

Short report

COVID-19 infection among bartenders and waiters before and after pub lockdown

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ABSTRACT

Objective To assess how different bans on serving alcohol in Norwegian bars and restaurants were related to the detection of SARS-CoV-2 in bartenders and waiters and in persons in any occupation.

Methods In 25392 bartenders and waiters and 1496328 persons with other occupations (mean (SD) age 42.0 (12.9) years and 51.8% men), we examined the weekly rates of workers tested and detected with SARS-CoV-2, 1–10 weeks before and 1–5 weeks after implementation of different degrees of bans on serving alcohol in pubs and restaurants, across 102 Norwegian municipalities with: (1) full blanket ban, (2) partial ban with hourly restrictions (eg, from 22:00 hours) or (3) no ban, adjusted for age, sex, testing behaviour and population size.

Results By 4 weeks after the implementation of ban, COVID-19 infection among bartenders and waiters had been reduced by 60% (from 2.8 (95% CI 2.0 to 3.6) to 1.1 (95% CI 0.5 to 1.6) per 1000) in municipalities introducing full ban, and by almost 50% (from 2.5 (95% CI 1.5 to 3.5) to 1.3 (95% CI 0.4 to 2.2) per 1000) in municipalities introducing partial ban. A similar reduction within 4 weeks was also observed for workers in all occupations, both in municipalities with full (from 1.3 (95% CI 1.3 to 1.4) to 0.9 (95% CI 0.9 to 1.0)) and partial bans (from 1.2 (95% CI 1.1 to 1.3) to 0.5 (95% CI 0.5 to 0.6)).

Conclusion Partial bans on serving alcohol in bars and restaurants may be similarly associated with declines in confirmed COVID-19 infection as full bans.

INTRODUCTION

We recently reported that bartenders and waiters are among the occupations with the highest COVID-19 incidence in Norway.¹ Several clusters of virus outbreaks have been related to pubs and restaurants in Austria, Japan and Thailand.^{2,3} Despite its widespread use, the effect of different restrictions imposed on bars, pubs and restaurants in reducing the spread of the virus is unknown. It is also unknown how strict restrictions should be in order to reduce the spread of the virus, that is, whether full bans on serving alcohol are required to limit the spread of SARS-CoV-2, or whether partial bans are sufficient.

We aimed to study whether municipalities that introduced a ban on serving alcohol had a greater reduction of the incidence of COVID-19 when compared with neighbouring municipalities that introduced no ban, as well as whether a partial ban could be similarly effective in reducing transmission as a full ban.

Key messages

What is already known about this subject?

- Bartenders and waiters are at increased risk of COVID-19 when compared with persons in other occupations.
- It is unknown whether a full ban on serving alcohol is required to reduce the incidence of COVID-19, or whether a partial ban is sufficient.

What are the new findings?

- Imposing blanket bans on serving alcohol reduced the rate of detected SARS-CoV-2 among bartenders and waiters by 60% within 4 weeks after implementation. A partial ban on serving alcohol (eg, after 22:00 hours) was associated with a similar decline in detected SARS-CoV-2 as a full blanket ban.

How might this impact on policy or clinical practice in the foreseeable future?

- Our results show that partial bans on serving alcohol in bars and restaurants may be similarly associated with declines in confirmed COVID-19 among bartenders and waiters as full bans. Considering the burden of full bans to owners and workers in bars and restaurants, hourly restrictions of serving alcohol, that is, from 22:00 hours, may be explored further in reducing the spread of the SARS-CoV-2.

METHODS

Data sources and population

Using a pre–post intervention study design with comparison groups, we used individual-level linked nationwide register data from BeredtC19, which contains, for example, information of every PCR test for SARS-CoV-2 performed in Norway (from the Norwegian Surveillance System for Communicable Diseases) and all employees in Norway (from the Employer and Employee register).⁴

Occupation

Bartenders and waiters were identified as employees with at least one of the International Standard Classification of Occupation (ISCO-08) codes 5131 (waiters) or 5132 (bartenders) in the Employer and Employee register, as registered in week 34 (17 August 2020–23 August 2020). Workers in any occupations were identified as persons that were registered with any ISCO-code (including bartenders and waiters).



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Outcome: COVID-19

COVID-19 was identified as having a confirmed positive PCR test within 10 weeks before or 5 weeks after implementing bans on serving alcohol.

Definition of blanket ban on serving alcohol

Data on local bans on serving alcohol in the fall 2020 (week 45–52) were gathered from national authorities, newspapers and the respective municipalities, and classified by the time they went into effect, as well as their level of strictness.^{5–7} We included all municipalities in Norway with local bans on alcohol in the given time period, as well as their neighbouring municipalities. We classified local variations of restrictions in three groups, using information from 102 municipalities: (1) municipalities with full ban (ie, no serving of alcohol allowed), (2) municipalities with partial ban (eg, no serving of alcohol after 22:00 hours) and (3) municipalities with no ban that were neighbours to the municipalities with full or partial ban, and thus, assumed to have similar trends of transmission (online supplemental figure 1 and table 2).

Statistical analyses

We calculated the average weekly rates of testing and detection of SARS-CoV-2 before and after imposing restrictions in each municipality that had one of the three types of alcohol bans. We treated the dependent variable, detection of SARS-CoV-2 as a binary variable (yes/no) denoting whether each individual was positive in the respective week.

We transformed all the calendar weeks to relative weeks for each municipality (including those with no ban, which we assigned the same implementation week as the neighbouring municipality with partial or full ban) by setting the first 7 days after the implementation in the municipality to be the relative week 0. For each level of restriction (full, partial and no ban), we then estimated rates of COVID-19 (with 95% CI) from 10 weeks prior to week 0 to 5 weeks after week 0. Thus, we compared the COVID-19 rate for bartenders and waiters working in a municipality with full ban, with bartenders and waiters working in a municipality with partial ban, as well as with bartenders and waiters working in a neighbouring municipality with no ban. We performed logistic regression analyses adjusted for testing behaviour (testing negative for COVID-19 in the respective

week) as well as age, sex and municipal population. Age and population were operationalised as continuous variables. SEs were clustered on the individual, and 95% CI are reported in online supplemental table 1 and figure 2. Finally, we repeated all analyses using COVID-19 rates for workers in any occupation as outcome variable. The latter analyses could improve precision and account better for other restrictions that may be implemented simultaneously as the alcohol ban. The statistical software used was STATA MP V.16.

Patient and public involvement

Patients and the public were not involved in the design or conduct, or reporting, or dissemination plans of this study.

RESULTS

Of the 102 municipalities, 13 imposed a full ban (covering 678 264 persons) and 28 a partial ban (covering 508 216 persons) on serving of alcohol. The remaining 61 municipalities did not impose any local restrictions (covering 335 240 persons) (online supplemental figure 1). We studied in total 1 521 720 persons, of which 13 618, 7610 and 4164 bartenders and waiters worked in municipalities with full, partial and no ban, respectively, with whole-period COVID-19 rates of 25.2, 20.6 and 11.3 per 1000, respectively.

Bartenders and waiters

In municipalities that implemented a full ban, the rate with COVID-19 for bartenders and waiters (2.8 per 1000, 95% CI 2.0 to 3.6) was higher than that for municipalities that implemented no ban (1.6 per 1000, 95% CI 0.2 to 3.1) in the week of implementation, declining by 60% (to 1.1 per 1000, 95% CI 0.5 to 1.6) by 4 weeks after the implementation to similar levels as for those with no ban (1.2 per 1000, 95% CI 0.0 to 2.5) (figure 1). A similar pattern was observed when comparing partial ban with no ban (figure 1). Thus, both in municipalities with full and partial bans, COVID-19 among bartenders and waiters had been reduced by 50%–60% (to 1.3 per 1000, 95% CI 0.4 to 2.2 for partial bans and 1.1 per 1000, 95% CI 0.5 to 1.6 for full bans) by 4 weeks (figure 1). We could not detect notable sex differences (online supplemental figure 3).

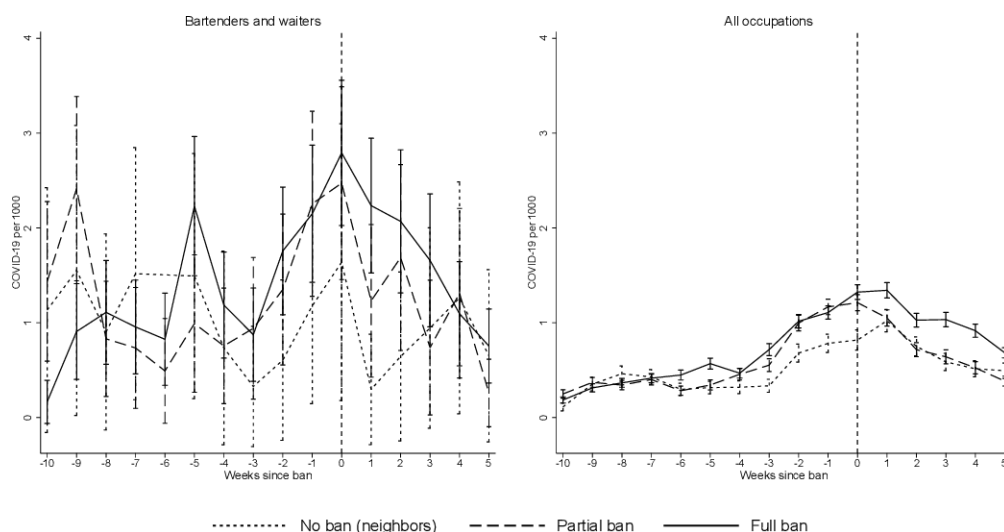


Figure 1 Estimated rates of confirmed COVID-19 per 1000 with 95% CI using logistic regression adjusted for age, sex, testing and municipal population.

Workers in any occupation

In municipalities that implemented a full ban, the rate with COVID-19 for workers in any occupation (1.3 per 1000, 95% CI 1.3 to 1.4) was higher than that for municipalities that implemented no ban (0.8 per 1000, 95% CI 0.7 to 0.9) in the week of implementation (figure 1). The COVID-19 rate in municipalities with full ban declined by 30% (to 0.9 per 1000, 95% CI 0.9 to 1.0) by 4 weeks after the implementation as compared with 0.5 per 1000 (95% CI 0.4 to 0.6) for municipalities with no ban (figure 1). Similarly, in municipalities implementing partial bans the rate of COVID-19 declined by almost 60% from 1.2 per 1000 (95% CI 1.1 to 1.3) to 0.5 per 1000 (95% CI 0.5 to 0.6) (figure 1). Again, we could not detect notable sex differences (online supplemental figure 3).

DISCUSSION

In this study of 1 521 720 persons including all bartenders, waiters and other workers in 102 municipalities with bans on serving of alcohol in Norway and their neighbouring municipalities, we report that both partial and full bans on serving alcohol are associated with a lower incidence of COVID-19.

To our knowledge, the current study is the first to assess effects of full or partial bans on serving alcohol during the COVID-19 pandemic. Our findings shed new light on previous studies, as we show that transmission is reduced once hourly or full restrictions on serving alcohol are implemented, adding to the evidence that physical distancing interventions are associated with a reduced incidence of COVID-19.⁸

Our more certain findings of a reduction of the incidence of COVID-19 for workers in any occupation following full or partial blanket ban may imply that full and partial bans on serving alcohol are effective in reducing transmission among persons with any occupation (ie, both bartenders and waiters and other occupations). However, when interpreted with care, these findings may still be of importance for informing local and national authorities in their implementation of restrictions, as well as for companies in the catering and night life business to help protect their workers and customers.

Some important limitations should be mentioned. First, we could not rule out that infection rates might have declined regardless of the imposed bans. Indeed, when interpreting the estimates week by week, we observe a decline in COVID-19 from the first week, but may have expected a longer lag from implementation of bans to observable effects. Fully randomised designs would be required to exclude this potential bias, however the observed pattern may also be explained by a short (1–6 days) incubation period of the virus.

Second, restrictions on alcohol serving were rarely or never imposed alone. As an example, in the same week as the first bans were imposed (week 45), the government also encouraged people to limit social contact and avoid unnecessary domestic travels.⁶ It is likely that also the municipalities with partial vs full bans implemented such comeasures, whereas the neighbouring municipalities with no ban did not.

In conclusion, we report that partial bans on serving alcohol in bars and restaurants may be similarly associated with declines in confirmed COVID-19 among bartenders and waiters as full bans.

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Contributors FM had access to all of the data in the study and takes full responsibility for the integrity of the data and the accuracy of the data analysis. FM and KT performed the statistical analyses and KM drafted the manuscript. All authors contributed with acquisition of data, conceptual design, analyses and interpretation of results. All authors contributed to writing the article or critically revising it for important intellectual content. All authors gave final approval for the version to be submitted.

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Competing interests None declared.

Patient consent for publication Not required.

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Supplementary file for the paper

COVID-19 among bartenders and waiters before and after pub lockdown

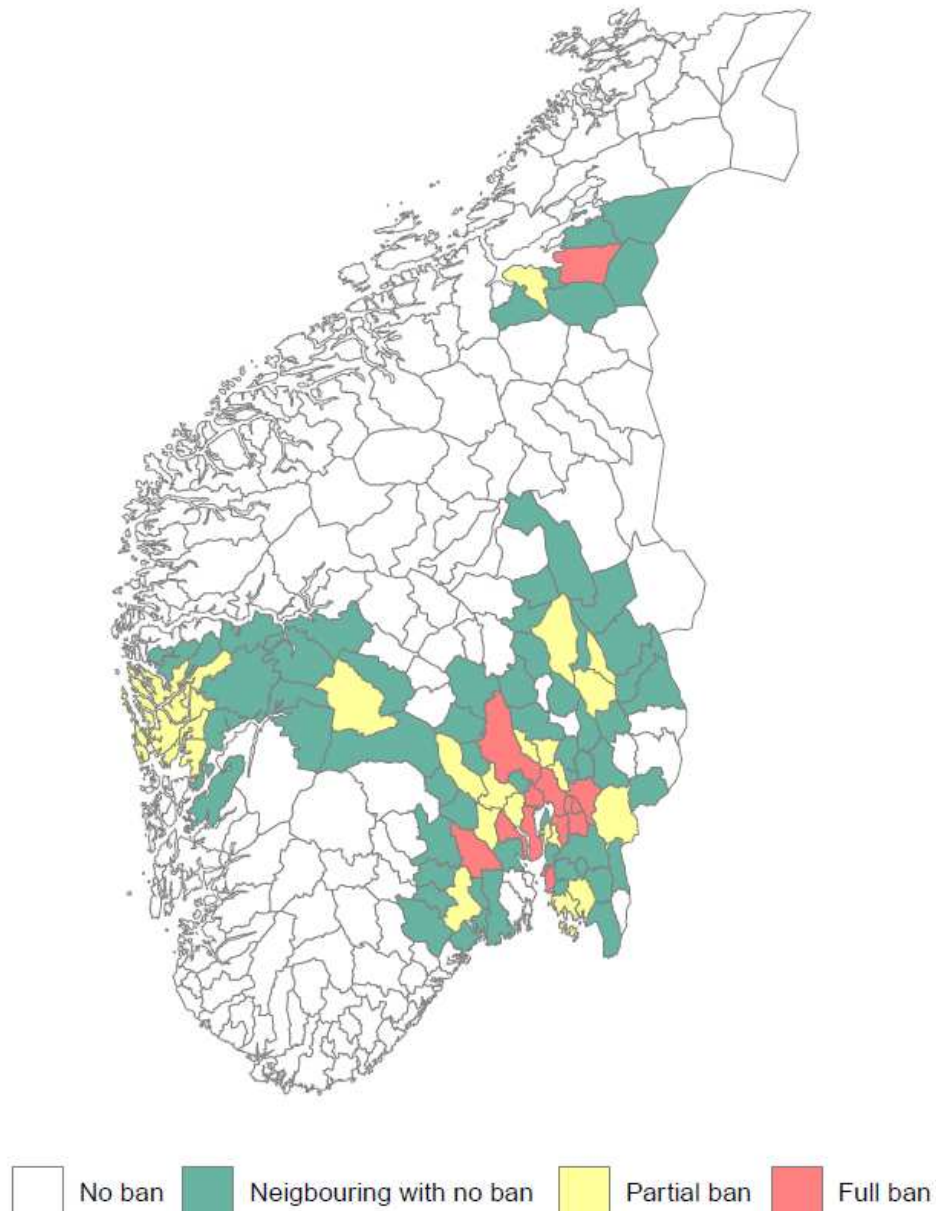
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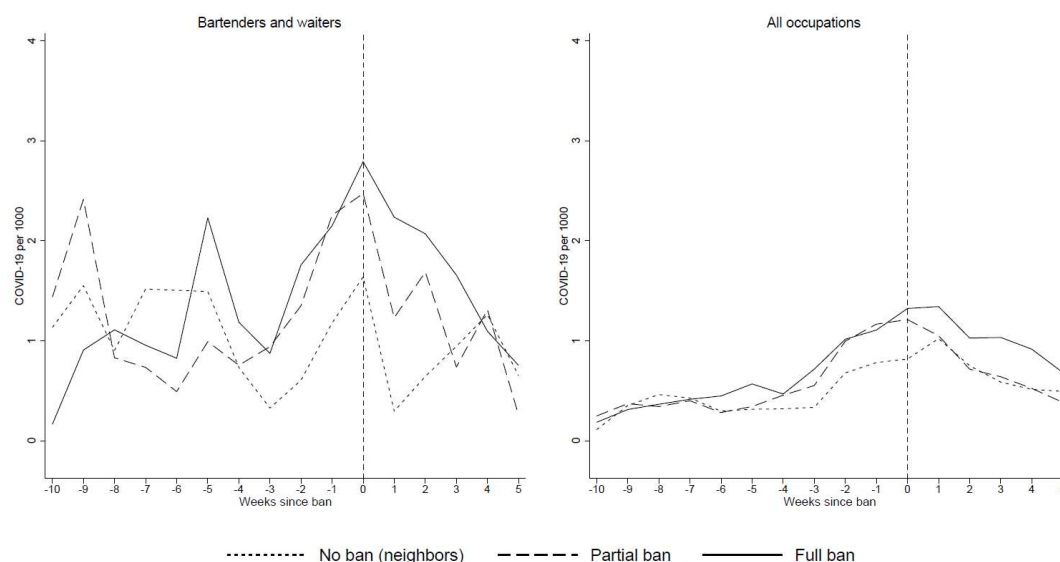
Supplementary Table 1: Adjusted odds ratios for COVID-19 for no ban, partial ban and full ban. Logistic regression adjusted for age (continuous), sex, testing and population size.

Week	Bartenders and waiters												All occupations												
	No ban				Partial ban				Full ban				No ban				Partial ban				Full ban				
	Odds ratios	Lower 95%	Upper 95%		Odds ratios	Lower 95%	Upper 95%		Odds ratios	Lower 95%	Upper 95%		Odds ratios	Lower 95%	Upper 95%		Odds ratios	Lower 95%	Upper 95%		Odds ratios	Lower 95%	Upper 95%		
-10	1.13	-0.16	2.42	1.44	0.59	2.28	0.16	-0.06	0.39	0.11	0.07	0.15	0.25	0.20	0.29	0.18	0.15	0.22		0.37	0.32	0.42	0.31	0.27	0.36
-9	1.55	0.02	3.08	2.41	1.44	3.39	0.91	0.40	1.41	0.35	0.28	0.42	0.37	0.32	0.42	0.31	0.27	0.36		0.34	0.29	0.39	0.37	0.32	0.41
-8	0.90	-0.13	1.94	0.83	0.22	1.44	1.11	0.56	1.66	0.46	0.38	0.54	0.34	0.29	0.39	0.37	0.32	0.41		0.40	0.34	0.46	0.41	0.37	0.46
-7	1.52	0.19	2.85	0.73	0.10	1.37	0.96	0.46	1.45	0.43	0.35	0.50	0.40	0.34	0.46	0.41	0.37	0.46		0.28	0.23	0.33	0.45	0.40	0.50
-6	(Not estimable)			0.49	-0.06	1.04	0.83	0.34	1.31	0.30	0.23	0.36	0.28	0.23	0.33	0.45	0.40	0.50		0.34	0.29	0.40	0.57	0.51	0.63
-5	1.49	0.20	2.78	0.99	0.27	1.72	2.23	1.50	2.96	0.32	0.25	0.38	0.34	0.29	0.40	0.47	0.42	0.52		0.46	0.40	0.52	0.47	0.42	0.52
-4	0.73	-0.29	1.76	0.76	0.15	1.37	1.19	0.63	1.75	0.32	0.25	0.39	0.46	0.40	0.52	0.47	0.42	0.52		0.55	0.49	0.62	0.72	0.65	0.78
-3	0.33	-0.31	0.96	0.94	0.19	1.69	0.87	0.38	1.37	0.33	0.27	0.40	0.55	0.49	0.62	0.72	0.65	0.78		1.00	0.91	1.08	1.02	0.94	1.09
-2	0.60	-0.24	1.45	1.35	0.55	2.14	1.76	1.08	2.43	0.68	0.58	0.77	1.00	0.91	1.08	1.02	0.94	1.09		1.17	1.08	1.25	1.11	1.04	1.18
-1	1.18	0.14	2.21	2.25	1.28	3.23	2.15	1.43	2.87	0.78	0.69	0.88	1.17	1.08	1.25	1.11	1.04	1.18		1.21	1.13	1.30	1.32	1.25	1.40
0	1.64	0.18	3.10	2.47	1.45	3.49	2.79	2.03	3.56	0.82	0.71	0.92	1.21	1.13	1.30	1.32	1.25	1.40		1.05	0.96	1.14	1.34	1.26	1.42
1	0.30	-0.29	0.88	1.23	0.43	2.04	2.24	1.52	2.95	1.02	0.90	1.14	1.05	0.96	1.14	1.34	1.26	1.42		0.72	0.64	0.79	1.03	0.95	1.10
2	0.64	-0.25	1.53	1.69	0.71	2.67	2.07	1.31	2.82	0.75	0.65	0.85	0.72	0.64	0.79	1.03	0.95	1.10		0.64	0.57	0.71	1.03	0.96	1.11
3	0.94	-0.11	2.00	0.74	0.03	1.45	1.66	0.96	2.36	0.59	0.50	0.68	0.64	0.57	0.71	1.03	0.96	1.11		0.52	0.46	0.59	0.92	0.85	0.99
4	1.26	0.04	2.48	1.31	0.42	2.21	1.09	0.54	1.64	0.51	0.43	0.60	0.52	0.46	0.59	0.92	0.85	0.99		0.38	0.33	0.44	0.68	0.63	0.74
5	0.65	-0.26	1.56	0.26	-0.10	0.62	0.75	0.36	1.14	0.49	0.41	0.57	0.38	0.33	0.44	0.68	0.63	0.74							

Supplementary Figure 1: Map of Southern Norway showing municipalities with full ban or partial ban, or their neighboring municipalities with no ban. There were no municipalities in Northern Norway with full or partial ban.



Supplementary Figure 2: COVID-19 among bartenders and waiters (left pane) vs. all occupations (right pane) ten weeks before and five weeks after ban on serving alcohol without 95% CI.



Note: Logistic regression adjusted for age (continuous), sex, tested for SARS-CoV-2 in the respective week (yes/no) and population size (number of employees in the given municipality).

Supplementary Table 2: Overview of local restrictions by municipality, type of restriction (1 = no local restrictions; 2 = partial ban; 3 = full ban) and date of implementation.

Municipality	Restriction type	Date	Municipality	Restriction type	Date
Alver	2	7-Nov-2020	Modalen	1	7-Nov-2020
Asker	3	10-Nov-2020	Modum	2	10-Nov-2020
Askøy	2	7-Nov-2020	Moss	3	4-Dec-2020
Aurland	1	22-Dec-2020	Nannestad	1	10-Nov-2020
Aurskog-Høland	2	10-Nov-2020	Nesodden	1	10-Nov-2020
Austrheim	2	8-Nov-2020	Nesodden	1	10-Nov-2020
Bamble	1	24-Dec-2020	Nittedal	2	10-Nov-2020
Bergen	2	7-Nov-2020	Nome	1	24-Dec-2020
Bjørnafjorden	2	7-Nov-2020	Nord-Odal	1	22-Dec-2020
Bærum	3	10-Nov-2020	Nordre Follo ²	3	10-Nov-2020
Drammen	3	10-Nov-2020	Nore og Uvdal	1	10-Nov-2020
Drangedal	1	24-Dec-2020	Notodden	1	21-Dec-2020
Eidfjord	1	22-Dec-2020	Oslo	3	9-Nov-2020
Eidskog	1	10-Nov-2020	Osterøy	2	7-Nov-2020
Eidsvoll	1	22-Dec-2020	Porsgrunn	1	24-Dec-2020

Elverum	1	17-Dec-2020	Rakkestad	1	4-Dec-2020
Enebakk	3	10-Nov-2020	Ringerike	3	25-Dec-2020
Flesberg	1	10-Nov-2020	Ringsaker	2	22-Dec-2020
Flå	1	10-Nov-2020	Rollag	1	10-Nov-2020
Fredrikstad	2	4-Dec-2020	Rælingen	3	10-Nov-2020
Frogn	2	10-Nov-2020	Råde	1	4-Dec-2020
Gjerdrum	1	10-Nov-2020	Samnanger	2	7-Nov-2020
Gjøvik	1	22-Dec-2020	Sarpsborg	2	4-Dec-2020
Gran	1	10-Nov-2020	Selbu	1	22-Dec-2020
Halden	1	4-Dec-2020	Sigdal ³	2	10-Nov-2020
Hamar	1	22-Dec-2020	Siljan	1	21-Dec-2020
Hol	2	22-Dec-2020	Skien	2	24-Dec-2020
Hole	1	10-Nov-2020	Skiptvet	1	4-Dec-2020
Holmestrand	1	10-Nov-2020	Stange	2	22-Dec-2020
Hvaler	2	4-Dec-2020	Stjørdal	3	28-Dec-2020
Indre Østfold	1	10-Nov-2020	Stor-Elvdal	1	22-Dec-2020
Jevnaker ¹	2	10-Nov-2020	Søndre Land	1	25-Dec-2020
Kongsberg	3	21-Dec-2020	Sør-Aurdal	1	25-Dec-2020
Krødsherad	1	10-Nov-2020	Trondheim	2	22-Dec-2020
Kvam	1	7-Nov-2020	Ullensaker	1	10-Nov-2020
Kvinnherad	1	7-Nov-2020	Ulvik	1	22-Dec-2020
Larvik	1	21-Dec-2020	Vaksdal	2	7-Nov-2020
Levanger	1	28-Dec-2020	Verdal	1	28-Dec-2020
Lier	2	10-Nov-2020	Vestby	1	10-Nov-2020
Lillehammer	1	22-Dec-2020	Vik	1	7-Nov-2020
Lillestrøm	3	10-Nov-2020	Voss	1	7-Nov-2020
Lunner	2	10-Nov-2020	Våler (Innlandet)	1	22-Dec-2020
Lærdal	1	22-Dec-2020	Våler (Viken)	1	4-Dec-2020
Lørenskog	3	10-Nov-2020	Østre Toten	1	22-Dec-2020
Løten	2	17-Dec-2020	Øvre Eiker	2	11-Nov-2020
Malvik	1	22-Dec-2020	Øyer	1	22-Dec-2020
Marker	1	10-Nov-2020	Øygarden	2	7-Nov-2020
Masfjorden	1	7-Nov-2020	Ål	1	22-Dec-2020
Melhus	1	22-Dec-2020	Åmot	1	17-Dec-2020
Meråker	1	28-Dec-2020	Ås	2	10-Nov-2020
Midt-Telemark	1	21-Dec-2020	Åsnes	1	22-Dec-2020

Note: Thanks to Verdens Gang (VG) for letting us make use of their routinely collected data. There are 365 municipalities in Norway.

¹Jevnaker removed their partial ban on alcohol in calendar week 50.

²Nordre Follo changed from a full ban to a partial ban in week 51.

³Sigdal removed their partial ban on alcohol in week 52.

Supplementary Figure 3: COVID-19 among bartenders and waiters (left pane) vs. all occupations (right pane) ten weeks before and five weeks after ban on serving alcohol stratified by sex.

