons by Post Codes in Fife and Tayside



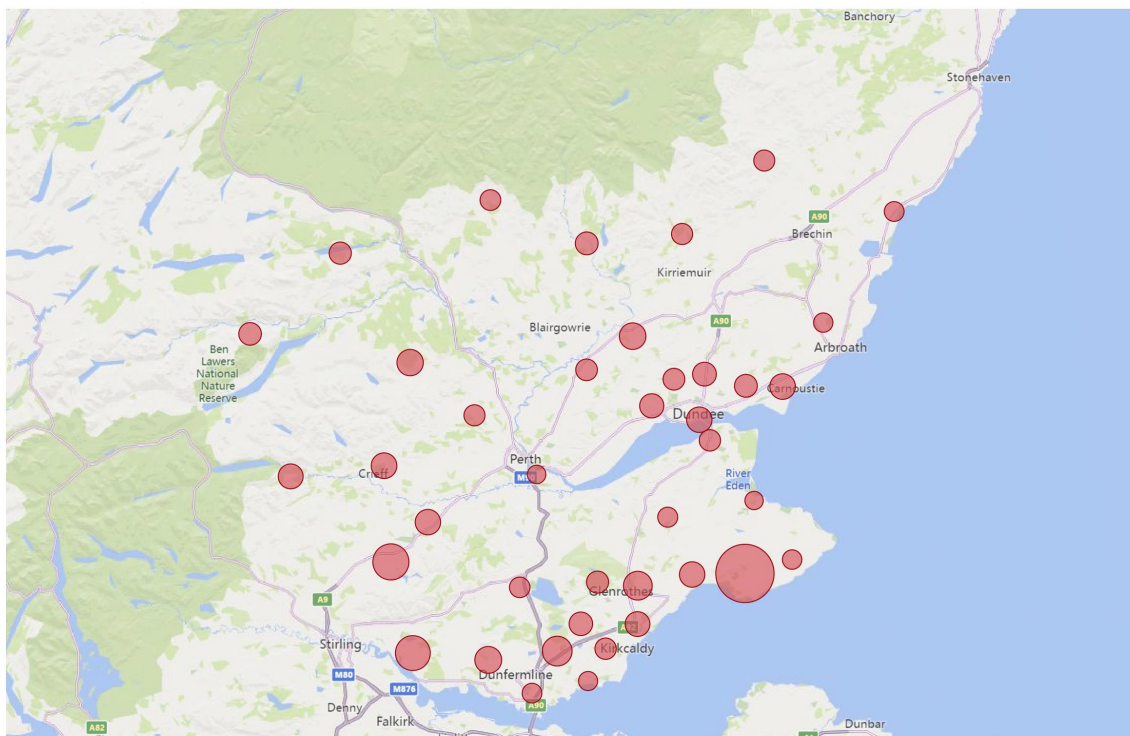
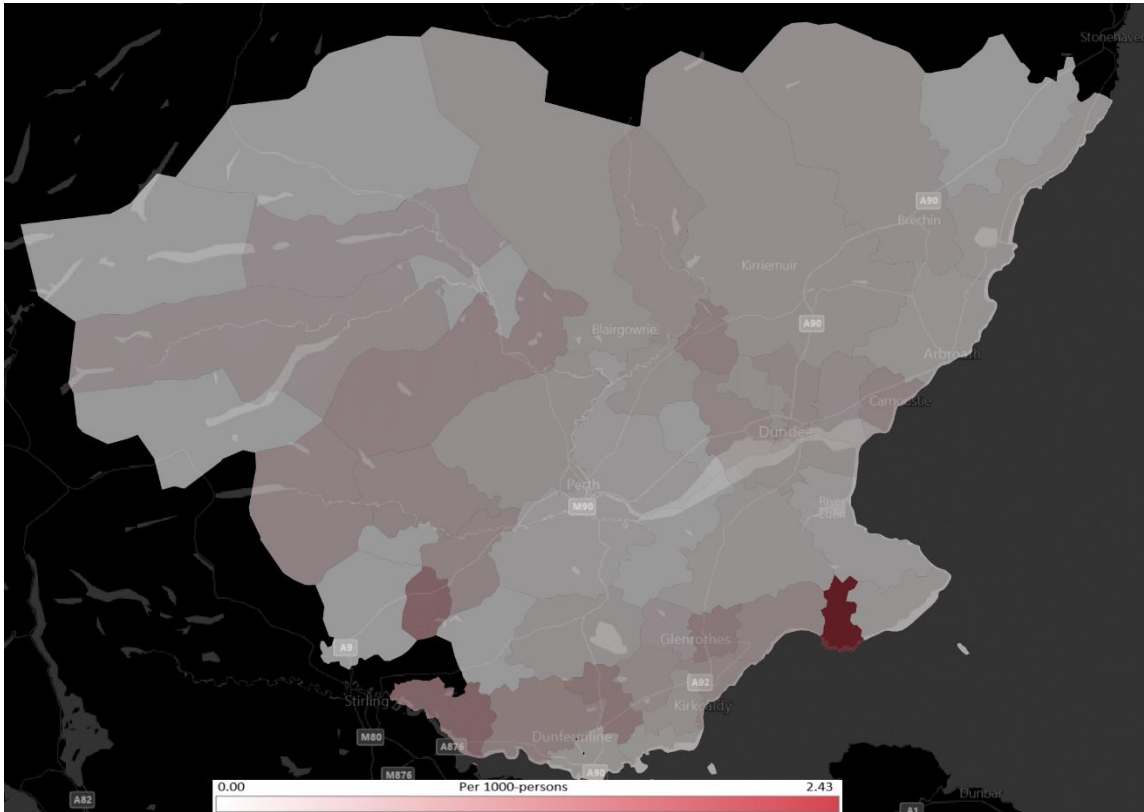




Our last figures shows the number of people who died with COVID-19 per 1000-persons by post code area in Fife and Tayside. In the first figure (Figure 3a), the darker the red colour, the higher the rate of COVID-19 deaths in the area. In Figure 3b, the bigger the size of the bubble, the bigger the rate of COVID-19 deaths in each area. Across all the postcode areas the rate of COVID-19 deaths ranged from 0 to 2.4 people in every 1000.

Figure 3 (a & b): Distribution of COVID-19 Deaths per 1000-persons by Post Codes in Fife and Tayside

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## WHAT IMPACT COULD THE FINDINGS HAVE?

- Our results allow people at a local level to better understand who is at greatest risk of catching COVID-19. It also allows people to understand what are the most common characteristics that raise the risk of suffering severe COVID-19. We would hope this allows people to better consider their own level of risk and take appropriate action in line with existing Government guidance.
- One of the key policy messages from this work is the difficulty of data collection direct from people which can then be added to their health records. We developed a robust and ethically approved system to allow people to make an informed choice of allowing data they provided to be used with their health records. However due to too small numbers participating with c19track.com in the Tayside & Fife regions we could not then use this. By contrast, the ZOE tracker app which had high use in Scotland did not have a process to allow linkage to health records.
- Routinely collected health records in Scotland and our existing rules which allow for their use for research are a fantastic resource that can be used to help inform how best to look after the people in Scotland. However, we need to continually look at this to ensure that when there is a public need we have robust and responsive processes to allow approved research groups to access this data.

## HOW WILL THE OUTCOMES BE DISSEMINATED?

We will explore the current literature to determine if the findings of this work can add to existing knowledge and would aim to submit a paper for publication. As part of the overall scheme funding COVID-19 research, we approached Prof Aziz Sheikh at the University of Edinburgh and have been involved with the EAVE II project contributing to publications from that work. Dr Agrawal has led two separate analyses supported by Dr Fagbamigbe which have been submitted to peer-reviewed journals and which acknowledge their funding under this grant. We are continuing to support work on the EAVE II project.

## CONCLUSION

We were unable to identify people with COVID-19 from the tracker information as planned due to low uptake. However using data for residents of Tayside & Fife we were able to identify those with confirmed COVID-19, those who were admitted and those who died. Our research showed that older people with higher levels of long term conditions or with higher numbers of different drugs were more likely to catch COVID-19 and to also suffer severe outcomes.

## RESEARCH TEAM & CONTACT

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## ADDITIONAL INFORMATION

Project completed on 30/11/2020. Amount awarded: £55,594