

Supplementary Materials

Patient Characteristics Associated with Repeat Antibiotic Prescribing Pre- and During the COVID-19 Pandemic: A Retrospective Nationwide Cohort Study of >19 Million Primary Care Records Using the OpenSAFELY Platform

Supplementary Results

Description of January 2020 (pre-pandemic) and January 2022 (pandemic) cohorts

The total study populations in the January 2020 (pre-pandemic) and January 2021 (pandemic) cohorts were 19.38 million and 19.55 million patients, respectively. Of these patient cohorts, 206,865 and 193,517 patients received repeat antibiotic prescriptions (determined based on all antibiotic classes) (Table 1). This yields overall repeat antibiotic prescribing rates of 10.68 and 9.90 per 1000 patients in pre-pandemic and pandemic cohorts, based on the 6-month lookback period (see Methods). This compares with overall non-repeat prescribing rates of 56.56 and 42.72 per 1000 patients in the pre-pandemic and pandemic cohorts (Table S1). Therefore, in accordance with the monthly percent change analysis (described in the main text), the overall antibiotic prescribing rate was reduced in the pandemic vs pre-pandemic cohort, and non-repeat prescribing showed a steeper overall decline (-24.46%) compared with repeat prescribing (-7.27%).

Supplementary Tables

Table S1. Demographic characteristics of primary care patients receiving non-repeat antibiotic prescriptions in pre-pandemic (January 2020) and pandemic (January 2021) cohorts

Characteristic	January 2020 (pre-pandemic) cohort			January 2021 (pandemic) cohort			
	Population (n = 19,375,208 n female = 9,756,346 n male = 9,618,862)	Prescribed non- repeated antibiotics (n = 1,095,824 n female = 721,393 n male = 374,431)	Prescribing per 1000	Population (n = 19,545,285 n female = 9,835,177 n male = 9,710,108)	Prescribed non- repeated antibiotics (n = 835,065 n female = 561,095 n male = 273,970)	Prescribing per 1000	Percent change vs 2020
Age (female patients)							
18-29	1,789,887 (9.24) (18.35)	134,634 (12.29) (18.66)	75.22	1,768,295 (9.05) (17.98)	109,661 (13.13) (19.54)	62.02	-17.55
30-39	1,683,962 (8.69) (17.26)	114,373 (10.44) (15.85)	67.92	1,707,559 (8.74) (17.36)	91,425 (10.95) (16.29)	53.54	-21.17
40-49	1,526,149 (7.88) (15.64)	95,049 (8.67) (13.18)	62.28	1,530,997 (7.83) (15.57)	75,587 (9.05) (13.47)	49.37	-20.73
50-59	1,635,345 (8.44) (16.76)	106,195 (9.69) (14.72)	64.94	1,654,637 (8.47) (16.82)	81,680 (9.78) (14.56)	49.36	-23.98
60-69	1,305,184 (6.74) (13.38)	95,640 (8.73) (13.26)	73.28	1,331,364 (6.81) (13.54)	69,702 (8.35) (12.42)	52.35	-28.55
70-79	1,090,670 (5.63) (11.18)	94,663 (8.64) (13.12)	86.79	1,116,918 (5.71) (11.36)	69,294 (8.30) (12.35)	62.04	-28.52
>79	725,149 (3.74) (7.43)	80,839 (7.38) (11.21)	111.48	725,407 (3.71) (7.38)	63,746 (7.63) (11.36)	87.88	-21.17
Age (male patients)							
18-29	1,801,657 (9.30) (18.73)	56,958 (5.20) (15.21)	31.61	1,787,078 (9.14) (18.40)	40,384 (4.84) (14.74)	22.6	-28.52
30-39	1,732,184 (8.94) (18.01)	46,449 (4.24) (12.41)	26.82	1,756,215 (8.99) (18.09)	33,553 (4.02) (12.25)	19.11	-28.75
40-49	1,620,217 (8.36) (16.84)	46,172 (4.21) (12.33)	28.5	1,629,425 (8.34) (16.78)	33,876 (4.06) (12.36)	20.79	-27.05
50-59	1,686,327 (8.70) (17.53)	56,306 (5.14) (15.04)	33.39	1,705,162 (8.72) (17.56)	42,531 (5.09) (15.52)	24.94	-25.3
60-69	1,281,804 (6.62) (13.33)	59,760 (5.45) (15.96)	46.62	1,310,721 (6.71) (13.50)	43,580 (5.22) (15.91)	33.25	-28.68
70-79	992,394 (5.12) (10.32)	63,573 (5.80) (16.98)	64.06	1,014,499 (5.19) (10.45)	45,823 (5.49) (16.73)	45.17	-29.49
>79	504,279 (2.60) (5.24)	45,213 (4.13) (12.08)	89.66	507,008 (2.59) (5.22)	34,223 (4.10) (12.49)	67.5	-24.71
England region							
London	1,370,757 (7.07)	49,413 (4.51)	36.05	1,401,485 (7.17)	38,806 (4.65)	27.69	-23.19
East	4,473,416 (23.09)	261,134 (23.83)	58.37	4,524,344 (23.15)	195,634 (23.43)	43.24	-25.93
East Midlands	3,346,011 (17.27)	190,942 (17.42)	57.07	3,368,011 (17.23)	141,999 (17.00)	42.16	-26.12
North East	924,774 (4.77)	54,707 (4.99)	59.16	928,030 (4.75)	39,970 (4.79)	43.07	-27.19
North West	1,695,187 (8.75)	104,227 (9.51)	61.48	1,706,464 (8.73)	83,188 (9.96)	48.75	-20.71
South East	1,316,373 (6.79)	74,325 (6.78)	56.46	1,323,206 (6.77)	56,771 (6.80)	42.9	-24.01
South West	2,701,539 (13.94)	149,984 (13.69)	55.52	2,726,547 (13.95)	114,471 (13.71)	41.98	-24.38

West Midlands	777,478 (4.01)	42,906 (3.92)	55.19	778,032 (3.98)	32,810 (3.93)	42.17	-23.58
Yorkshire and The Humber	2,760,064 (14.25)	167,543 (15.29)	60.7	2,778,667 (14.22)	130,883 (15.67)	47.1	-22.4
Missing	9,609 (0.05)	643 (0.06)	66.92	10,499 (0.05)	533 (0.06)	50.77	-24.13
Ethnicity							
British	13,336,088 (68.83)	874,819 (79.83)	65.6	13,424,038 (68.68)	674,871 (80.82)	50.27	-23.36
African	237,664 (1.23)	9,023 (0.82)	37.97	248,818 (1.27)	6,745 (0.81)	27.11	-28.6
Any other Asian background	280,197 (1.45)	10,930 (1.00)	39.01	290,504 (1.49)	8,201 (0.98)	28.23	-27.63
Any other Black background	88,421 (0.46)	3,829 (0.35)	43.3	93,335 (0.48)	3,087 (0.37)	33.07	-23.62
Any other Mixed background	90,785 (0.47)	3,923 (0.36)	43.21	94,187 (0.48)	3,122 (0.37)	33.15	-23.29
Any other White background	1,671,589 (8.63)	64,806 (5.91)	38.77	1,718,196 (8.79)	46,065 (5.52)	26.81	-30.85
Any other ethnic group	304,982 (1.57)	11,563 (1.06)	37.91	320,839 (1.64)	9,087 (1.09)	28.32	-25.3
Bangladeshi	85,337 (0.44)	4,645 (0.42)	54.43	89,091 (0.46)	3,488 (0.42)	39.15	-28.07
Caribbean	105,798 (0.55)	4,936 (0.45)	46.65	106,382 (0.54)	4,054 (0.49)	38.11	-18.32
Chinese	133,388 (0.69)	2,325 (0.21)	17.43	134,678 (0.69)	1,403 (0.17)	10.42	-40.23
Indian	528,449 (2.73)	23,344 (2.13)	44.17	547,831 (2.80)	16,128 (1.93)	29.44	-33.36
Irish	102,020 (0.53)	6,488 (0.59)	63.6	102,812 (0.53)	5,029 (0.60)	48.91	-23.08
Pakistani	372,857 (1.92)	23,068 (2.11)	61.87	385,318 (1.97)	17,869 (2.14)	46.37	-25.04
White and Asian	45,869 (0.24)	2,119 (0.19)	46.2	48,185 (0.25)	1,643 (0.20)	34.1	-26.19
White and Black African	42,435 (0.22)	1,840 (0.17)	43.36	44,412 (0.23)	1,423 (0.17)	32.04	-26.11
White and Black Caribbean	53,562 (0.28)	3,014 (0.28)	56.27	55,520 (0.28)	2,628 (0.31)	47.33	-15.88
Missing	1,895,767 (9.78)	45,152 (4.12)	23.82	1,841,139 (9.42)	30,222 (3.62)	16.41	-31.08
Index of multiple deprivation (IMD) quintile							
1	3,688,616 (19.04)	224,189 (20.46)	60.78	3,708,065 (18.97)	175,373 (21.00)	47.3	-22.18
2	3,806,589 (19.65)	216,195 (19.73)	56.79	3,827,052 (19.58)	166,545 (19.94)	43.52	-23.38
3	4,113,190 (21.23)	229,326 (20.93)	55.75	4,133,488 (21.15)	173,933 (20.83)	42.08	-24.53
4	3,861,551 (19.93)	213,073 (19.44)	55.18	3,883,672 (19.87)	158,955 (19.04)	40.93	-25.82
5	3,529,411 (18.22)	190,812 (17.41)	54.06	3,548,646 (18.16)	139,983 (16.76)	39.45	-27.04
Missing	375,851 (1.94)	22,229 (2.03)	59.14	444,362 (2.27)	20,276 (2.43)	45.63	-22.85
Residence							
Private home	19,102,126 (98.59)	1,066,974 (97.37)	55.86	19,276,300 (98.62)	811,003 (97.12)	42.07	-24.68
Care home	56,979 (0.29)	10,339 (0.94)	181.45	56,385 (0.29)	9,105 (1.09)	161.48	-11.01
Care or nursing home	2,505 (0.01)	454 (0.04)	181.24	2,322 (0.01)	375 (0.04)	161.5	-10.89

Nursing home	48,843 (0.25)	8,827 (0.81)	180.72	47,447 (0.24)	7,734 (0.93)	163	-9.8
Missing	164,755 (0.85)	9,230 (0.84)	56.02	162,831 (0.83)	6,848 (0.82)	42.06	-24.93

Table shows N (%) for total population and total population prescribed non-repeat antibiotics, in January 2020 and January 2021 cohorts. For age/sex strata, % is shown relative to total population, total female/male population, total non-repeat prescribed population, total female/male non-repeat prescribed population. The rate of antibiotic prescribing is calculated per 1000, and percent change in the rate of antibiotic prescribing is calculated for January 2021 vs January 2020.

Table S2. Unadjusted risk ratios indicating associations between patient demographic characteristics and repeat prescribing in January 2020 (pre-pandemic) and January 2021 (pandemic) cohorts

Characteristic	January 2020 (pre-pandemic) cohort			January 2021 (pandemic) cohort		
	Risk ratio [CI]	Log Risk ratio [CI]	p value	Risk ratio [CI]	Log Risk ratio [CI]	p value
Age (female patients)						
18-29 (reference)						
30-39	0.90 [0.88, 0.92]	-0.11 [-0.13, -0.08]	****	0.84 [0.82, 0.86]	-0.17 [-0.20, -0.15]	****
40-49	1.19 [1.16, 1.22]	0.18 [0.15, 0.20]	****	1.07 [1.04, 1.09]	0.06 [0.04, 0.09]	****
50-59	1.64 [1.61, 1.68]	0.50 [0.47, 0.52]	****	1.43 [1.40, 1.46]	0.36 [0.33, 0.38]	****
60-69	2.40 [2.34, 2.45]	0.87 [0.85, 0.89]	****	2.00 [1.95, 2.04]	0.69 [0.67, 0.71]	****
70-79	3.44 [3.37, 3.52]	1.24 [1.22, 1.26]	****	2.81 [2.76, 2.87]	1.03 [1.01, 1.06]	****
>79	4.29 [4.20, 4.39]	1.46 [1.44, 1.48]	****	3.64 [3.57, 3.72]	1.29 [1.27, 1.31]	****
Age (male patients)						
18-29 (reference)						
30-39	0.66 [0.64, 0.69]	-0.41 [-0.45, -0.37]	****	0.64 [0.62, 0.67]	-0.44 [-0.48, -0.40]	****
40-49	1.02 [0.99, 1.06]	0.02 [-0.01, 0.06]	0.1906	1.00 [0.97, 1.04]	0.00 [-0.03, 0.04]	0.974
50-59	1.81 [1.76, 1.87]	0.59 [0.56, 0.62]	****	1.77 [1.72, 1.83]	0.57 [0.54, 0.60]	****
60-69	3.36 [3.27, 3.46]	1.21 [1.18, 1.24]	****	3.13 [3.04, 3.23]	1.14 [1.11, 1.17]	****
70-79	5.28 [5.13, 5.42]	1.66 [1.64, 1.69]	****	4.98 [4.84, 5.13]	1.61 [1.58, 1.63]	****
>79	6.63 [6.43, 6.82]	1.89 [1.86, 1.92]	****	6.25 [6.06, 6.44]	1.83 [1.80, 1.86]	****
England region						
London (reference)						
East	2.76 [2.69, 2.84]	1.02 [0.99, 1.04]	****	2.72 [2.64, 2.79]	1.00 [0.97, 1.03]	****
East Midlands	2.74 [2.66, 2.82]	1.01 [0.98, 1.04]	****	2.76 [2.69, 2.84]	1.02 [0.99, 1.05]	****
North East	3.05 [2.95, 3.15]	1.11 [1.08, 1.15]	****	2.97 [2.87, 3.07]	1.09 [1.06, 1.12]	****

North West	3.35 [3.25, 3.45]	1.21 [1.18, 1.24]	****	3.39 [3.29, 3.49]	1.22 [1.19, 1.25]	****
South East	2.44 [2.37, 2.52]	0.89 [0.86, 0.92]	****	2.38 [2.30, 2.45]	0.87 [0.83, 0.90]	****
South West	2.69 [2.61, 2.76]	0.99 [0.96, 1.02]	****	2.64 [2.56, 2.72]	0.97 [0.94, 1.00]	****
West Midlands	2.25 [2.18, 2.33]	0.81 [0.78, 0.85]	****	2.24 [2.16, 2.32]	0.81 [0.77, 0.84]	****
Yorkshire and The Humber	2.59 [2.52, 2.67]	0.95 [0.92, 0.98]	****	2.57 [2.50, 2.65]	0.95 [0.92, 0.97]	****
Missing	2.61 [2.15, 3.17]	0.96 [0.76, 1.15]	****	2.70 [2.23, 3.26]	0.99 [0.80, 1.18]	****
Ethnicity						
British (reference)						
African	0.25 [0.23, 0.27]	-1.38 [-1.45, -1.31]	****	0.26 [0.24, 0.27]	-1.37 [-1.44, -1.30]	****
Any other Asian background	0.29 [0.27, 0.30]	-1.25 [-1.31, -1.19]	****	0.27 [0.25, 0.29]	-1.31 [-1.37, -1.24]	****
Any other Black background	0.38 [0.35, 0.42]	-0.97 [-1.06, -0.88]	****	0.38 [0.34, 0.41]	-0.98 [-1.07, -0.89]	****
Any other Mixed background	0.35 [0.32, 0.39]	-1.04 [-1.14, -0.95]	****	0.39 [0.36, 0.43]	-0.94 [-1.03, -0.85]	****
Any other White background	0.38 [0.37, 0.39]	-0.97 [-0.99, -0.95]	****	0.36 [0.35, 0.37]	-1.01 [-1.04, -0.99]	****
Any other ethnic group	0.30 [0.29, 0.32]	-1.19 [-1.25, -1.14]	****	0.30 [0.28, 0.32]	-1.21 [-1.27, -1.15]	****
Bangladeshi	0.39 [0.35, 0.42]	-0.95 [-1.05, -0.86]	****	0.35 [0.31, 0.38]	-1.06 [-1.16, -0.96]	****
Caribbean	0.43 [0.40, 0.47]	-0.84 [-0.92, -0.77]	****	0.46 [0.43, 0.50]	-0.77 [-0.85, -0.69]	****
Chinese	0.12 [0.10, 0.14]	-2.12 [-2.26, -1.99]	****	0.12 [0.11, 0.14]	-2.08 [-2.22, -1.95]	****
Indian	0.36 [0.35, 0.38]	-1.01 [-1.05, -0.98]	****	0.34 [0.33, 0.35]	-1.08 [-1.12, -1.04]	****
Irish	1.10 [1.05, 1.16]	0.10 [0.05, 0.15]	0.0001	1.16 [1.10, 1.22]	0.15 [0.10, 0.20]	****
Pakistani	0.50 [0.48, 0.52]	-0.70 [-0.74, -0.66]	****	0.49 [0.47, 0.51]	-0.70 [-0.75, -0.66]	****
White and Asian	0.39 [0.34, 0.44]	-0.95 [-1.08, -0.83]	****	0.39 [0.35, 0.45]	-0.94 [-1.06, -0.81]	****
White and Black African	0.29 [0.25, 0.34]	-1.24 [-1.39, -1.09]	****	0.34 [0.30, 0.40]	-1.07 [-1.21, -0.93]	****
White and Black Caribbean	0.46 [0.41, 0.51]	-0.79 [-0.89, -0.68]	****	0.55 [0.49, 0.60]	-0.61 [-0.71, -0.51]	****
Missing	0.21 [0.20, 0.21]	-1.57 [-1.60, -1.55]	****	0.20 [0.19, 0.20]	-1.62 [-1.65, -1.59]	****
Index of multiple deprivation (IMD) quintile						
1 (reference)						
2	0.94 [0.93, 0.95]	-0.06 [-0.08, -0.05]	****	0.93 [0.92, 0.95]	-0.07 [-0.08, -0.06]	****
3	0.96 [0.94, 0.97]	-0.05 [-0.06, -0.03]	****	0.95 [0.94, 0.96]	-0.05 [-0.06, -0.04]	****
4	0.93 [0.92, 0.94]	-0.07 [-0.08, -0.06]	****	0.92 [0.91, 0.93]	-0.08 [-0.10, -0.07]	****
5	0.91 [0.89, 0.92]	-0.10 [-0.11, -0.08]	****	0.89 [0.88, 0.91]	-0.11 [-0.13, -0.10]	****
Missing	0.95 [0.92, 0.98]	-0.06 [-0.09, -0.02]	0.0007	0.90 [0.87, 0.93]	-0.10 [-0.13, -0.07]	****
Residence						

Private home (reference)						
Care home	4.89 [4.72, 5.07]	1.59 [1.55, 1.62]	****	4.73 [4.55, 4.91]	1.55 [1.52, 1.59]	****
Care or nursing home	4.48 [3.75, 5.34]	1.50 [1.32, 1.68]	****	5.07 [4.24, 6.06]	1.62 [1.44, 1.80]	****
Nursing home	5.26 [5.06, 5.45]	1.66 [1.62, 1.70]	****	5.20 [5.00, 5.41]	1.65 [1.61, 1.69]	****
Missing	1.09 [1.04, 1.14]	0.09 [0.04, 0.13]	0.0001	1.08 [1.03, 1.13]	0.08 [0.03, 0.12]	0.0018

Table shows unadjusted (log) risk ratios, confidence intervals (CIs), and p values. **** indicates p value < 0.0001

Table S3. Unadjusted risk ratios indicating associations between patient demographic characteristics and non-repeat prescribing in January 2020 (pre-pandemic) and January 2021 (pandemic) cohorts

Characteristic	January 2020 (pre-pandemic) cohort			January 2021 (pandemic) cohort		
	Risk ratio [CI]	Log Risk ratio [CI]	p value	Risk ratio [CI]	Log Risk ratio [CI]	p value
Age (female patients)						
18-29 (reference)						
30-39	0.90 [0.90, 0.91]	-0.10 [-0.11, -0.09]	****	0.86 [0.86, 0.87]	-0.15 [-0.16, -0.14]	****
40-49	0.83 [0.82, 0.83]	-0.19 [-0.20, -0.18]	****	0.80 [0.79, 0.80]	-0.23 [-0.24, -0.22]	****
50-59	0.86 [0.86, 0.87]	-0.15 [-0.15, -0.14]	****	0.80 [0.79, 0.80]	-0.23 [-0.24, -0.22]	****
60-69	0.97 [0.97, 0.98]	-0.03 [-0.03, -0.02]	****	0.84 [0.84, 0.85]	-0.17 [-0.18, -0.16]	****
70-79	1.15 [1.14, 1.16]	0.14 [0.14, 0.15]	****	1.00 [0.99, 1.01]	0.00 [-0.01, 0.01]	0.931
>79	1.48 [1.47, 1.49]	0.39 [0.39, 0.40]	****	1.42 [1.40, 1.43]	0.35 [0.34, 0.36]	****
Age (male patients)						
18-29 (reference)						
30-39	0.85 [0.84, 0.86]	-0.16 [-0.18, -0.15]	****	0.85 [0.83, 0.86]	-0.17 [-0.18, -0.15]	****
40-49	0.90 [0.89, 0.91]	-0.10 [-0.12, -0.09]	****	0.92 [0.91, 0.93]	-0.08 [-0.10, -0.07]	****
50-59	1.06 [1.04, 1.07]	0.05 [0.04, 0.07]	****	1.10 [1.09, 1.12]	0.10 [0.09, 0.11]	****
60-69	1.47 [1.46, 1.49]	0.39 [0.38, 0.40]	****	1.47 [1.45, 1.49]	0.39 [0.37, 0.40]	****
70-79	2.03 [2.00, 2.05]	0.71 [0.70, 0.72]	****	2.00 [1.97, 2.03]	0.69 [0.68, 0.71]	****
>79	2.84 [2.80, 2.87]	1.04 [1.03, 1.05]	****	2.99 [2.95, 3.03]	1.09 [1.08, 1.11]	****
England region						
London (reference)						
East	1.62 [1.60, 1.63]	0.48 [0.47, 0.49]	****	1.56 [1.54, 1.58]	0.45 [0.44, 0.46]	****

East Midlands	1.58 [1.57, 1.60]	0.46 [0.45, 0.47]	****	1.52 [1.51, 1.54]	0.42 [0.41, 0.43]	****
North East	1.64 [1.62, 1.66]	0.50 [0.48, 0.51]	****	1.56 [1.53, 1.58]	0.44 [0.43, 0.46]	****
North West	1.71 [1.69, 1.72]	0.53 [0.52, 0.54]	****	1.76 [1.74, 1.78]	0.57 [0.55, 0.58]	****
South East	1.57 [1.55, 1.58]	0.45 [0.44, 0.46]	****	1.55 [1.53, 1.57]	0.44 [0.43, 0.45]	****
South West	1.54 [1.52, 1.56]	0.43 [0.42, 0.44]	****	1.52 [1.50, 1.53]	0.42 [0.40, 0.43]	****
West Midlands	1.53 [1.51, 1.55]	0.43 [0.41, 0.44]	****	1.52 [1.50, 1.55]	0.42 [0.41, 0.44]	****
Yorkshire and The Humber	1.68 [1.67, 1.70]	0.52 [0.51, 0.53]	****	1.70 [1.68, 1.72]	0.53 [0.52, 0.54]	****
Missing	1.86 [1.72, 2.00]	0.62 [0.54, 0.69]	****	1.83 [1.69, 1.99]	0.61 [0.52, 0.69]	****
Ethnicity						
British (reference)						
African	0.58 [0.57, 0.59]	-0.55 [-0.57, -0.53]	****	0.54 [0.53, 0.55]	-0.62 [-0.64, -0.59]	****
Any other Asian background	0.59 [0.58, 0.61]	-0.52 [-0.54, -0.50]	****	0.56 [0.55, 0.57]	-0.58 [-0.60, -0.56]	****
Any other Black background	0.66 [0.64, 0.68]	-0.42 [-0.45, -0.38]	****	0.66 [0.64, 0.68]	-0.42 [-0.45, -0.38]	****
Any other Mixed background	0.66 [0.64, 0.68]	-0.42 [-0.45, -0.39]	****	0.66 [0.64, 0.68]	-0.42 [-0.45, -0.38]	****
Any other White background	0.59 [0.59, 0.60]	-0.53 [-0.53, -0.52]	****	0.53 [0.53, 0.54]	-0.63 [-0.64, -0.62]	****
Any other ethnic group	0.58 [0.57, 0.59]	-0.55 [-0.57, -0.53]	****	0.56 [0.55, 0.57]	-0.57 [-0.59, -0.55]	****
Bangladeshi	0.83 [0.81, 0.85]	-0.19 [-0.21, -0.16]	****	0.78 [0.75, 0.80]	-0.25 [-0.28, -0.22]	****
Caribbean	0.71 [0.69, 0.73]	-0.34 [-0.37, -0.31]	****	0.76 [0.74, 0.78]	-0.28 [-0.31, -0.25]	****
Chinese	0.27 [0.26, 0.28]	-1.33 [-1.37, -1.28]	****	0.21 [0.20, 0.22]	-1.57 [-1.63, -1.52]	****
Indian	0.67 [0.66, 0.68]	-0.40 [-0.41, -0.38]	****	0.59 [0.58, 0.59]	-0.54 [-0.55, -0.52]	****
Irish	0.97 [0.95, 0.99]	-0.03 [-0.05, -0.01]	0.0101	0.97 [0.95, 1.00]	-0.03 [-0.05, -0.00]	0.047
Pakistani	0.94 [0.93, 0.96]	-0.06 [-0.07, -0.05]	****	0.92 [0.91, 0.94]	-0.08 [-0.10, -0.07]	****
White and Asian	0.70 [0.68, 0.73]	-0.35 [-0.39, -0.31]	****	0.68 [0.65, 0.71]	-0.39 [-0.44, -0.34]	****
White and Black African	0.66 [0.63, 0.69]	-0.41 [-0.46, -0.37]	****	0.64 [0.61, 0.67]	-0.45 [-0.50, -0.40]	****
White and Black Caribbean	0.86 [0.83, 0.89]	-0.15 [-0.19, -0.12]	****	0.94 [0.91, 0.98]	-0.06 [-0.10, -0.02]	0.0016
Missing	0.36 [0.36, 0.37]	-1.01 [-1.02, -1.00]	****	0.33 [0.32, 0.33]	-1.12 [-1.13, -1.11]	****
Index of multiple deprivation (IMD) quintile						
1 (reference)						
2	0.93 [0.93, 0.94]	-0.07 [-0.07, -0.06]	****	0.92 [0.91, 0.93]	-0.08 [-0.09, -0.08]	****
3	0.92 [0.91, 0.92]	-0.09 [-0.09, -0.08]	****	0.89 [0.88, 0.90]	-0.12 [-0.12, -0.11]	****
4	0.91 [0.90, 0.91]	-0.10 [-0.10, -0.09]	****	0.87 [0.86, 0.87]	-0.14 [-0.15, -0.14]	****
5	0.89 [0.88, 0.89]	-0.12 [-0.12, -0.11]	****	0.83 [0.83, 0.84]	-0.18 [-0.19, -0.17]	****

Missing	0.97 [0.96, 0.99]	-0.03 [-0.04, -0.01]	****	0.96 [0.95, 0.98]	-0.04 [-0.05, -0.02]	****
Residence						
Private home (reference)						
Care home	3.25 [3.19, 3.31]	1.18 [1.16, 1.20]	****	3.84 [3.77, 3.91]	1.34 [1.33, 1.36]	****
Care or nursing home	3.24 [2.99, 3.53]	1.18 [1.09, 1.26]	****	3.84 [3.50, 4.21]	1.35 [1.25, 1.44]	****
Nursing home	3.24 [3.17, 3.30]	1.17 [1.16, 1.19]	****	3.87 [3.80, 3.95]	1.35 [1.33, 1.37]	****
Missing	1.00 [0.98, 1.02]	0.00 [-0.02, 0.02]	0.7698	1.00 [0.98, 1.02]	-0.00 [-0.02, 0.02]	0.9734

Table shows unadjusted (log) risk ratios, confidence intervals (CIs), and p values. **** indicates p value < 0.0001

Table S4. Rate of repeat and non-repeat antibiotic prescribing per 100,000 patients, in January 2020 and January 2021 cohorts (4 patient groups), broken down by antibiotic class.

BNF antibiotic class	Rate of prescribing per 100,000			
	Jan 2020, prescribed repeat	Jan 2020, prescribed non- repeat	Jan 2021, prescribed repeat	Jan 2021, prescribed non- repeat
Aminoglycosides	0.13	0.46	0.13	0.38
Antileprotic drugs	4.52	2.4	4.43	2.02
Antituberculosis drugs	4.36	5.73	3.17	4.53
Cephalosporins and other beta-lactams	7.66	22.5	7.65	21.57
Clindamycin and lincomycin	4.1	39.2	4.35	37.48
Macrolides	173.96	1,580.24	164.77	1,080.13
Metronidazole tinidazole and ornidazole	11.51	493.39	13.05	454.87
Penicillins	81.78	929.56	84.98	677.91
Quinolones	2.74	48.64	2.97	56.02
Some other antibacterials	15.35	10.71	16.6	10.69
Sulfonamides and trimethoprim	121.5	795.17	124.81	735.52
Tetracyclines	377	2,379.54	348.86	1,717.78
Urinary tract infections	98.97	372.51	97.7	244.51

Supplementary Figures

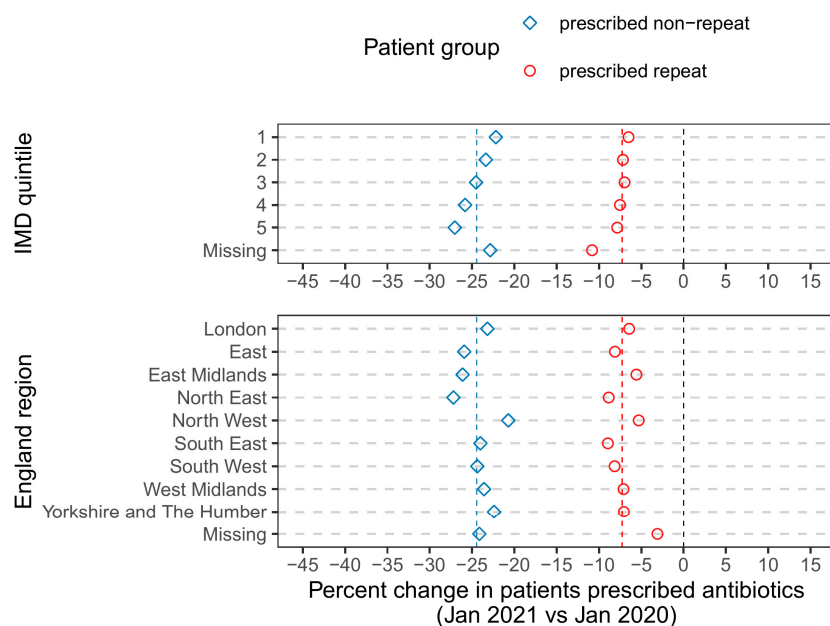


Figure S1. Percentage change in the rate of repeat and non-repeat antibiotic prescribing among patients in the January 2021 (pandemic) cohort vs January 2020 (pre-pandemic) cohort, broken down by demographic characteristics: index of multiple deprivation (IMD) quintile; England region. The red and blue dashed lines indicate the overall percent change in the rate of repeat and non-repeat prescribing, respectively. Figure 2 shows an equivalent visualisation for all other demographic characteristics described in the main text.

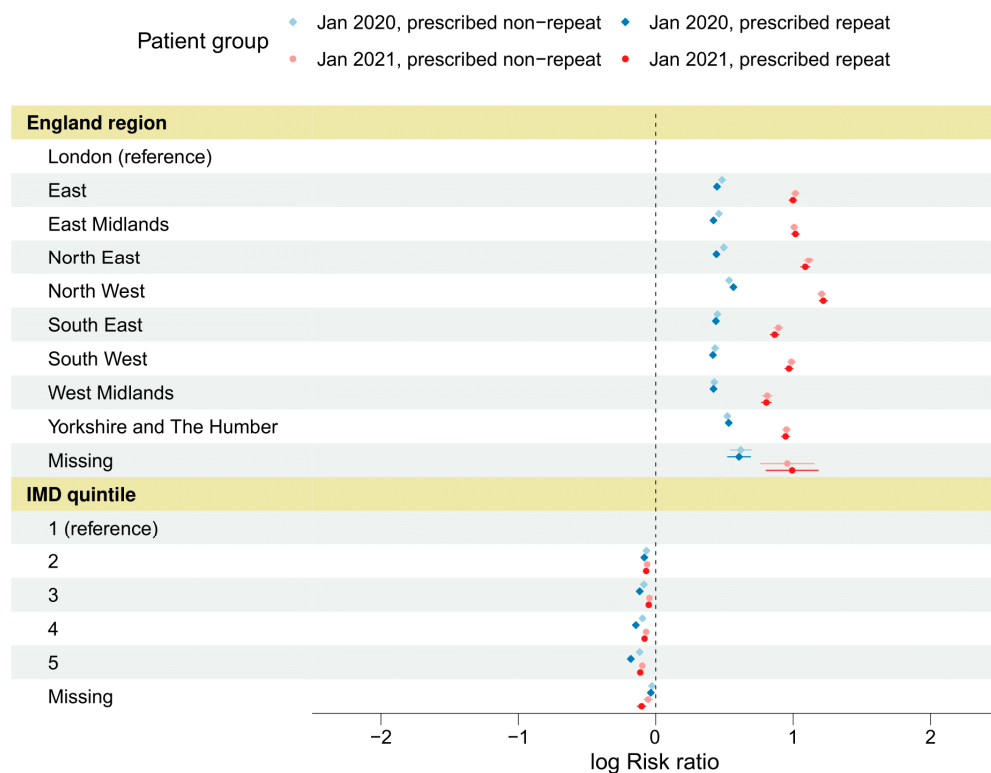


Figure S2. Log risk ratios and 95% confidence intervals showing unadjusted associations between patient demographic characteristics and frequency of repeat and non-repeat antibiotic prescribing in patients from the January 2020 (pre-pandemic) and January 2021 (pandemic) cohorts (4 patient groups). Log risk ratios are calculated relative to the reference factor levels for the following demographic characteristics: index of multiple deprivation (IMD) quintile; England region. Log risk ratios > 0 indicate higher risk of prescribing vs the reference factor level (and vice-versa).

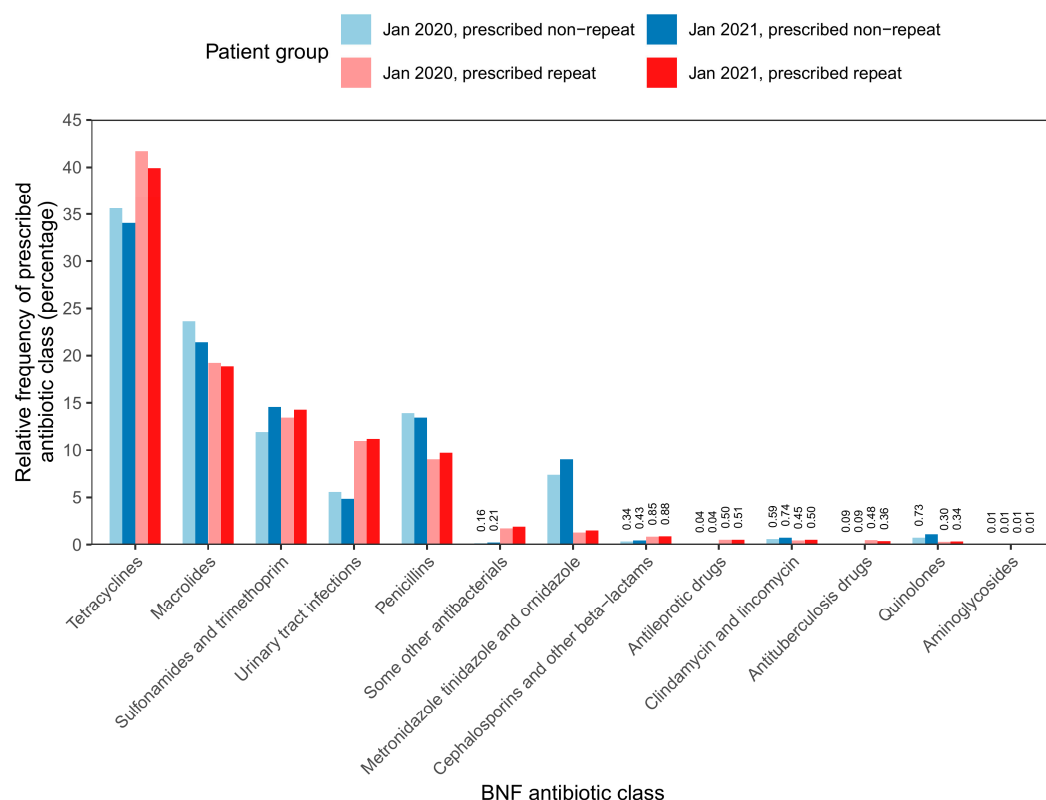


Figure S3. Relative frequency of patients prescribed antibiotic classes is shown as a percentage of total per class prescribing (sum of patients, across all classes), within each patient group. Patient groups represent repeat and non-repeat prescribing of a given antibiotic class in January 2020 and 2021 (4 patient groups). Antibiotic classes are ordered by frequency of prescribing among the January 2021 repeat prescribed patient group (from most frequent [tetracyclines] to least frequent [aminoglycosides]). For low frequencies (values <1), are indicated above bars. Note, patients in our analysis may be prescribed multiple antibiotic classes. For further breakdown by patient clinical condition and tetracycline subclasses, see Figures S4 and S5.

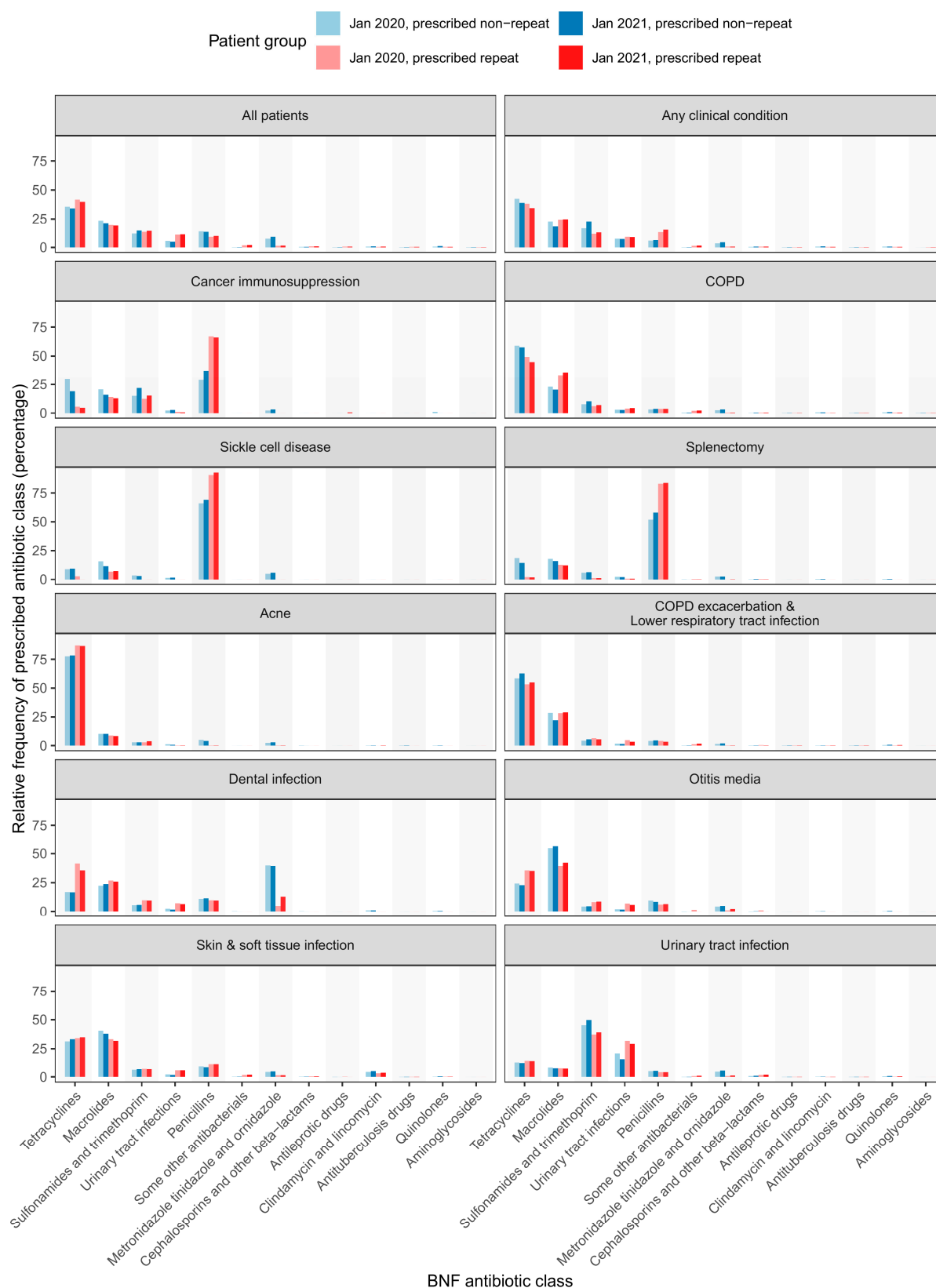


Figure S4. The relative frequency of prescribed antibiotic classes is shown as a percentage of total patients within each patient group, broken down by patient clinical condition. Patient groups represent repeat and non-repeat prescribing of a given antibiotic class in January 2020 and 2021 cohorts. Antibiotic classes are ordered by frequency of prescribing among the January 2021 repeat prescribed group, among 'All patients' (from most frequent [tetracyclines] to least frequent [aminoglycosides]). Note, for convenience, all-class prescribing was used to determine patient indications (see main text methods).

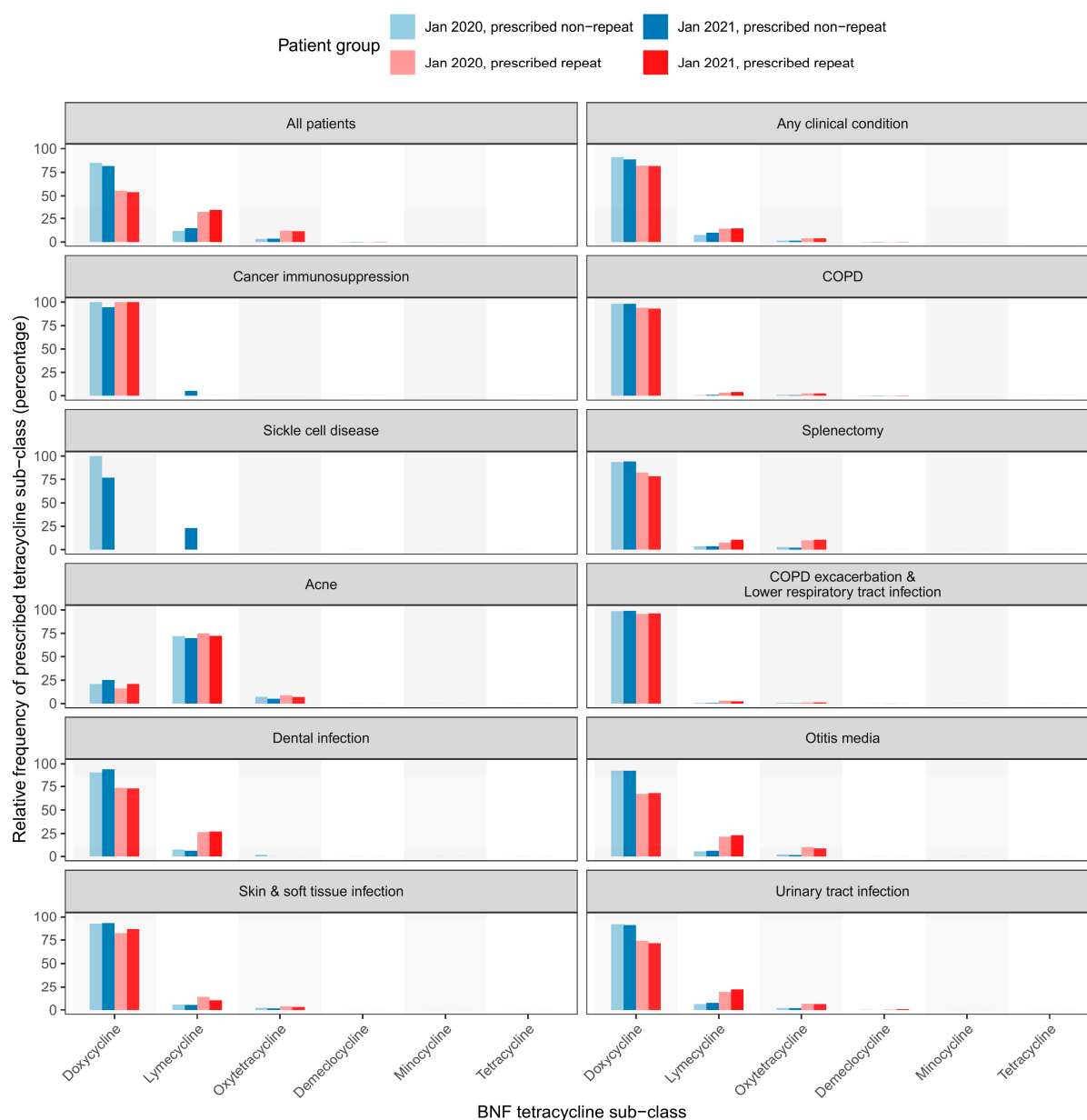


Figure S5. The relative frequency of prescribed tetracycline sub-classes is shown as a percentage of total patients within each patient group, broken down by patient clinical condition. Patient groups represent repeat and non-repeat prescribing of a given antibiotic class in January 2020 and 2021 cohorts. Tetracycline sub-classes are ordered by frequency of prescribing among the January 2021 repeat prescribed group, among 'All patients' (from most frequent [doxycycline] to least frequent [tetracycline]). Note, for convenience, all-class prescribing was used to determine patient indications (see main text methods).