Time trends in tuberculosis in London during the COVID-19 pandemic

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Aim

This document describes changes in the rate and characteristics of diagnosed tuberculosis (TB) cases in London during the COVID-19 pandemic.

Data source

We used data from the London TB Register (LTBR), a surveillance database maintained by the UK Health Security Agency. It includes all cases of TB notified by doctors and laboratories in London. In the UK, TB is a legally notifiable disease and LTBR collects data on patient demographics; disease factors such as site, drug sensitivities and previous TB treatment history; and social risk factors such as homelessness and illicit drug use.[3]

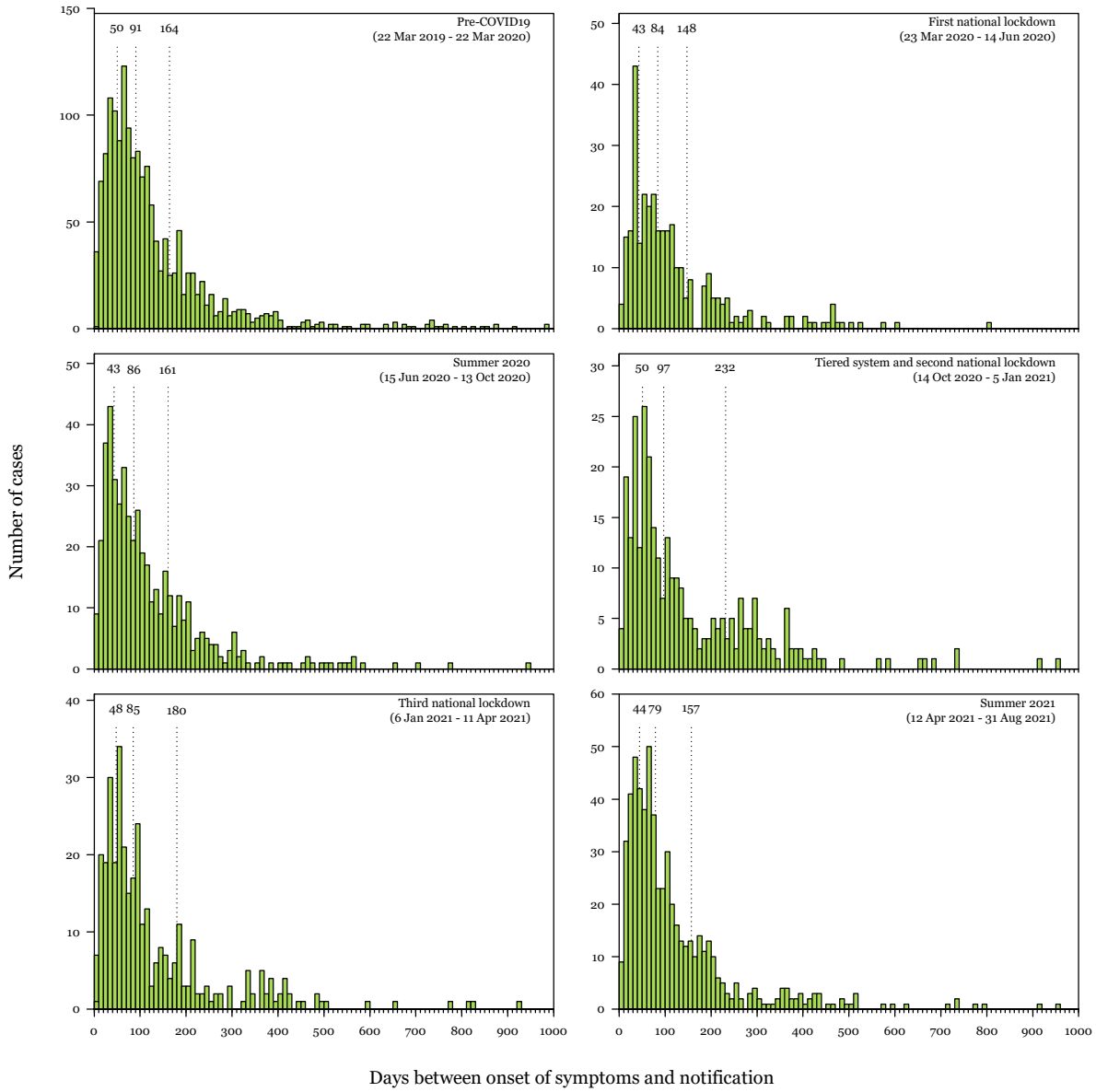
Characteristics of cases

Table 1 describes notified cases in six time periods defined by level of COVID-19 restrictions: (i) before COVID-19 lockdowns (22 March 2019 – 22 March 2020); (ii) the first national lockdown (23 March 2020 – 14 June 2020); (iii) summer 2020 (15 June 2020 – 13 October 2020); (iv) tiered restrictions and second national lockdown (14 October 2020 – 5 January 2021); (v) third national lockdown (6 January 2021 – 11 April 2021); and (vi) summer 2021 (12 April 2021 – 31 August 2021). Cases in each period had similar characteristics in terms of age, sex, ethnicity, social risk factors, and disease site. The time between self-reported symptom onset and diagnosis was similar in each period, with the distribution in this time shown in Figure 1.

Table 1: Characteristics of notified tuberculosis cases in London, England, in time periods defined by level of COVID-19 restrictions. Values are numbers (%)

Variable	Level	**Pre-COVID-19** (22 Mar 2019 – 22 Mar 2020)	**First national lockdown** (23 Mar 2020 – 14 Jun 2020)	**Summer 2020** (15 Jun 2020 – 13 Oct 2020)	**Tiered restrictions and second national lockdown** (14 Oct 2020 – Jan 2021)	**Third national lockdown** (6 Jan 2021 – 11 Apr 2021)	**Summer 2021** (12 Apr 2021 – 31 Aug 2021)
Total diagnosed cases		1,739 (100.0)	340 (100.0)	525 (100.0)	329 (100.0)	413 (100.0)	713 (100.0)
Days		367	84	121	84	96	142
Rate per day [95% CI]		4.74 (4.52-4.97)	4.05 (3.63-4.50)	4.34 (3.98-4.73)	3.92 (3.50-4.36)	4.30 (3.90-4.74)	5.02 (4.66-5.40)
Age group	0-15	70 (4.0)	7 (2.1)	16 (3.0)	14 (4.3)	21 (5.1)	22 (3.1)
	16-24	216 (12.4)	39 (11.5)	67 (12.8)	60 (18.2)	49 (11.9)	91 (12.8)
	25-34	383 (22.0)	95 (27.9)	113 (21.5)	80 (24.3)	88 (21.3)	182 (25.5)
	35-44	371 (21.3)	67 (19.7)	115 (21.9)	65 (19.8)	99 (24.0)	140 (19.6)
	45-54	288 (16.6)	55 (16.2)	93 (17.7)	49 (14.9)	68 (16.5)	105 (14.7)
	55-64	196 (11.3)	46 (13.5)	61 (11.6)	25 (7.6)	40 (9.7)	79 (11.1)
	65+	215 (12.4)	31 (9.1)	60 (11.4)	36 (10.9)	48 (11.6)	94 (13.2)
	Median [IQR]	40 [29-54]	38 [28-52.25]	40 [29-53]	35 [26-50]	38 [28-52]	39 [29-54]
Sex	Female	693 (39.9)	127 (37.4)	190 (36.2)	140 (42.6)	153 (37.0)	293 (41.1)
	Male	1,046 (60.1)	213 (62.6)	335 (63.8)	189 (57.4)	260 (63.0)	420 (58.9)
Ethnicity	Bangladeshi	95 (5.5)	12 (3.5)	21 (4.0)	16 (4.9)	24 (5.8)	37 (5.2)
	Black-African	345 (19.8)	62 (18.2)	135 (25.7)	78 (23.7)	86 (20.8)	101 (14.2)
	Black-Caribbean	54 (3.1)	9 (2.6)	14 (2.7)	3 (0.9)	19 (4.6)	22 (3.1)
	Black-Other	34 (2.0)	6 (1.8)	6 (1.1)	3 (0.9)	5 (1.2)	12 (1.7)
	Chinese	30 (1.7)	4 (1.2)	7 (1.3)	2 (0.6)	2 (0.5)	8 (1.1)
	Indian	426 (24.5)	104 (30.6)	136 (25.9)	96 (29.2)	110 (26.6)	213 (29.9)
	Other	346 (19.9)	60 (17.6)	92 (17.5)	61 (18.5)	75 (18.2)	137 (19.2)
	Pakistani	135 (7.8)	28 (8.2)	40 (7.6)	31 (9.4)	22 (5.3)	64 (9.0)
	Unknown	10 (0.6)	3 (0.9)	3 (0.6)	5 (1.5)	4 (1.0)	15 (2.1)
	White	264 (15.2)	52 (15.3)	71 (13.5)	34 (10.3)	66 (16.0)	104 (14.6)
Social risk factors	Drug use	81 (4.7)	17 (5.0)	24 (4.6)	11 (3.3)	19 (4.6)	37 (5.2)
	Homelessness	1,650 (94.9)	19 (5.6)	27 (5.1)	16 (4.9)	22 (5.3)	35 (4.9)
	Prison	89 (5.1)	15 (4.4)	19 (3.6)	10 (3.0)	16 (3.9)	18 (2.5)
	Mental health	1,674 (96.3)	19 (5.6)	37 (7.0)	22 (6.7)	24 (5.8)	36 (5.0)
	Any	65 (3.7)	45 (13.2)	76 (14.5)	47 (14.3)	57 (13.8)	89 (12.5)
Site	Pulmonary	599 (34.4)	95 (27.9)	173 (33.0)	107 (32.5)	149 (36.1)	246 (34.5)
	Non-pulmonary	246 (14.1)	60 (17.6)	85 (16.2)	52 (15.8)	54 (13.1)	86 (12.1)
	Mixed	894 (51.4)	185 (54.4)	267 (50.9)	170 (51.7)	210 (50.8)	381 (53.4)
Drug resistance		119 (6.8)	29 (8.5)	28 (5.3)	21 (6.4)	15 (3.6)	11 (1.5)
Days to diagnosis	Median [IQR]	91 [50-164]	84 [43-147.75]	86.5 [43-161]	97 [50.5-231.5]	85 [48-180]	79 [44-157]

Figure 1: Distribution of time between self-reported symptom onset and notification for TB cases in London, England, in time periods defined by level of COVID-19 restrictions

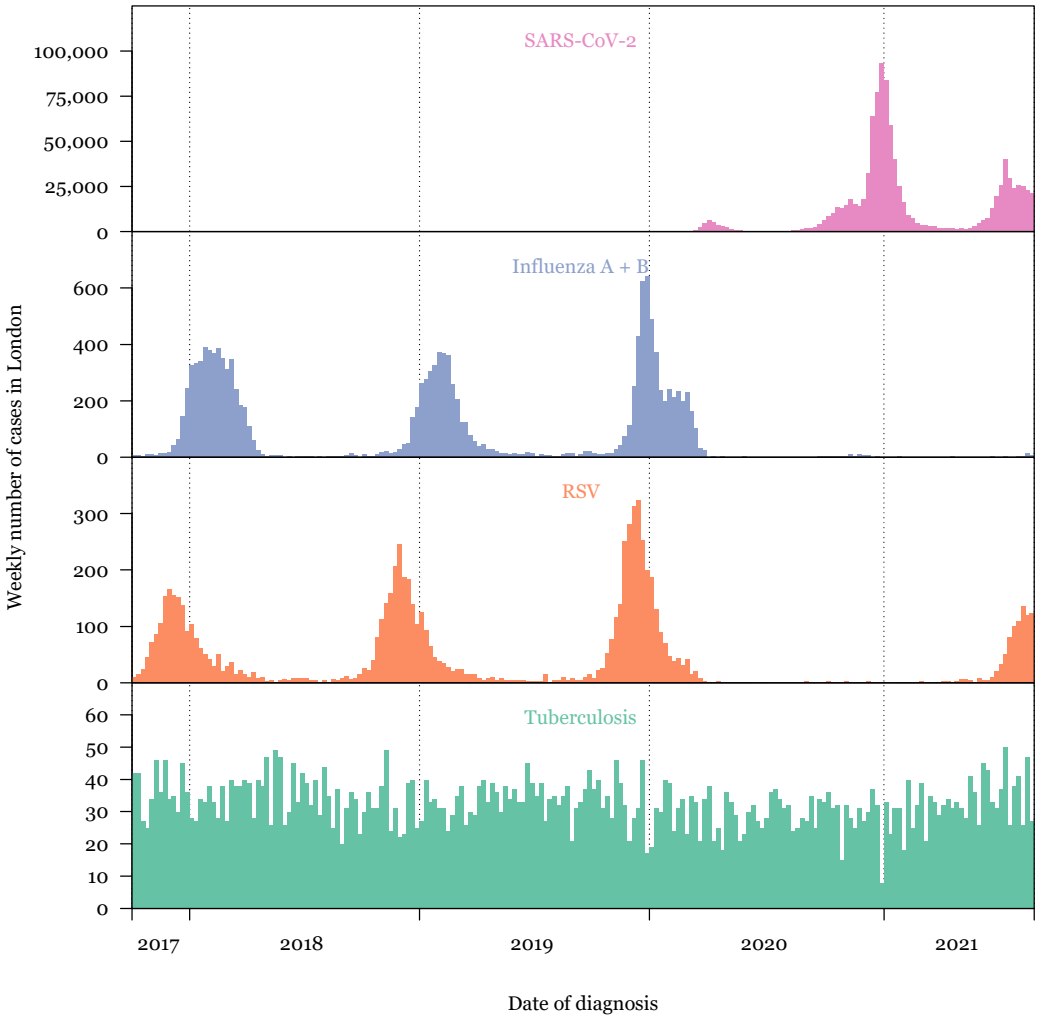


The horizontal axis is truncated at 1,000 days.

Time trend in notifications

Unlike seasonal respiratory infections such as influenza and respiratory syncytial virus (RSV), the number of diagnosed TB cases did not reduce dramatically during COVID-19 restrictions (Figure 2).

Figure 2: Number of diagnosed cases per week in London for selected respiratory infections (TB, SARS-CoV-2, RSV, and influenza A + B), October 2017 - August 2021



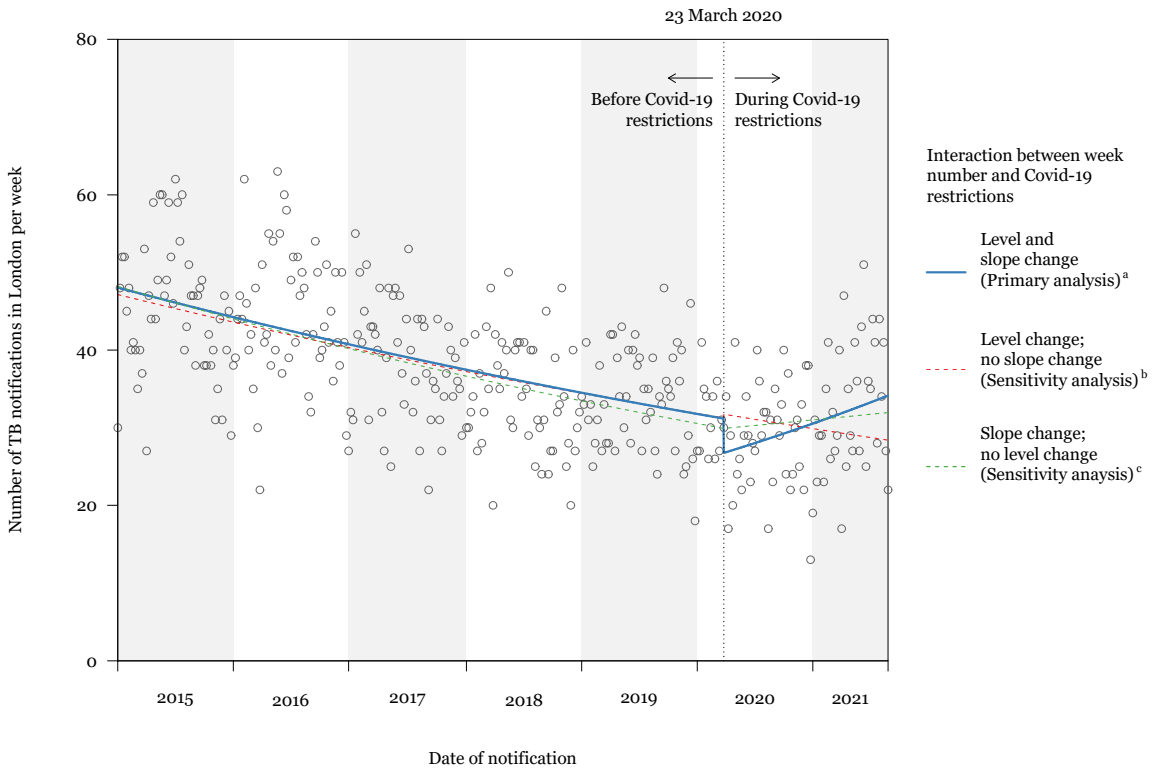
Data for RSV and Influenza A+B are from the Second Generation Surveillance System (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/926838/PHE_Laboratory_reporting_guidelines_October-2020-v3.pdf) and for SARS-CoV-2 are publicly available data from the UK Coronavirus data portal (https://coronavirus.data.gov.uk/). The number of SARS-CoV-2 cases reported in the 'first wave' (approximately March-June 2020) is low due to limited availability of tests.

We used an interrupted time-series method[4] to test for a difference in the rate of TB notifications at the start of the first national lockdown (23 March 2021). We expected there would be a reduction (step-change) due to reduced accessibility of services or reduced help-seeking for respiratory symptoms; and then a reduction in the long-term trend (slope change) as reduced travel and local transmission is incrementally reflected in disease onset and diagnosis. We used a Poisson model in which the dependent variable was the number of weekly TB notifications, and the independent variables were an interaction term between the week number and the pre/post COVID-19 status, and a categorical term for the month (January, February etc.) representing the seasonal trend.

This model suggested a reduction in the rate of TB notifications at 23 March 2020. After 23 March 2020, the model suggested an increasing rate of TB notifications, with the slope reversing from a downward-trend to an upward-trend. As exploratory sensitivity analyses, we fit two additional models: (1) with a step change only, showing no evidence of a step change; and (2)

with a slope change only; showing a less pronounced reversal in the slope. These sensitivity analyses show that the trends identified by the interrupted time series model are sensitive to the model specification.

Figure 3: Interrupted time series testing for a change in the rate of TB notifications per week at 23 March 2020. The trend line is "deseasonalised" by predicting the number of notifications in June



a. Strong evidence of a step change ($p < 0.001$) and a slope change ($p < 0.001$)
b. Strong evidence of a slope change ($p < 0.001$)
c. No evidence of a step change ($p = 0.71$)

References

1 Public Health England. Guidance on notifying Tuberculosis (TB) cases. 2015. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/360263/Guidance_on_Notifying_Tuberculosis__TB__cases.pdf (accessed Nov 25, 2021).

2 Lopez Bernal J, Cummins S, Gasparrini A. Interrupted time series regression for the evaluation of public health interventions: a tutorial. *Int J Epidemiol* 2016; : dyw098. DOI:10.1093/ije/dyw098.