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Abstract

We study the effect of media coverage on individual behaviour during a public health crisis. For this purpose, we collect a unique dataset of 200,000 newspaper articles about the Covid-19 pandemic from Sweden – one of the few countries that did not impose mandatory lockdowns or curfews. We show that mentions of Covid-19 significantly lowered the number of visits to workplaces and retail and recreation areas, while increasing the duration of stays in residential locations. Using two different identification strategies, we show that these effects are causal. The impacts are largest when Covid-19 news stories are more locally relevant, more visible and more factual. We find larger behavioural effects for articles that reference crisis managers (as opposed to medical experts) and contain explicit public health advice. These results have wider implications for the design of public communications and the value of the local media.

Keywords: Covid-19, Mobility, Newspapers, Persuasion, Public health

JEL Codes: D83, H12, I12, I18, J22, L82

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1 Introduction

During the Covid-19 pandemic, many governments imposed curfews or lockdowns in order to restrict people's movements and lower the spread of the virus. In several countries, these public health policies led to widespread protests, conspiracy theories fuelled by perceptions of government overreach and refusals to adopt other safety measures, such as wearing face masks (e.g., Ball and Maxmen, 2020; Perlstein and Verboord, 2021). These policies have also been criticised for placing the burden disproportionately on the poorest members of society, many of whom lost their livelihoods due to the restrictions (e.g., Aspachs et al., 2021; Gupta et al., 2020).

In this paper, we investigate the effect of media coverage on compliance with public health recommendations during the Covid-19 pandemic in Sweden. Sweden is an important case to study as it is one of the few countries in the world that chose not to impose any lockdowns or curfews in response to the pandemic. Instead, the Swedish strategy relied on voluntary compliance with public health recommendations aimed at reducing mobility and encouraging social distancing. Despite criticisms for its strategy, Sweden saw similar declines in average mobility in 2020 compared to its Scandinavian neighbours which imposed strict lockdowns. We provide empirical evidence that news coverage of the pandemic could have played an important role in shaping public opinion, social norms and ultimately individuals' health-related actions. How the media covers the pandemic matters. We find the largest impacts on mobility due to locally-relevant and factual Covid-19 news stories, as well as those containing explicit public health advice rather than medical expertise. These results have wider implications for the design of public communications and the value of the local media.

We collect close to the the entire universe of newspaper articles about Covid-19 in Swedish newspapers during the first year of the pandemic – resulting in approximately 200,000 individual articles. Newspapers remain a major source of information in Sweden, where close to two thirds of the population are regular newspaper readers. We analyse

the full texts of articles to identify which aspects of news coverage have the largest impact on behaviour. As our main outcome variable, we use data on the number (or duration) of visits to different locations within a municipality provided by Google. We construct a municipality-day panel of mobility and exposure to Covid-19 news.

Our main measure of exposure to Covid-19 news is the number of Covid-19 articles in each newspaper weighted by the share of subscriptions to that newspapers for 2020 in the municipality. Newspaper subscriptions are annual and decided at the end of the previous year. This means that our approach is not vulnerable to one of the main challenges in identifying the causal effect of media coverage, namely that media outlets' audiences self select based on their prior views. By construction, there is no such selection in our setting as subscriptions were determined prior to the pandemic.

We regress mobility on Covid-19 news exposure in a municipality-day panel model with both municipality and day fixed effects. As both mobility and media coverage are potentially driven by the spread of the pandemic, we include the latest-available excess death statistics at the municipality level as a proxy for local pandemic severity. We show that our results are robust to using other proxies, such as infection rates or total deaths, to different levels of geographical aggregation, such as county or commuting zone, and to different time lags.[1]

To ensure a causal interpretation of our results, we also adopt an instrumental variable (IV) strategy, which exploits the fact that Swedish newspapers typically circulate in multiple municipalities. The key intuition underlying our identification strategy is that newspapers are more likely to respond to reader demand in municipalities that form a larger share of its subscription base. Our IV is the circulation-weighted excess mortality in a newspaper's distribution area, which is a strong predictor for the amount of Covid-19 coverage by that newspaper. Conditional on controlling for pandemic severity in the municipality itself, we argue that the exclusion restriction for this IV holds. Importantly, we show the robustness of our results to spatial correlation in the severity of the pandemic

[1]We also control for weather and the total number of news articles and subscribed newspapers.

across municipalities, as well as allowing for arbitrary spatial correlation in the error terms. We also show that our results hold in a sample of "peripheral" municipalities, that is municipalities that only form a small percentage of any newspaper's subscriber base, but where these newspapers are nonetheless major sources of information.

We find consistent evidence that news coverage of Covid-19 increases compliance with the main public health recommendation to work from home. Our IV estimates show the same pattern as the OLS results, but the coefficient sizes are 7 to 16 times bigger. This suggests that the effect on behaviour is larger when news coverage has more local relevance, since the IV estimates the LATE of additional Covid-19 coverage due to a more severe pandemic in a newspaper's local circulation. We test this mechanism directly by showing that Covid-19 articles that explicitly mention the affected municipality have a larger impact on mobility than, for instance, articles that only relate to developments abroad. Consistent with the interpretation that behaviour responds most to personally relevant news, we also find larger impacts of more factual compared to more subjective reporting. As the local news media are an important and trusted source of information about local events, these findings underscore their importance, not only for local political accountability and community participation, but also in informing and persuading the public in a crisis.

Adding to the recent public debates on trust in science and experts, we find that Covid-19 coverage that references medical experts has a smaller impact on individual behaviour. This is likely due to the complexity of the language used in these articles. In contrast, articles that contain direct and explicit public health advice have a large impact on individual behaviour. We also find a greater impact on individual behaviour in response to more visible Covid-19 stories, such as articles on the front page or articles whose headlines mention the pandemic. These results are consistent with media coverage not just increasing the salience of the pandemic and reminding individuals to follow official guidelines, but also providing relevant information. Despite fears that the large amount of press coverage could lead to individuals avoiding news about the pandemic,

we find little evidence for media fatigue except at very high levels of coverage.

We contribute to several strands of literature. Our paper adds to the empirical literature on identifying the causal impact of media coverage on individual behaviour (see, e.g., DellaVigna and La Ferrara, 2015; DellaVigna and Gentzkow, 2010; Prat and Strömberg, 2013, for surveys of the literature).[2] Complementing the findings of papers, such as Gentzkow, Shapiro and Sinkinson (2011); Snyder and Strömberg (2010); Zhuang (2022), which show the importance of local news on political outcomes, we document that local news coverage can affect a wider range of individual behaviours, such as compliance with government recommendations during a public health crisis. Our study adds an important dimension to the policy discussion about the decline of local news (e.g., Garz and Rickardsson, 2022; Martin and McCrain, 2019). We find that local news remains an important source of information during a public health crisis, and that compliance with public advice is greater when information is tailored to the local experience. A lack of trusted local media could adversely affect a range of other information campaigns, such as those encouraging the take-up of vaccines or adoption of more environmentally friendly behaviours.

A number of papers address the role of the news media during the pandemic, focussing mostly on the US experience. Among these, Kim, Shepherd and Clinton (2020) also emphasise the importance of local news in the pandemic. They show that mobility is lower in rural counties in the US that are in the same media market as cities, that are more impacted by Covid-19, than in a matched sample of control counties. In our paper, we are able to study the placement and content of Covid-19 news coverage to more precisely identify the type of news that has the biggest impact during a crisis.[3] We argue that our setting is particularly suited to investigating the effect of mass media on public health behaviour, as Sweden is one of the few countries that has not implemented any lockdowns or curfews during the pandemic. This allows us to cleanly identify the role

[2]Evidence from the medical science literature shows that some mass media campaigns can successfully affect health behaviour (see, e.g. Wakefield, Loken and Hornik, 2010, for a review of the literature).

[3]While not a focus of our paper, we confirm the finding by Sacerdote, Sehgal and Cook (2020) that Covid-19 coverage is predominantly negative in tone during the early stages of the pandemic.

of the media, absent government intervention. Empirically, we use a panel spanning the first year of the pandemic instead of cross-sectional variation at a given point in time.

Our paper shows that media coverage of the pandemic in Sweden has positive effects in terms of voluntary adherence to public health measures. While this may reflect an average consumer's experience of the media during the pandemic, especially in more politically polarised environments, such as the US, some individual media outlets have engaged in more biased coverage of the Covid-19 pandemic. Misinformation during the pandemic has become the subject of much public debate and research. A number of papers identify the effects of being exposed to biased coverage on Fox News on mobility and other health-related outcomes (e.g., Ananyev, Poyker and Tian, 2021; Ash et al., 2020; Bursztyn et al., 2020; Pinna, Picard and Goessmann, 2021; Simonov et al., 2020).[4]

Our focus on understanding the different aspects of news coverage that are most effective in eliciting behavioural change complements several studies that use experimental variation in messages around Covid-19. For instance, in line with our own findings, Banerjee et al. (2020) find a positive treatment effect of short and explicit messages containing public health advice on social distancing and hand washing in India. Alatas et al. (2021) use a Twitter experiment to study the effects of celebrity messaging on vaccination in Indonesia. They find that celebrity endorsements that cite external medical sources have significantly fewer retweets and likes - similar to our own findings about the role of medical experts.

Finally, our study adds to research on mobility during the pandemic. Previous studies have shown how mobility responds to lockdowns (e.g., Borri et al., 2021; Ciminelli and Garcia-Mandicó, 2022; Cronin and Evans, 2021; Orea and Álvarez, 2022), weather (e.g., Porcher and Renault, 2021; Shenoy et al., 2022; Wu, Mooring and Linz, 2021), trust in government (e.g., Besley and Dray, 2021; Everett et al., 2021), partisan evaluations (e.g., Allcott et al., 2020; Clinton et al., 2021; Cornelson and Miloucheva, 2022) and social and

[4]Other studies investigate correlations between media coverage of the pandemic and mobility (e.g., Liu, Chen and Bao, 2021; Ophir et al., 2021). Besley and Dray (2020) find that countries with free media experienced larger decreases in mobility during lockdowns than countries with limited media freedom.

cultural factors (e.g., Campos-Mercade et al., 2021; Durante, Guiso and Gulino, 2021; Egorov et al., 2021).

2 Background

2.1 Coronavirus, policy response, and public opinion in Sweden

Sweden reported its first confirmed case of Covid-19 on January 31 2020 and its first death on March 11 2020. By the end of the year, the country registered 462,660 confirmed cases and 9,816 Covid-19-related deaths (FOHM, 2021*a*). Among high-income countries, Sweden ranks 15th in terms of excess mortality, with fewer deaths than the US and Italy, but more than its Nordic neighbours (Islam et al., 2021).

Sweden's policy response was atypical internationally, with no mandatory lockdowns or curfews at any point during the pandemic. Daycare, primary schools, shops and restaurants remained open throughout (e.g., Claeson and Hanson, 2021). At certain points, there were limited travel restrictions, bans on large gatherings and visits to elderly homes. The Public Health Agency of Sweden ("Folkhälsomyndigheten" or FOHM) and its chief epidemiologist Anders Tegnell played a central role in managing the pandemic. The public was encouraged to voluntarily follow public health recommendations by the FOHM, including to socially distance and from 16 March 2020 onward, to work from home when possible (FOHM, 2021*b*).

2.2 Newspapers in Sweden

Newspapers play an important role in Sweden, where 64 percent of the population (aged 9 to 79) are regular newspaper readers (Nordicom, 2020). Newspapers are most commonly sold via annual print subscriptions, sold at the end of the previous year.[5] A national distribution system delivers newspapers directly to the home in the morning.

[5]The market share of digital subscriptions in 2020 was 18.9%. This figure is driven by a small number of newspapers with a large digital subscriber base, such as Dagens Nyheter (57%), Svenska Dagbladet (42%), Göteborgs-Posten (37%) and Sydsvenskan (24%).

There were 123 subscription-based newspapers in Sweden in 2020, according to the Swedish Press and Broadcasting Authority ("Myndigheten för press, radio och tv" or MPRT).[6] Swedish newspapers typically circulate in a limited geographical area, serving on average seven municipalities.[7] They tend to have a strong local focus, but also cover national and foreign news. Readers in an average municipality have the choice between two to three local newspapers.

Strong reader demand and generous government subsidies have slowed the decline of local newspapers in Sweden (Presstödsförordning, 1990). However, while the number of newspapers remains high, in Sweden, as in many other advanced economies, the ownership of media outlets has become highly concentrated (Bleyer-Simon et al., 2021). For instance, our data indicate that the three largest newspaper companies owned 60 percent of newspapers in 2020. Garz and Rickardsson (2022) show that 40% of the variation in political slant across Swedish newspapers can be explained by newspaper ownership. As our findings highlight the importance of locally-relevant media coverage, this concentration of ownership and resulting "copy journalism" threatens the ability of Swedish newspapers to function as an effective communication tool for crisis management and behavioural change.

3 Data and variables

We focus our empirical analysis on the period from March 16 (the date of FOHM's first guidelines about social distancing and working from home) and December 31 2020. We only consider 2020 to alleviate potential selection concerns due to changes in subscriptions at the end of the year. Summary statistics are in Table 1 and a more detailed description of the data and variables is in Appendix B.

Our sample includes 110 out of the 123 subscription newspapers in Sweden. We

[6] In addition, there are four evening tabloids, which are individually sold at the newsstand, and several free ad-financed newspapers that do not offer much editorial content.

[7] The largest newspapers from Stockholm ("Dagens Nyheter" and "Svenska Dagbladet") are read more widely around the country.

exclude 9 newspapers because their coverage is not consistently archived and 4 outlets due to a lack of municipality-level circulation data. The excluded newspapers account for less than 5 percent of all newspaper subscriptions, and they do not dominate any local market. We exclude six municipalities where more than 10 percent of the households subscribe to the excluded newspapers.[8]

3.1 Newspapers

3.1.1 Covid-19 coverage

We use the newspaper archive "Retriever Mediearkivet" to identify and download individual articles related to the coronavirus pandemic. The digital news archive is operated by Sweden's largest news agency "TT Nyhetsbyrån", which is jointly held by different newspaper companies. See https://www.retrievergroup.com/. We follow the literature (e.g., Motta, Stecula and Farhart, 2020; Sacerdote, Sehgal and Cook, 2020) and search for articles containing the case-insensitive string "coronavirus* OR covid*", where the asterisk is used as a wildcard. This search retrieves 209,259 articles, of which 190,978 were published between March 16 and December 31, 2020.

We construct different variables to capture the amount and intensity of Covid-19 coverage by newspaper and day: the number of articles, total word count, number of front page articles and number of headlines referring to Covid-19. Figure 2 shows the average number of Covid-19 news articles over time. We also obtain the total number of articles published per newspaper per day to control for a newspaper's "thickness".

We manually evaluate a random sample of 500 Covid-19 articles and find that the coverage is predominantly negative, consistent with the findings of Sacerdote, Sehgal and Cook (2020) for the United States. In Appendix C we show a more detailed content analysis of the articles.

[8] "Alingsås Tidning" reaches 36 percent of households in the municipality of Vårgårda, 27 percent in Alingsås, and 25 percent in Herrljunga. "Haparandabladet" reaches 37 percent of households in Haparanda, 31 percent in Övertorneå, and 10 percent in Pajala (MPRT, 2020).

3.1.2 Exposure to Covid-19 news

Our main explanatory variable is the extent to which a municipality m is exposed to Covid-19 news on day t. To calculate exposure, we use municipality-level data on the number of annual subscriptions sold by each newspaper from MPRT. By construction, as subscriptions were decided at the end of 2019 before any Swedish newspaper reported about Covid-19, this measure is immune to selection bias.[9]

We define exposure to Covid-19 coverage ($Exposure_{mt}^{C19}$) as the number of Covid-19 articles $Coverage_{nt}^{C19}$ in newspaper n on day t weighted by the share of households in municipality m who subscribe to newspaper n with $MarketShare_{nm}$, summed across all newspapers available in municipality m on day t ($S(mt)$).[10]

$$Exposure_{mt}^{C19} = \sum_{n \in S_{mt}} Coverage_{nt}^{C19} \times MarketShare_{nm} \tag{1}$$

Alternative measures of Covid-19 coverage, such as the number of Covid-19 articles on the front page, are constructed analogously.

3.2 Mobility

We obtain daily mobility data for all Swedish municipalities from Google's Covid-19 Mobility Reports.[11] The data are available from February 15, 2020, and capture the daily percentage change in mobility compared to median values in the baseline period (January 3 to February 6 2020). Google computes mobility changes based on the number (or duration for residential mobility) of visits of individuals using Google's location services on their mobile devices in certain types of areas. The data are divided into the following categories: retail and recreation, groceries and pharmacies, parks, transit, workplace and residential. Dahlberg et al. (2020) find that the Google mobility indices correlate well with detailed mobile phone data during the early stages of the pandemic in the greater

[9] The first article about coronavirus is on 12 January 2020.
[10] We follow the terminology by Snyder and Strömberg (2010) for *MarketShare* and *ReaderShare*.
[11] See https://www.google.com/Covid-19/mobility.

Stockholm area. Figures 1 and B.1 show the average change in mobility over time.

The data are not consistently available over time and across municipalities. To ensure that the data are reliable and do not compromise users' anonymity, Google only reports these figures when the number of users exceeds a certain privacy threshold. We focus our analysis on workplace and residential mobility, where there are fewer missing values. Figure B.2 shows that the municipalities with more observations are distributed across the country. A strong predictor of the availability of mobility data is a municipality's population size, while the share of households with a newspaper subscription is not correlated with mobility data availability; see Tables 1 and B.1.

3.3 Local pandemic severity

We measure the severity of the pandemic at the municipality level in several ways and show that our results are robust to these different measures in Section 6. Our preferred measure is the latest publicly available excess deaths number for the municipality. We construct excess mortality using death statistics from Statistics Sweden and take the difference between deaths in 2020 and average deaths during 2015–2019, see Figure B.4.[12] The data are provided in 10-day intervals and updated weekly. Each month is divided in three segments (i.e., days 1 to 10, 11 to 20, and 21 to 28/29/30/31). We use the Wayback Machine (http://web.archive.org) to retrieve the exact dates of the weekly updates.

We also collect weekly municipality-level data on laboratory-confirmed Covid-19 infections from FOHM.[13] Figure B.5 shows the number of infections per 100,000 inhabitants. As infection rates are sensitive to local testing capacity, we follow the FOHM in preferring the deaths statistics.[14] In Appendix Table B.5, we show correlations between these different measures.

[12]The results are very similar when we use total deaths in 2020, see Section 6.

[13]The figures are published every Thursday at 2 PM for the previous week. To protect patients' anonymity, the figures are censored if the weekly sum of cases in a municipality is below 15. We treat these instances as zeros.

[14]In its communications, the FOHM stresses the importance of deaths and hospitalisations over infections. The FOHM also publishes Covid-19 related deaths, but only at higher levels of geographical aggregation. These figures are also prone to revision.

3.4 Other control variables

Newspaper exposure Not all Swedish newspapers are published daily.[15] Analogous to equation 1, we construct a municipality-day level measure of exposure to published newspapers.[16] This variable approximately measures the share of households in a municipality receiving a newspaper on a given day. The mapping is not exact, as some households may subscribe to more than one newspaper.[17]

We control separately for the total amount of coverage in newspapers, i.e. the "thickness" of newspapers, using the total number of articles in each newspaper per day. We construct a municipality-day level measure using the same approach as in equation 1.

Weather We collect daily mean air temperature (in degrees Celsius) and precipitation (in millimetres) data from the Swedish Meteorological and Hydrological Institute ("Sveriges meteorologiska och hydrologiska institut"). To each municipality-day observation, we assign the values from the closest of 657 weather stations with available data.

Bank and school holidays We restrict our sample to normal workdays, that is weekdays which are neither bank nor school holidays.[18]

4 Empirical strategy

We test how exposure to news about Covid-19 in Swedish newspapers affect individuals' decisions to comply with public health recommendations in a municipality-day panel using two empirical strategies.

[15] Publication schedules are fixed and we verify that they remained unchanged during 2020. See Appendix Table B.2.

[16]
$$Exposure_{mt}^{pub} = \sum_{n \in S(mt)} P_{nt} \times MarketShare_{nm}$$
where P_{nt} is a binary indicator for whether newspaper n is published on day t.

[17] There is substantial spatial variation in daily newspaper exposure, since most newspapers circulate in multiple municipalities and with different circulation shares, see Table B.3. As Figure B.3 shows, there is no geographical clustering in newspaper exposure.

[18] Bank holidays are on the same dates across the country, while dates for school holidays can vary by municipality. Data on school holidays are from skolportalen.se.

4.1 OLS estimator

We estimate the following equation using OLS:

$$mobility_{m,t} = \beta_1 \times Exposure^{C19}_{m,t} + \mathbf{X'_{m,t}}\mu + \gamma_m + \gamma_t + \epsilon_{m,t} \quad (2)$$

where $mobility_{m,t}$ is the percentage change in mobility in municipality m on day t. The main regressor of interest is exposure to Covid-19 coverage ($Exposure^{C19}_{mt}$, see also equation 1). Control variables $\mathbf{X'_{m,t}}$ include the weather (precipitation and mean temperature), latest available excess death statistic, exposure to published newspapers and total news (see also Section 3). We include municipality γ_m and day γ_t fixed effects. Municipality fixed effects account for time-invariant characteristics of municipalities that might affect mobility, such as the size of the municipality, its shape, its industry mix etc. Day fixed effects account for common shocks across the country which affect mobility, such as the release of national Covid-19 statistics, changes in national policies and recommendations by the FOHM, national media coverage of the pandemic etc. Given that one of the main FOHM recommendations is to work from home, we focus our analysis on workplace and residential mobility on normal workdays. We cluster standard errors at the municipality level.

Even though equation 2 is not subject to selection concerns, there are potential omitted variables that could affect both mobility and local newspapers' Covid-19 coverage. The most important omitted variable is likely to be the perceived severity of the pandemic at the local level. For this reason, we control for the latest available excess deaths statistic for each municipality in our main specification, see also Section 3. This is our preferred measure of local pandemic severity, as it captures the wider mortality cost of the pandemic, does not depend on testing strategies and reflects the information available to individuals at the time of their mobility decision. We show that our results are robust to using alternative measures, such as infections, total deaths, as well as different leads and lags of these variables, in Section 6.

Our main unit of analysis is the municipality, but there could be geographical spillovers. In Section 6, we show that our results are robust to controlling for excess deaths and infection rates in counties and "LA-regions", which denote commuting zones and local labour markets in Sweden.[19] Our results are also robust to clustering our standard errors at higher levels of geographical aggregation (county or "LA-region") and allowing for arbitrary spatial correlation up to 300 km.

A potential bias still remains if, for instance, publication decisions are based on local perceptions of the severity of the pandemic which are only imperfectly correlated with any of these statistics. We show that this type of bias is unlikely to be driving our results by using an instrumental variable strategy.

4.2 Instrumental variable

Our identification strategy relies on the fact that 92 percent of Swedish newspapers serve more than one municipality, with a newspaper circulating on average in 7 municipalities. We assume that a newspaper responds more to reader demand from municipalities that are relatively more important to the newspaper, that is, municipalities that constitute a larger share of that newspaper's subscriber base. Our approach is related to "Waldfogel instruments", which assume that product attributes are exogenous to individual consumers if producers respond to average market characteristics (see, e.g. Gentzkow and Shapiro, 2010; George and Waldfogel, 2003; Waldfogel, 2003), and the approach by Snyder and Strömberg (2010), who exploit differences in geographical overlap between US newspaper markets and congressional districts to predict news coverage of congressmen.

Our instrumental variable is a proxy for reader demand for Covid-19 related news stories across a newspaper's circulation area. We weight excess deaths in all municipalities m in a newspaper's circulation area by the share of subscribers to newspaper n from

[19]Statistics Sweden defines 70 LA-regions in the country, based on data about commuting across municipality borders; see Hedin and Tegsjö (2006) for methodological details. We use the number of households in each municipality within a LA-region as weights.

municipality m (i.e., municipality m's $ReaderShare_{mn}$ in newspaper n).[20] As in equation 1, we aggregate this variable to the municipality level by weighting it with the share of households in municipality m that subscribes to newspaper n (i.e., newspaper n's $MarketShare_{nm}$ in municipality m). Since not all newspapers publish every day, we interact this variable with newspaper exposure.[21]

Our IV is based on the following equation, with notation as above:

$$IV_{mt} = \Bigg(\sum_{n \in S(mt)} \Bigg(\sum_{m \in N(nt)} ExcessDeaths_{mt} \times ReaderShare_{mn} \Bigg) \times MarketShare_{nm} \Bigg) \times Exposure_{mt}^{pub} \tag{3}$$

Columns 1 and 2 of Table 3 show that our IV is a strong predictor for exposure to Covid-19 coverage. The F-statistics of 380 and 123, respectively, are well above relevant critical values. In column 1, a one standard deviation increase in the instrument (standard deviation of 0.22) leads to an increase in exposure of 0.29 Covid-19 articles ($0.22 \times 1.34 = 0.29$) or 7 percent of the mean and 11 percent of the standard deviation of Covid-19 news exposure.

Our exclusion assumption is that the instrument only affects a municipality's mobility through changes in exposure to Covid-19 newspaper articles, conditional on a municipality's own Covid-19 situation (and other controls in equation 2). This assumption could be violated in the case of geographical spillovers across municipalities. For instance, if pandemic severity in a nearby municipality affects both mobility directly and through exposure to Covid-19 coverage by newspapers that circulate in both municipalities. To alleviate these concerns, we show in Section 6 that our results are robust to controlling

[20] We use actual excess death figures at the time of publication, as most newspapers have local sources information and do not need to rely on official statistics which are centrally compiled with a lag.

[21] Newspapers' publication schedules are by construction part of the potentially endogenous regressor, as on days when no newspaper in a municipality is published, exposure to Covid-19 coverage in that municipality is zero. The interaction ensures that newspapers' publication schedules also enter into the IV.

for the Covid-19 situation in a wider geographical area, such as LA-region or county, as well as allowing for standard errors to be correlated within this wider area or arbitrarily spatially correlated up to 300km.[22]

We also use an alternative identification strategy that relies on a similar motivating assumption as our IV. Section 6 shows that our results remain robust to restricting the sample to "peripheral municipalities", i.e., municipalities that account for a small share of any newspaper's subscriber base ($ReaderShare_{mn}$), so that local conditions in these municipalities are unlikely to affect any newspaper's editorial decisions.

5 Results

5.1 Main results: working from home

Both the OLS and IV estimates suggest that exposure to news about Covid-19 significantly increases compliance with public health recommendations during the pandemic, in particular to work from home (Table 2). An increase in Covid-19 coverage in a given municipality results in a significantly negative effect on workplace mobility and a significantly positive effect on residential mobility. The OLS results in columns 1 and 2 show that if all households in a municipality are exposed to one additional article about Covid-19 in their local newspapers, the number of visitors to workplaces falls by 0.16 percentage points (or 0.85 percent of the mean, column 1) and the duration of visits to residential areas increases by 0.05 percentage points (or 0.68 percent of the mean, column 2). A one standard deviation increase in exposure to Covid-19 news (or 2.69 circulation-weighted articles) implies a decrease in work mobility by 0.43 percentage points (or 2.3 percent of the mean) and an increase in residential mobility by 0.13 percentage points (or 1.8 percent of the mean). In comparison, an additional death (in excess of the 2015–2019 average) in a municipality does not reduce workplace mobility significantly (point esti-

[22]In the case where these wider regions perfectly coincide with a newspaper's circulation area, the identifying variation stems entirely from a difference in weights. While the IV is weighted by newspaper subscriptions ($ReaderShare_{mn}$), regional excess deaths are calculated using population weights.

mate of -0.011), but increases residential mobility significantly by 0.09 percentage points. Mobility also responds to the weather, for instance, precipitation significantly reduces workplace mobility while increasing residential mobility.

The IV results (shown in columns 3 and 4) are qualitatively similar to the OLS estimates, but significantly larger in size. Being exposed to an additional article about Covid-19 leads to a decrease in workplace mobility by 1.1 percentage points (or 5.8 percent of the mean) and an increase in residential mobility by 0.8 percentage points (or 11 percent of the mean). The IV coefficients are 7 and 16 times the size of the OLS coefficients, respectively. The coefficients on the other controls are similar to their OLS counterparts.

What explains this difference in the OLS and IV estimates? The potential omitted variable problem set out in Section 4 should lead to larger OLS than IV estimates. We think that the main explanation is that the IV estimate is a local average treatment effect. Our IV is based on the severity of the pandemic across a newspaper's circulation area. The kind of coverage driven by this IV is likely to be different from the average news article about Covid-19, in particular, it is likely to be more personally relevant and thus have a larger effect on individual behaviour. This is in line with a (reversed) third-person effect (Davison, 1983) and explains why the LATE estimated through the IV is larger than the effect of an average article about Covid-19 that OLS estimates. In the following section, we show evidence for this interpretation.[23]

Columns 3 and 4 of Table 3 show the reduced form results for the IV. The reduced form results are in line with the 2SLS results and show that the IV has a negative and significant impact on workplace mobility and a positive and significant impact on residential mobility. A one standard deviation increase in the IV leads to a decrease in

[23]The difference in OLS and IV estimates could in theory also be due to measurement error in Covid-19 exposure, for instance, because we do not take into account digital subscriptions. As the IV coefficient is 7 times the size of the OLS coefficient for workplace mobility (and 16 times for residential mobility), the measurement error has to be very large to fully explain this discrepancy. Digital subscriptions are an unlikely source for this measurement error as the market-wide share of digital subscriptions among all subscriptions was only 18.9% in 2020, with the majority of digital subscriptions concentrated among 4 newspapers.

work mobility by 0.32 percentage points (or 1.7 percent of the mean; $0.22 \times 1.46 = 0.32$) and an increase in residential mobility by 0.22 percentage points (or 3 percent of the mean; $0.22 \times 0.98 = 0.22$).

Figure 3 shows counterfactual workplace and residential mobility in the absence of local newspaper coverage of the pandemic in Sweden, based on a simple back-of-the-envelope calculation and the OLS and IV estimates. Reflecting the changing amount of Covid-19 coverage, the impact of newspaper coverage was largest during the first wave from March to May. The implied impact of the average article about Covid-19 (based on the OLS estimates) is not very large throughout 2020, however, more locally-relevant coverage (based on IV estimates) are estimated to have had a sizeable effect on mobility.

5.2 What type of Covid-19 coverage has the biggest impact?

In this subsection, we evaluate what type of Covid-19 coverage has the biggest impact on individual behaviour. All the results shown here are estimated by OLS, as the IV identifies the total amount of coverage rather than different aspects of coverage separately.[24]

5.2.1 Local relevance

We find that more locally relevant news coverage has a bigger impact on behaviour. We classify Covid-19 news articles by their geographic proximity to a newspaper subscriber in municipality m into the following categories: articles that refer to i) municipality m, ii) the county of municipality m or other municipalities in that county, iii) other areas of Sweden or Sweden as a whole, iv) foreign countries and v) no explicit geographic reference. Figure 4 shows that articles referring to the local municipality have a consistently larger impact on both workplace and residential mobility than articles referring to more geographically remote areas. These results show that readers are more responsive to Covid-19 articles when they are personally relevant, supporting our interpretation for the difference in

[24]We also examine whether the effects of Covid-19 coverage differ across subtopics resulting from an LDA model; see Appendix C. We do not find very consistent patterns, perhaps as the LDA model does not identify the relevant dimensions of coverage (results available upon request).

magnitudes of the OLS and IV results. They also highlight the importance of the local news media as a trusted source of locally relevant information.

5.2.2 Facts vs. opinions

Recent public debate has focussed on the apparent ineffectiveness of facts in swaying public opinion. During the coronavirus pandemic, in some countries, notably the US, politics instead of epidemiology heavily influenced both media content and individual choices (e.g., Allcott et al., 2020; Bursztyn et al., 2020). In Sweden, there is a strong norm that newspapers clearly separate between fact and opinion. In practice, subjective content, such as editorials, op-eds, and columns are clearly labelled and placed separately from more objective news articles. We use these labels at the beginning of each article to identify Covid-19 articles which are opinion pieces and those that are not.[25] Figure 5 shows that opinion pieces do not affect mobility, but the decrease in work mobility and the increase in residential mobility are driven by more factual articles. This finding is in line with surveys which suggest that the Swedish public trusts factual Covid-19 news more than journalists' opinions (Bohlin, Bergman and Brounéus, 2021).[26] Seen in the wider context, these findings are an encouraging sign that "hard news" continues to play a role in informing the public.

5.2.3 Role of experts and crisis managers

The coronavirus pandemic has also reignited the debate over the role of science and experts in steering the public debate. Does the public understand, trust and value scientific expertise? Or is most scientific communication too abstract and complex and easily misrepresented by politicians and the media? The existing empirical literature appears to point to the latter. For instance, Eichengreen, Aksoy and Saka (2021) find that exposure

[25] We use Swedish terms, such as "debatt", "kommentar", and "ledare".

[26] According to the surveys conducted between March 2020 and January 2021 by The Institute for Media Studies, 43% of respondents have fairly or very high confidence in coverage of the pandemic by their local newspaper, but only 22% have fairly or very high confidence when journalists comment on the pandemic.

to epidemics during individuals' impressionable years reduces their trust in scientists and Sapienza and Zingales (2013) find that being informed of expert opinions does not have a large effect on people's views.

In our paper, we study this question by investigating the relative impact of articles about medical experts compared to crisis managers. Using the Wikipedia article about the coronavirus pandemic in Sweden, we create a list of keywords that relate to relevant medical professions, as well as those related to the most prominent actors in managing the pandemic.[27]

Figure 6 shows the effect of being exposed to articles referring to medical experts, crisis managers or other types of coverage. We find that the coefficient on Covid-19 articles referencing medical experts is very close to zero and statistically insignificant. In contrast, the coefficient on Covid-19 articles referencing crisis managers is more than twice as large as the baseline estimate (-0.35 vs. -0.16 in Table 2). There are no substantial differences between these articles regarding the effect on residential mobility, except for differences in the size of the standard errors of the coefficients. Analysing the content of these articles suggests that their differential impact on mobility decisions could be driven by differences in language and vocabulary. As Figure C.3 indicates, articles that reference crisis managers include a higher share of explicit public health recommendations and use simpler and more common vocabulary than articles referencing medical experts, judging from indices of lexical diversity and uniqueness (see below and Appendix C for details). This finding is in line with the literature on scientific communication.

We test the role of language on individual behaviour more directly. Figure 7 shows the effects of articles that explicitly mention "working from home" compared to those that do not. While both types of articles affect mobility, the effect of the articles mentioning working from home is three to four times larger. This result reflects the value of direct

[27] See https://sv.wikipedia.org/wiki/Covid-19-pandemin_i_Sverige. For medical professionals, we use "epidemiolog*", "immunolog*", "virolog*" and "professor*". For crisis managers, we use "folkhälsomyndighet*", "löfven" (Prime Minister) and "hallengren" (Minister for Health). We do not use references to Anders Tegnell, as his person unites both medical expertise and crisis management responsibility. We also exclude other potentially relevant terms due to a large share of false positives, such as "regering" (government) and "carlson" (head of FOHM).

and explicit communication – individuals appear more likely to follow public guidelines when they are explicitly reminded of them and when the information that they receive is more directly related to the guidelines.

To show that this finding holds more generally, we identify articles that give explicit public health advice. As described in Appendix C, we construct a dictionary of "instructive expressions" – phrases typically used to advise the public about how to behave during the pandemic – by using phrases containing the grammatical imperative (e.g., "Stay at home", "Keep your distance", or "Avoid congestion") and commanding modal verbs (e.g., should, must, supposed to) in FOHM press releases; see Tables C.3 and C.4 for details and example articles. Figure 8 shows how the mobility effect varies with exposure to different levels of instructive language in Covid-19 news coverage. For both workplace and residential mobility, the effects are consistently larger when articles include more instructive expressions. These findings confirm that individuals are more likely to change their behaviour when they are exposed to more explicit public health advice.

5.3 Other mobility categories

Tables A.1 and A.2 show the OLS and IV results for all mobility categories: retail and recreation, grocery and pharmacy, parks, transit stations, workplace and residential. Exposure to Covid-19 news coverage in local newspapers reduces the number of visits to retail and recreation areas significantly by 0.23 percentage points (or 3.7 percent of the mean) according to the OLS results and 1.3 percentage points (or 21 percent of the mean) according to the IV results. This sizeable reduction in mobility for the retail and recreation sector suggests more general compliance with social distancing recommendations, especially for activities that are non-essential.

Covid-19 coverage does not have statistically significant effects on visits to grocery stores and pharmacies, parks, and transit facilities, either in the OLS or the IV estimation. This could be partly due to a reduction in sample size or mobility in these categories being more difficult to change.

5.4 Visibility of Covid-19 coverage

Table 4 shows how the visibility of Covid-19 coverage affects workplace and residential mobility in the OLS and IV estimations. According to the OLS results, articles about Covid-19 that appear on the front page of a newspaper have twice the impact on workplace mobility (-0.16 vs. -0.33 percentage points) and a 5.7 times larger impact on residential mobility (0.049 vs. 0.28 percentage points) than average articles about Covid-19. Articles that include the words "coronavirus*" or "Covid-19*" in their headlines also have a 1.7 times larger impact on workplace mobility and 1.2 times larger impact on residential mobility. The impact of newspaper articles is also greater when the articles are longer. The IV estimates confirm this pattern, with generally even larger differences in the effects of more visible Covid-19 coverage (compared to the average coverage) on mobility.

This pattern of results is consistent with theories of limited attention (see e.g., DellaVigna, 2009; Gabaix, 2019). Readers are more likely to read articles on the front page and more likely to scan article headlines rather than reading all articles. It is also possible that front-page articles and articles that contain Covid-19 in their headlines differ from the average article mentioning Covid-19 in other dimensions.

5.5 Media fatigue

Some commentators have raised the possibility that the sheer volume of new information from the media could cause information overload and media avoidance. This might apply in particular to news coverage of the Covid-19 pandemic which is large in volume and a source of anxiety for many people. In Table 5, we study whether the effect of Covid-19 coverage on mobility is non-linear in the amount of coverage. The IV estimates of the square of Covid-19 news exposure is statistically significant and of opposite sign to the coefficient on the linear term for both workplace and residential mobility. This implies that Covid-19 exposure has a diminishing marginal effect on mobility. However, the coefficients on the square terms are small and imply that increasing exposure to Covid-19

coverage will only start to have perverse effects on mobility, once it reaches very high levels of coverage (more than 19 and 26 articles per day, for workplace and residential mobility, respectively). The OLS estimates show no statistically significant non-linear effects of Covid-19 coverage.

6 Robustness

6.1 Alternative identification strategy: "peripheral" municipalities

The intuition behind this alternative identification strategy is similar to that of the IV. As newspapers are more likely to respond to conditions in municipalities that contain a larger share of its subscribers (i.e., municipalities with a high $ReaderShare_{mn}$), municipalities with a small $ReaderShare_{mn}$ or "peripheral" municipalities are thus likely to be coincidentally treated to different news coverage. While the municipality might be unimportant for the newspaper (small $ReaderShare_{mn}$), the newspaper could be a major source of news in that municipality (high $MarketShare_{nm}$). For example, 48 percent of households in Karlsborg municipality subscribe to *Skaraborgs Allehanda*, but they only represent 8 percent of this newspaper's subscribers.

Table A.3 shows the OLS estimation results for municipalities that form less than ten percent of the readership of any Swedish newspaper and which are thus unlikely to have a strong impact on newsroom production decisions. This reduces the sample by 23 municipalities for workplace mobility and 13 municipalities for residential mobility. The results in this sample are very similar to the full sample, suggesting that the OLS results are unlikely to be biased by omitted variables, such as local perceptions that are uncorrelated with the measured severity of the pandemic.

6.2 Alternative measures of local pandemic severity

As discussed in Section 4, the validity of our OLS estimates depends on controlling for the severity of the pandemic at the local level. The exclusion restriction for the IV could also fail in cases where pandemic severity in nearby areas affect mobility both directly and indirectly through newspaper coverage. Tables A.4, A.5, A.6 and A.7 show that both the OLS and IV results for workplace and residential mobility remain robust to using other measures of the severity of the pandemic at the local level. As alternative measures of local pandemic severity, we use total deaths and infections per 100,000 inhabitants, with and without the publication lag, and at the commuting-region rather than municipality level. Tables A.8 and A.9 show that our results are also robust to controlling for municipality-level excess deaths with different lags or leads.

6.3 Alternative standard error assumptions

Both the OLS and IV results are robust to different assumptions about the standard errors. In Table A.10 we report standard errors clustered at a higher level of geographical aggregation, either the commuting or the county level. The standard errors increase slightly as the number of clusters is reduced, but the main coefficient remains significant at conventional levels. We also report Wild bootstrapped p-values due to the small number of clusters. Figure A.1 shows that the standard errors remain relatively stable when allowing for arbitrary spatial correlation of up to 300 km using the approach by Colella et al. (2019).

6.4 Lagged dependent variable

Both mobility and newspapers' Covid-19 coverage could potentially depend on previous mobility. In Table A.11 we show that both the OLS and IV results remain unchanged when controlling for lagged mobility. The lagged dependent variable itself is not statisti-

cally significantly different from zero, conditional on the controls and fixed effects.[28]

7 Conclusion

In this paper, we study the effects of media coverage on individual behaviour during a public health crisis. We focus on Sweden, a country that did not impose any lockdowns or curfews during the Covid-19 pandemic and where newspapers remain an important source of information. We collect close to the universe of all Swedish newspaper articles about Covid-19 in 2020. We find that mentions of the coronavirus significantly lowered the number of visits to workplaces and retail and recreation areas, while increasing the duration of stays in residential areas. Using two different identification strategies, we show that this effect is causal. The effect on individuals' behaviour is largest when Covid-19 news stories are of local relevance and contain explicit public health advice. Articles about medical experts are less effective than those referencing key crisis managers, due to the complexity of the language used. We find little evidence of media fatigue or a preference of opinion pieces relative to factual reporting when it comes to Covid-19 in Sweden. These results have important implications for the design of future public communication strategies that aim to foster behavioural change. They also highlight the continued importance of the local media as a trusted source of locally-relevant information.

[28] As our panel has a long time dimension, the Nickell (1981) bias is likely to be small. The results are unchanged when instrumenting the lagged dependent variable with a longer lag. Results not shown.

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Tables and figures

Table 1: Summary statistics of main variables

	Mean	SD	Min.	Max.	N
Google mobility (% change)					
-Retail and recreation	-5.97	23.86	-94.00	152.00	21886
-Grocery and pharmacy	-2.22	15.07	-87.00	117.00	21551
-Parks	37.51	58.97	-79.00	369.00	3329
-Transit	-26.41	22.72	-91.00	218.00	35208
-Work	-26.81	19.73	-100.00	54.00	55995
-Residential	7.77	4.89	-10.00	32.00	22849
Circulation-weighted Covid-19 newspaper coverage					
-Number of articles	3.92	3.36	0.00	35.89	82644
-Number of front-page articles	0.17	0.27	0.00	2.96	82644
-Number of words	1642.18	1491.09	0.00	19092.25	82644
-Number of words on front page	13.81	39.53	0.00	718.52	82644
-Number of headlines	0.27	0.36	0.00	3.54	82644
-Number of front-page headlines	0.04	0.11	0.00	1.41	82644
Circ.-weighted # of Covid-19 articles, split by geographical reference					
-related to municipality in circ. area	1.20	1.21	0.00	14.64	82644
-related to county in circ. area	0.24	0.39	0.00	4.91	82644
-related to national level	1.93	1.77	0.00	23.78	82644
-related to foreign countries	0.23	0.36	0.00	5.10	82644
-without geo reference	0.32	0.44	0.00	8.01	82644
# of Covid-19 articles declared as opinion	0.12	0.22	0.00	2.70	82644
# of Covid-19 articles not declared as opinion	3.80	3.27	0.00	33.47	82644
# of Covid-19 articles mentioning working from home	0.10	0.22	0.00	3.27	82644
# of Covid-19 articles not mentioning working from home	3.82	3.26	0.00	35.89	82644
Circ.-weighted # of Covid-19 articles, split by share of instructive expressions					
p0–p95	3.72	3.21	0.00	35.27	82644
p95–p99	0.16	0.27	0.00	3.67	82644
p95–p100	0.04	0.13	0.00	1.78	82644
Circ.-weighted # of Covid-19 articles, split by references to key actors					
-medical experts	0.21	0.35	0.00	5.30	82644
-crisis managers	0.73	0.73	0.00	7.55	82644
-without reference to key actors	2.98	2.67	0.00	30.95	82644
Total number of articles	29.43	17.06	0.00	123.52	82644
Newsp. exposure (share of households)	0.36	0.17	0.00	1.06	82644
Excess deaths in municipality	0.09	0.67	-6.00	26.50	77248
Mean daily air temperature (degree C)	9.76	6.23	-18.50	25.80	82644
Precipitation (mm per day)	1.87	4.22	0.00	107.70	82644

Notes: The data refer to max. 291 days between March 16 and December 31, 2020, and 284 municipalities.

Table 2: Covid-19 coverage and working-from-home:

	OLS		IV	
Dep.Var.	Work	Residential	Work	Residential
	(1)	(2)	(3)	(4)
C19 news exposure	-0.16***	0.049***	-1.09**	0.80***
	(0.049)	(0.013)	(0.45)	(0.15)
Local pandemic severity	-0.011	0.094***	0.012	0.084***
	(0.059)	(0.011)	(0.064)	(0.021)
Precipitation	-0.041***	0.049***	-0.037***	0.043***
	(0.0076)	(0.0033)	(0.0081)	(0.0039)
Temperature	-0.00070	-0.076***	-0.0021	-0.080***
	(0.026)	(0.011)	(0.025)	(0.013)
Newspaper exposure	-0.84	-0.26	0.0069	-0.75*
	(0.63)	(0.25)	(0.90)	(0.41)
Total news exposure	0.018*	-0.0034	0.094**	-0.070***
	(0.010)	(0.0033)	(0.037)	(0.014)
No. of observations	27,545	13,877	27,545	13,877
No. of municipalities	266	141	266	141
R-squared	0.85	0.94		
Mean dep. var.	-19.0	7.22	-19.0	7.22

Notes: Observations are at the municipality-day level. The dependent variables are percentage changes in Google mobility for workplaces (columns 1 and 3) and residential areas (columns 2 and 4) relative to the baseline. The main regressor is the circulation-weighted number of Covid-19 articles. Columns 3 and 4 show IV results using the interaction between weighted excess deaths across a newspaper's circulation area and newspaper exposure as the IV. Local pandemic severity is the latest available excess deaths figure in the municipality at the time of newspaper publication. All regressions control for municipality and day fixed effects. Standard errors in parentheses are clustered by municipality. Significance at the 1%, 5% and 10% is denoted by ***, ** and *, respectively.

Table 3: Covid-19 coverage and working-from-home
IV first-stage and reduced form

	First-stage		Reduced form	
Dep.Var.	C19 news exposure		Google mobility	
	Work	Residential	Work	Residential
	(1)	(2)	(3)	(4)
IV	1.34***	1.22***	-1.46**	0.98***
	(0.069)	(0.11)	(0.58)	(0.14)
Local pandemic severity	-0.021	-0.022	0.035	0.067***
	(0.015)	(0.019)	(0.058)	(0.010)
Precipitation	0.0027	0.0052*	-0.040***	0.048***
	(0.0026)	(0.0031)	(0.0075)	(0.0032)
Temperature	0.0030	0.013*	-0.0054	-0.070***
	(0.0054)	(0.0077)	(0.027)	(0.011)
Newspaper exposure	0.76***	0.47	-0.82	-0.37
	(0.26)	(0.39)	(0.64)	(0.25)
Total news exposure	0.083***	0.090***	0.0033	0.0020
	(0.0030)	(0.0046)	(0.0081)	(0.0030)
No. of observations	27,545	13,877	27,545	13,877
No. of municipalities	266	141	266	141
R-squared	0.81	0.81	0.86	0.95
Mean dep. var.	4.21	4.14	-19.0	7.22
Kleibergen-Paap F-statistic	379.6	122.7		

Notes: Observations are at the municipality-day level. Columns 1 and 2 show the first stage of the IV reported in Table 2. The dependent variable is the circulation-weighted number of Covid-19 articles and the main regressor is the interaction between weighted excess deaths across a newspaper's circulation area and newspaper exposure. Columns 3 and 4 show the reduced form results for the IV in Table 2. The dependent variables are percentage changes in Google mobility for workplaces (column 3) and residential areas (column 4) relative to the baseline and the main regressor is the interaction between weighted excess deaths across a newspaper's circulation area and newspaper exposure. Local pandemic severity is the latest available excess deaths figure in the municipality at the time of newspaper publication. All regressions control for municipality and day fixed effects. Standard errors in parentheses are clustered by municipality. Significance at the 1%, 5% and 10% is denoted by ***, ** and *, respectively.

Table 4: Visibility of Covid-19 coverage and mobility

Indep.Var.: Type of exposure to Covid-19 coverage	OLS # front-page articles (1)	OLS # headlines (2)	OLS # words (3)	IV # front-page articles (4)	IV # headlines (5)	IV # words (6)
			A. Workplace Mobility			
Covid coverage	-0.33**	-0.27***	-0.00024**	-7.46**	-24.0***	-0.0017**
	(0.13)	(0.095)	(0.00010)	(2.98)	(8.31)	(0.00067)
No. of observations	27,545	27,545	27,545	27,545	27,545	27,545
No. of municipalities	266	266	266	266	266	266
R-squared	0.85	0.85	0.85			
Kleibergen-Paap F-statistic				342.1	15.1	486.9
Mean dep. var.	-19.0	-19.0	-19.0	-19.0	-19.0	-19.0
			B. Residential Mobility			
Covid coverage	0.28***	0.061**	0.00011***	4.60***	13.6***	0.0011***
	(0.048)	(0.027)	(0.000024)	(0.74)	(3.07)	(0.00017)
No. of observations	13,877	13,877	13,877	13,877	13,877	13,877
No. of municipalities	141	141	141	141	141	141
R-squared	0.94	0.94	0.94			
Kleibergen-Paap F-statistic				174.6	20.0	325.0
Mean dep. var.	7.22	7.22	7.22	7.22	7.22	7.22

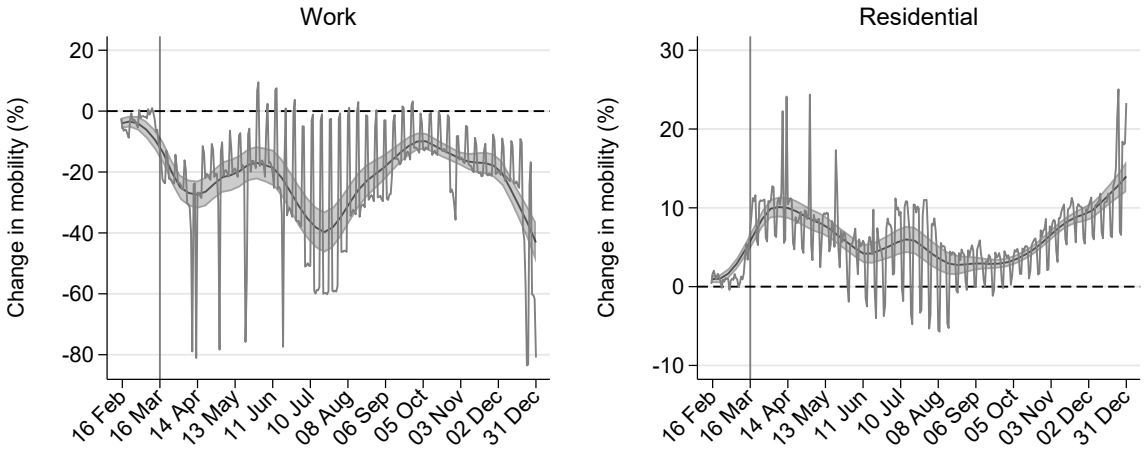
Notes: Observations are at the municipality-day level. The dependent variables are percentage changes in Google mobility from the baseline for workplace (Panel A) and residential (Panel B) mobility. The main regressors are the following circulation-weighted measures of Covid-19 coverage: number of front-page articles (columns 1 and 4), number of headlines with Covid-19 (columns 2 and 5) and number of words (columns 3 and 6). Columns 1 to 3 show OLS estimates and columns 4 to 6 show IV estimates using the interaction between weighted excess deaths across a newspaper's circulation area and newspaper exposure as the IV. All regressions control for excess deaths in municipality (data at publication), precipitation, temperature, newspaper exposure, total news exposure, as well as municipality and day fixed effects. Standard errors in parentheses are clustered by municipality. Significance at the 1%, 5% and 10% is denoted by ***, ** and *, respectively.

Table 5: Covid-19 coverage and working-from-home: nonlinear effects

	OLS		IV	
Dep.Var.	Work	Residential	Work	Residential
	(1)	(2)	(3)	(4)
C19 news exposure	-0.19***	0.046*	-3.84***	1.56***
	(0.071)	(0.027)	(1.06)	(0.54)
C19 news exposure, squared	0.0021	0.00027	0.10***	-0.031*
	(0.0057)	(0.0024)	(0.028)	(0.018)
Local pandemic severity	-0.012	0.094***	0.031	0.085***
	(0.059)	(0.011)	(0.070)	(0.025)
Precipitation	-0.041***	0.049***	-0.034***	0.042***
	(0.0076)	(0.0033)	(0.010)	(0.0049)
Temperature	-0.00034	-0.076***	0.013	-0.087***
	(0.026)	(0.011)	(0.026)	(0.015)
Newspaper exposure	-0.79	-0.25	3.66**	-1.80*
	(0.65)	(0.26)	(1.80)	(0.96)
Total news exposure	0.018*	-0.0034	0.23***	-0.11***
	(0.0100)	(0.0033)	(0.063)	(0.031)
No. of observations	27,545	13,877	27,545	13,877
No. of municipalities	266	141	266	141
R-squared	0.85	0.94		
Mean dep. var.	-19.0	7.22	-19.0	7.22

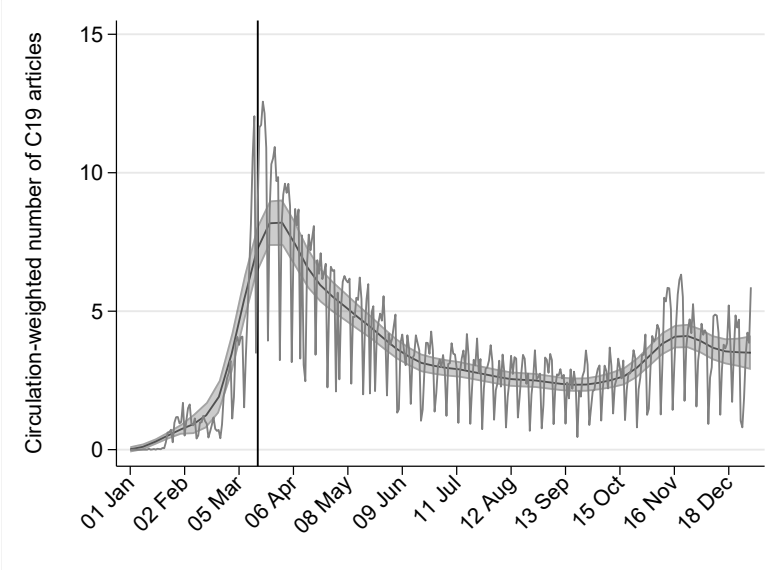
Notes: Observations are at the municipality-day level. The dependent variables are percentage changes in Google mobility for workplaces (columns 1 and 3) and residential areas (columns 2 and 4) relative to the baseline. The main regressors are the circulation-weighted number of Covid-19 articles and its square. Columns 3 and 4 show IV results using the interaction between weighted excess deaths across a newspaper's circulation area and newspaper exposure and its square as the IVs. Local pandemic severity is the latest available excess deaths figure in the municipality at the time of newspaper publication. All regressions control for municipality and day fixed effects. Standard errors in parentheses are clustered by municipality. Significance at the 1%, 5% and 10% is denoted by ***, ** and *, respectively.

Figure 1: Average workplace and residential mobility over time



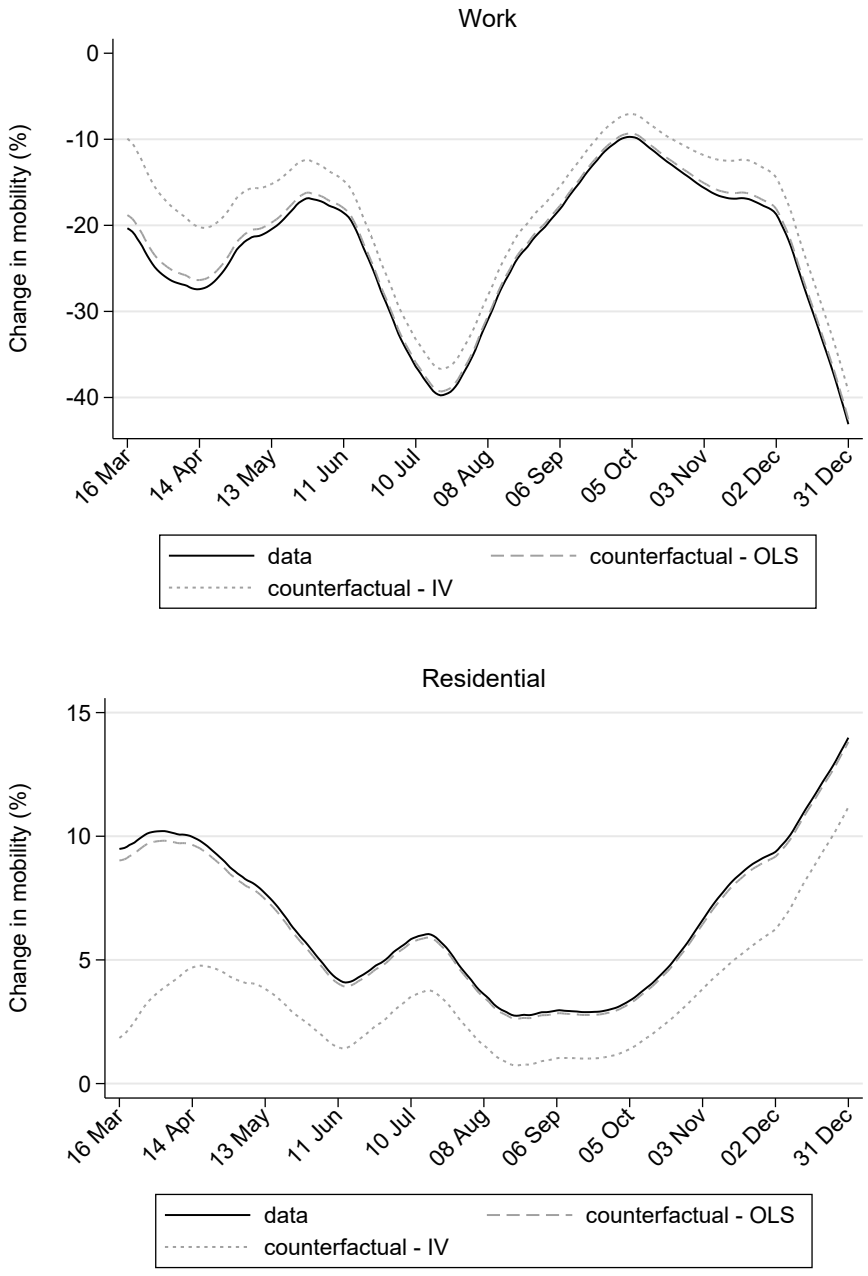
Notes: The graphs show the daily percentage change in mobility compared to median values between January 3 to February 6, 2020. The grey solid lines are local polynomial smooths with 95 percent confidence intervals. Our estimation sample starts on March 16, 2020.

Figure 2: Covid-19 coverage over time



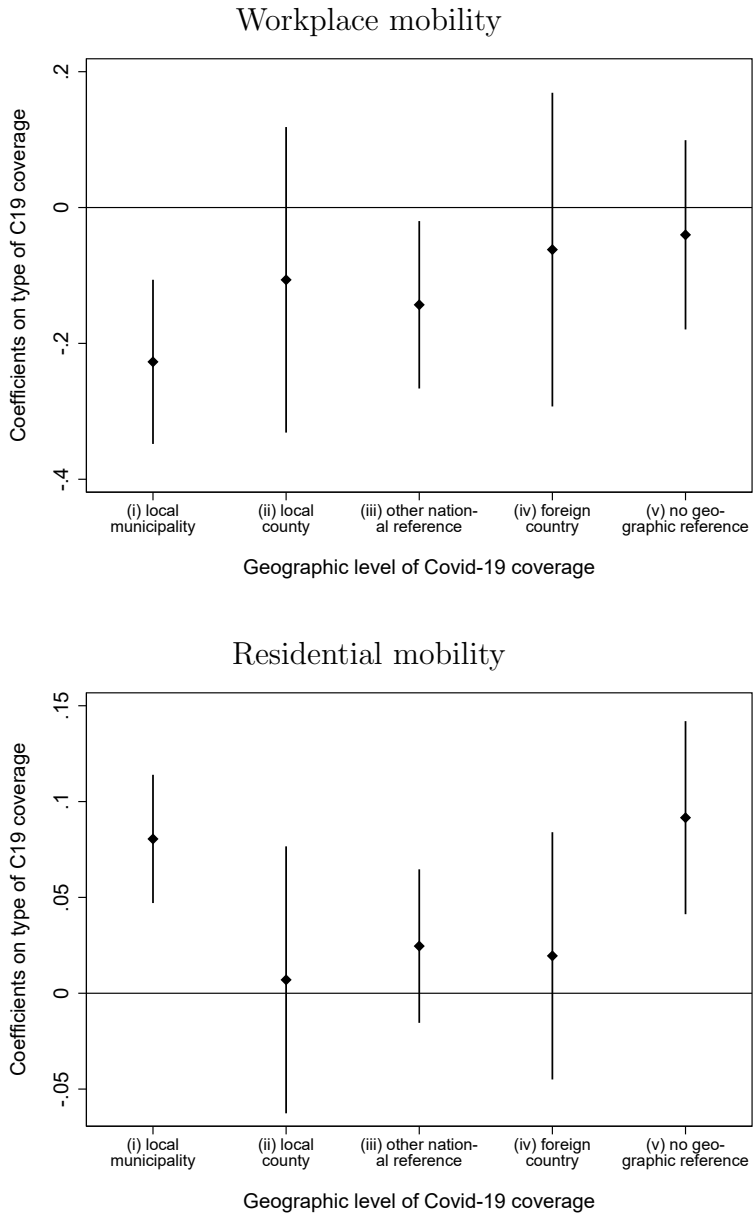
Notes: Thes graph shows the number of articles including "coronavirus* OR covid*" of all articles on a given day, weighted by newspaper circulation. The grey solid lines are local polynomial smooths with 95 percent confidence intervals. Our estimation sample starts on March 16, 2020.

Figure 3: Counterfactual absent newspaper Covid-19 coverage



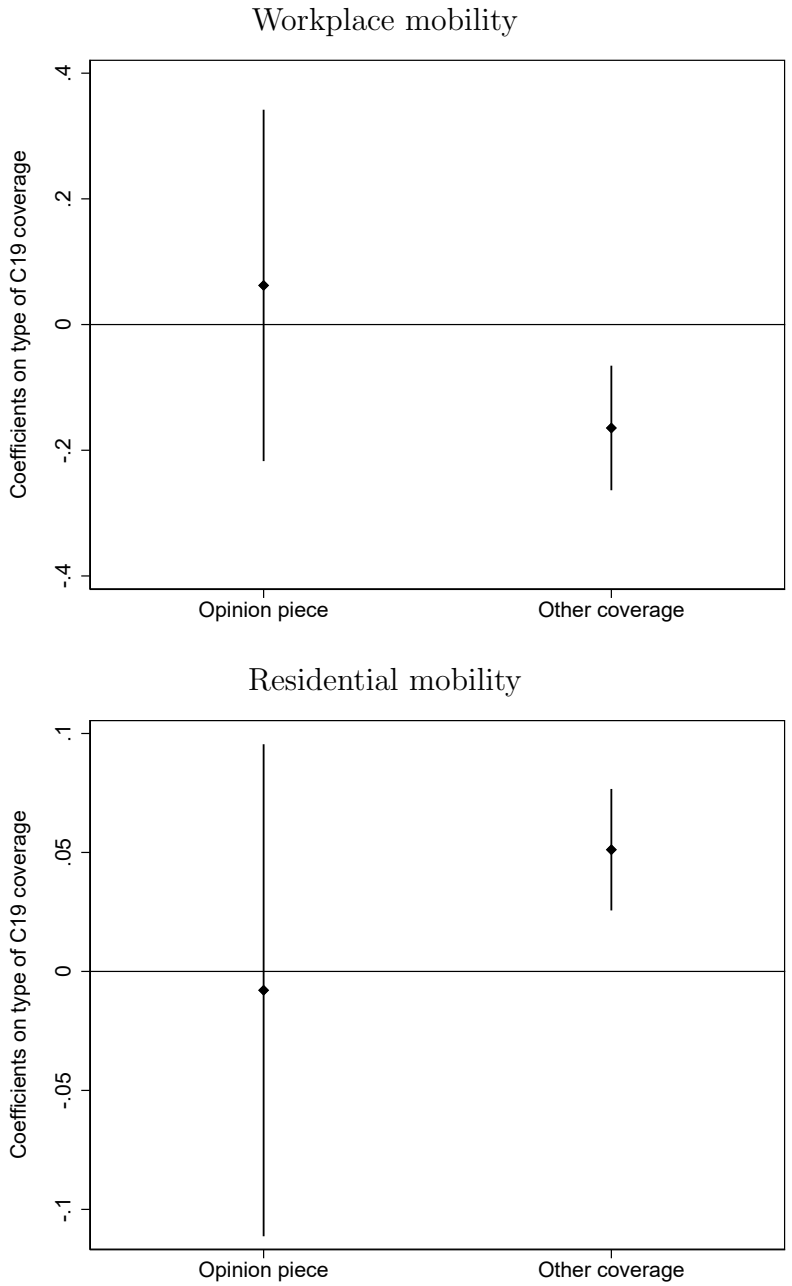
Notes: These graphs show the local polynomial smooths of the daily percentage change in mobility compared to median values between January 3 to February 6, 2020 in the black line. The grey lines show the implied counterfactual change in mobility in the absence of local newspapers' Covid-19 coverage according to the OLS estimates OLS estimates (dotted line) and the IV estimates (dashed line) from Table 2.

Figure 4: Mobility impact of different geographic levels of Covid-19 coverage



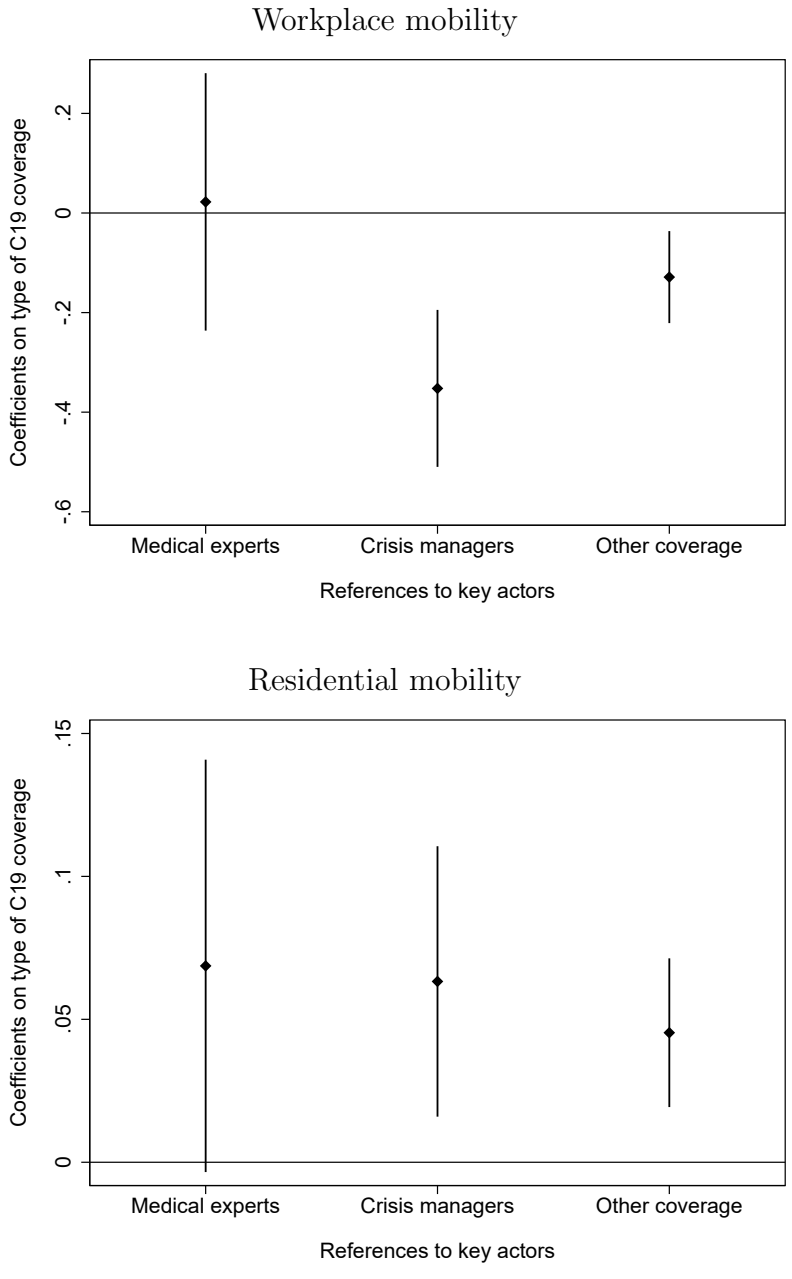
Notes: These graphs show the main coefficients of OLS regressions of mobility on the geographic level of Covid-19 coverage in newspapers. The coefficient estimates are shown in the black diamonds with 95% confidence intervals. Observations are at the municipality-day level. The dependent variables are percentage changes in Google mobility for workplaces and residential areas relative to the baseline. The main regressors are the circulation-weighted number of Covid-19 articles that mention (i) the local municipality; (ii) the local county or another municipality in the local county; (iii) Sweden (based on keywords, such as "sverige*", "svensk*", "riket", or "landet"), another county, or another municipality; (iv) foreign countries; and (v) no explicit geographic reference. Articles that include references to multiple geographic levels are assigned to the most local level. All regressions control for excess deaths in municipality (data at publication), precipitation, temperature, newspaper exposure, total number of articles, as well as municipality and day fixed effects. Standard errors are clustered by municipality.

Figure 5: Mobility Impact of facts vs. opinions on Covid-19 coverage



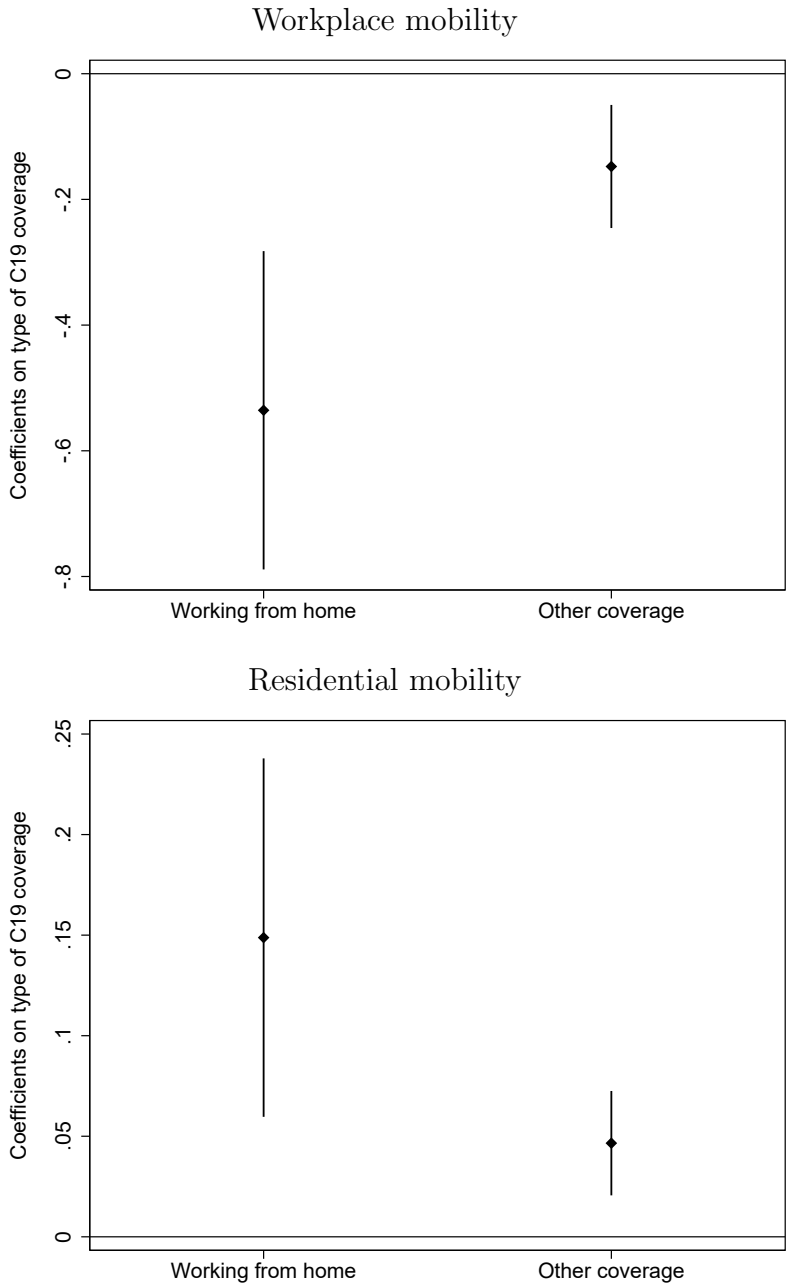
Notes: These graphs show the main coefficients of OLS regressions of mobility on opinion pieces vs. news reports about Covid-19 coverage in newspapers. The coefficient estimates are shown in the black diamonds with 95% confidence intervals. Observations are at the municipality-day level. The dependent variables are percentage changes in Google mobility for workplaces and residential areas relative to the baseline. The main regressors are the circulation-weighted number of Covid-19 articles that are opinion pieces and other types of coverage. Opinion pieces are those that include the words "åsikt" (opinion), "debatt" (debate), "insändare" (letter to the editor), "kommentar" (comment), "krönika" (chronicle), "ledare" (leader), or "replik" (reply) within the first 16 characters of the headline, subheadline, or first paragraph. All regressions control for excess deaths in municipality (data at publication), precipitation, temperature, newspaper exposure, total number of articles, as well as municipality and day fixed effects. Standard errors are clustered by municipality.

Figure 6: Mobility impact of medical experts and crisis managers in Covid-19 coverage



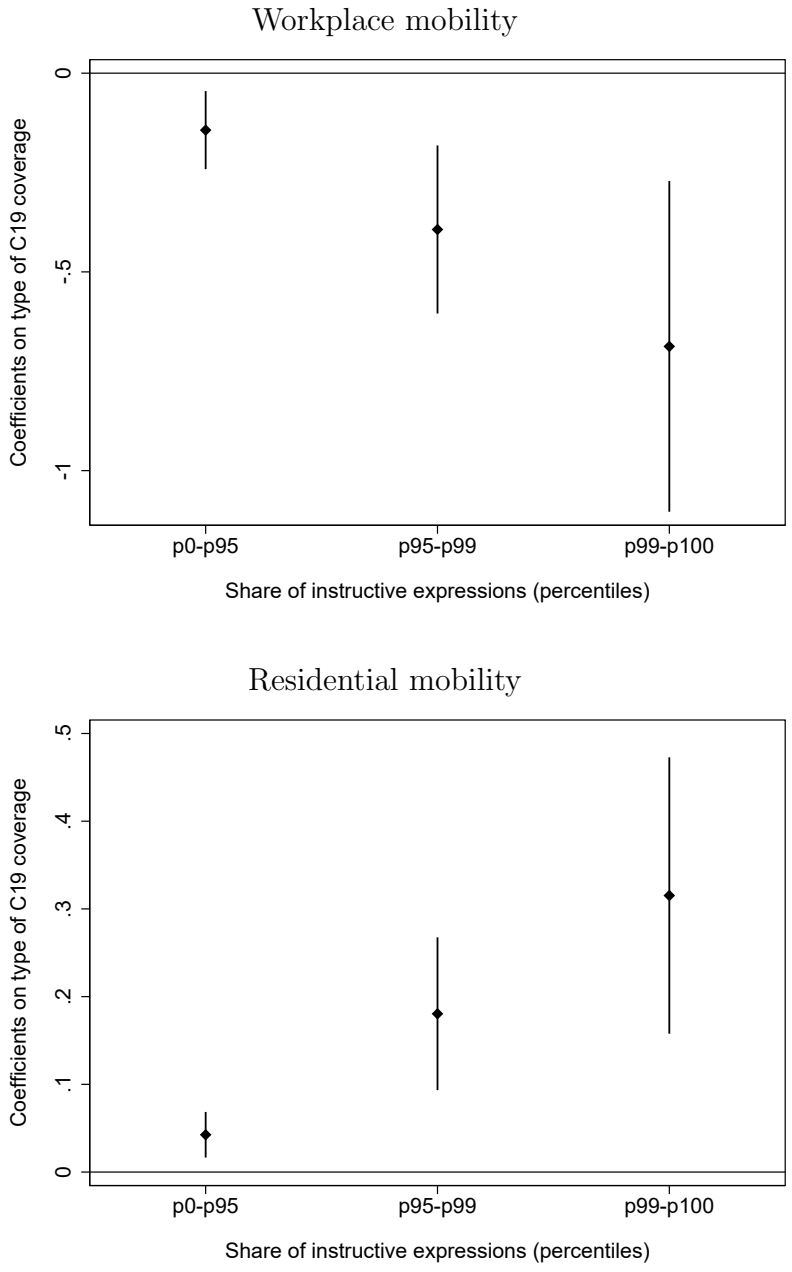
Notes: These graphs show the main coefficients of OLS regressions of mobility on references to medical experts and crisis managers in Covid-19 coverage in newspapers. The coefficient estimates are shown in the black diamonds with 95% confidence intervals. Observations are at the municipality-day level. The dependent variables are percentage changes in Google mobility for workplaces and residential areas relative to the baseline. The main regressors are the circulation-weighted number of Covid-19 articles, split by those that reference medical experts ("epidemolog*", "immunolog*", "professor*", or "virolog*"), key crisis managers ("folkhälsomyndighet*", "löfven", or "hallengren") and other types of coverage. All regressions control for excess deaths in municipality (data at publication), precipitation, temperature, newspaper exposure, total number of articles, as well as municipality and day fixed effects. Standard errors are clustered by municipality.

Figure 7: Mobility impact of explicit mentions of working from home in Covid-19 coverage



Notes: These graphs show the main coefficients of OLS regressions of mobility on explicit mentions of working from home in Covid-19 coverage in newspapers. The coefficient estimates are shown in the black diamonds with 95% confidence intervals. Observations are at the municipality-day level. The dependent variables are percentage changes in Google mobility for workplaces and residential areas relative to the baseline. The main regressors are the circulation-weighted number of Covid-19 articles that reference working from home and other types of coverage. Working-from-home articles include "arbeta hemifrån", "arbeta från hemmet", "arbeta hemma", "hemarbete", or synonyms ("jobbar") and grammatical inflexions of these terms. All regressions control for excess deaths in municipality (data at publication), precipitation, temperature, newspaper exposure, total number of articles, as well as municipality and day fixed effects. Standard errors are clustered by municipality.

Figure 8: Mobility impact of explicit public health advice in Covid-19 coverage



Notes: These graphs show the main coefficients of OLS regressions of mobility on the amount of explicit public health advice in Covid-19 coverage in newspapers. The coefficient estimates are shown in the black diamonds with 95% confidence intervals. Observations are at the municipality-day level. The dependent variables are percentage changes in Google mobility for workplaces and residential areas relative to the baseline. The main regressors are the circulation-weighted number of Covid-19 articles divided into different percentiles in terms of their share of instructive expressions (a proxy for explicit public health advice, see Appendix C for more details). All regressions control for excess deaths in municipality (data at publication), precipitation, temperature, newspaper exposure, total number of articles, as well as municipality and day fixed effects. Standard errors are clustered by municipality.

A Additional tables and figures

Table A.1: Covid-19 coverage and other mobility categories: OLS

Dep.Var.	Retail & Recreation (1)	Grocery & Pharmacy (2)	Parks (3)	Transit stations (4)	Work (5)	Residential (6)
C19 news exposure	-0.23***	0.084	0.63	-0.052	-0.16***	0.049***
	(0.089)	(0.10)	(0.73)	(0.12)	(0.049)	(0.013)
Local pandemic severity	-0.65***	-0.21**	0.22	-0.55***	-0.011	0.094***
	(0.14)	(0.083)	(0.80)	(0.18)	(0.059)	(0.011)
Precipitation	-0.14***	-0.17***	-1.69***	-0.16***	-0.041***	0.049***
	(0.025)	(0.025)	(0.39)	(0.028)	(0.0076)	(0.0033)
Temperature	0.25***	0.083	0.52	0.055	-0.00070	-0.076***
	(0.083)	(0.070)	(1.09)	(0.11)	(0.026)	(0.011)
Newspaper exposure	-2.33	-1.71	32.0	-2.14	-0.84	-0.26
	(2.12)	(2.06)	(58.9)	(2.46)	(0.63)	(0.25)
Total news exposure	0.092***	0.010	-0.31	0.044	0.018*	-0.0034
	(0.028)	(0.032)	(0.41)	(0.040)	(0.010)	(0.0033)
No. of observations	8,986	8,904	1,291	15,376	27,545	13,877
No. of municipalities	107	108	18	159	266	141
R-squared	0.90	0.83	0.80	0.80	0.85	0.94
Mean dep. var.	-6.18	-1.64	27.5	-27.4	-19.0	7.22

Notes: Observations are at the municipality-day level. The dependent variables are percentage changes in Google mobility from the baseline for the following location types: 1) retail and recreation, 2) grocery and pharmacy, 3) parks, 4) transit stations, 5) work places and 6) residential areas. The main regressor is the circulation-weighted number of Covid-19 articles. Local pandemic severity is the latest available excess deaths figure in the municipality at the time of newspaper publication. All regressions control for municipality and day fixed effects. Standard errors in parentheses are clustered by municipality. Significance at the 1%, 5% and 10% is denoted by ***, ** and *, respectively.

Table A.2: Covid-19 coverage and other mobility categories: IV

Dep.Var.	Retail & Recreation (1)	Grocery & Pharmacy (2)	Parks (3)	Transit stations (4)	Work (5)	Residential (6)
C19 news exposure	-1.30***	0.43	-7.62	0.71	-1.09**	0.80***
	(0.40)	(0.70)	(8.39)	(0.84)	(0.45)	(0.15)
Local pandemic severity	-0.63***	-0.22***	0.68	-0.57***	0.012	0.084***
	(0.15)	(0.082)	(1.01)	(0.17)	(0.064)	(0.021)
Precipitation	-0.13***	-0.17***	-1.54***	-0.17***	-0.037***	0.043***
	(0.026)	(0.025)	(0.38)	(0.030)	(0.0081)	(0.0039)
Temperature	0.25***	0.083	0.62	0.063	-0.0021	-0.080***
	(0.083)	(0.070)	(1.16)	(0.10)	(0.025)	(0.013)
Newspaper exposure	-0.70	-2.39	111.5	-3.06	0.0069	-0.75*
	(2.32)	(2.34)	(108.2)	(2.86)	(0.90)	(0.41)
Total news exposure	0.18***	-0.018	0.32	-0.019	0.094**	-0.070***
	(0.039)	(0.068)	(0.82)	(0.076)	(0.037)	(0.014)
No. of observations	8,986	8,904	1,291	15,376	27,545	13,877
No. of municipalities	107	108	18	159	266	141
Kleibergen-Paap F-statistic	263.3	127.0	10.7	358.5	379.6	122.7
Mean dep. var.	-6.18	-1.64	27.5	-27.4	-19.0	7.22

Notes: Observations are at the municipality-day level. The dependent variables are percentage changes in Google mobility from the baseline for the following location types: 1) retail and recreation, 2) grocery and pharmacy, 3) parks, 4) transit stations, 5) work places and 6) residential areas. The main regressor is the circulation-weighted number of Covid-19 articles and the IV is the interaction between weighted excess deaths across a newspaper's circulation area and newspaper exposure. Local pandemic severity is the latest available excess deaths figure in the municipality at the time of newspaper publication. All regressions control for municipality and day fixed effects. Standard errors in parentheses are clustered by municipality. Significance at the 1%, 5% and 10% is denoted by ***, ** and *, respectively.

Table A.3: Covid-19 coverage and working-from-home: peripheral municipalities

Dep.Var.	Work (1)	Residential (2)
C19 news exposure	-0.18***	0.034***
	(0.054)	(0.013)
Local pandemic severity	-0.010	0.095***
	(0.061)	(0.011)
Precipitation	-0.043***	0.049***
	(0.0079)	(0.0035)
Temperature	0.00019	-0.074***
	(0.028)	(0.011)
Newspaper exposure	-0.55	-0.30
	(0.69)	(0.26)
Total news exposure	0.018	-0.0011
	(0.011)	(0.0036)
No. of observations	25,180	12,597
No. of municipalities	243	128
R-squared	0.84	0.94
Mean dep. var.	-18.5	6.93

Notes: Observations are at the municipality-day level. The dependent variables are percentage changes in Google mobility for workplaces (column 1) and residential areas (column 2) relative to the baseline. The main regressor is the circulation-weighted number of Covid-19 articles. The sample is restricted to municipalities that form less than 10% of any newspaper's readership. Local pandemic severity is the latest available excess deaths figure in the municipality at the time of newspaper publication. All regressions control for municipality and day fixed effects. Standard errors in parentheses are clustered by municipality. Significance at the 1%, 5% and 10% is denoted by ***, ** and *, respectively.

Table A.4: Covid-19 coverage and workplace mobility: alternative measures of local pandemic severity - OLS estimates

Dep.Var.	Percentage change in workplace mobility										
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
C19 news exposure	-0.16***	-0.19***	-0.18***	-0.16***	-0.16***	-0.19***	-0.18***	-0.20***	-0.20***	-0.19***	-0.20***
	(0.050)	(0.046)	(0.047)	(0.049)	(0.050)	(0.046)	(0.047)	(0.046)	(0.046)	(0.046)	(0.046)
Excess deaths in region (data at publication)	-0.011										
	(0.050)										
Excess deaths in municipality		-0.21*									
		(0.12)									
Excess deaths in region			-0.17***								
			(0.052)								
Total deaths in municipality (data at publication)				-0.0022							
				(0.055)							
Total deaths in region (data at publication)					-0.0043						
					(0.048)						
Total deaths in municipality						-0.20					
						(0.12)					
Total deaths in region							-0.17***				
							(0.051)				
Infections per 100k in municipality (data at publication)								-0.0034			
								(0.0028)			
Infections per 100k in region (data at publication)									-0.0034**		
									(0.0013)		
Infections per 100k in municipality										-0.0034	
										(0.0023)	
Infections per 100k in region											-0.0035***
											(0.0011)
No. of observations	27,545	30,950	30,950	27,545	27,545	30,950	30,950	30,950	30,950	30,950	30,950
No. of municipalities	266	266	266	266	266	266	266	266	266	266	266
R-squared	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Mean dep. var.	-19.0	-19.4	-19.4	-19.0	-19.0	-19.4	-19.4	-19.4	-19.4	-19.4	-19.4

Notes: Observations are at the municipality-day level. The dependent variable is the percentage change in Google mobility from the baseline for workplace mobility. The main regressor is the circulation-weighted number of Covid-19 articles. The regressions include different controls for local pandemic severity: excess deaths in the LA-region at data publication (column 1); excess deaths in municipality (column 2); excess deaths in LA-region (column 3); total deaths in municipality at data publication (column 4); total deaths in the LA-region at data publication (column 5); total deaths in municipality (column 6); total deaths in LA-region (column 7); infections per 100k in municipality at data publication (column 8); infections per 100k in LA-region at data publication (column 9); infections per 100k in municipality (column 10); infections per 100k in LA-region (column 11). All regressions control for precipitation, temperature, total news exposure, newspaper exposure and municipality and day fixed effects. Standard errors in parentheses are clustered by municipality. Significance at the 1%, 5% and 10% is denoted by ***, ** and *, respectively.

Table A.5: Covid-19 coverage and residential mobility: alternative measures of local pandemic severity - OLS estimates

Dep.Var.	Percentage change in residential mobility										
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
C19 news exposure	0.039***	0.046***	0.032***	0.050***	0.038***	0.046***	0.031***	0.047***	0.047***	0.047***	0.047***
	(0.011)	(0.016)	(0.011)	(0.013)	(0.011)	(0.016)	(0.011)	(0.017)	(0.017)	(0.017)	(0.017)
Excess deaths in region (data at publication)	0.13***										
	(0.016)										
Excess deaths in municipality		0.16***									
		(0.025)									
Excess deaths in region			0.19***								
			(0.018)								
Total deaths in municipality (data at publication)				0.095***							
				(0.012)							
Total deaths in region (data at publication)					0.12***						
					(0.015)						
Total deaths in municipality						0.16***					
						(0.027)					
Total deaths in region							0.18***				
							(0.017)				
Infections per 100k in municipality (data at publication)								0.00053			
								(0.00054)			
Infections per 100k in region (data at publication)									-0.00039		
									(0.00054)		
Infections per 100k in municipality										0.00054	
										(0.00048)	
Infections per 100k in region											-0.0000011
											(0.00045)
No. of observations	13,877	15,243	15,243	13,877	13,877	15,243	15,243	15,243	15,243	15,243	15,243
No. of municipalities	141	141	141	141	141	141	141	141	141	141	141
R-squared	0.95	0.94	0.95	0.94	0.95	0.94	0.95	0.94	0.94	0.94	0.94
Mean dep. var.	7.22	7.54	7.54	7.22	7.22	7.54	7.54	7.54	7.54	7.54	7.54

Notes: Observations are at the municipality-day level. The dependent variable is the percentage change in Google mobility from the baseline for residential mobility. The main regressor is the circulation-weighted number of Covid-19 articles. The regressions include different controls for local pandemic severity: excess deaths in the LA-region at data publication (column 1); excess deaths in municipality (column 2); excess deaths in LA-region (column 3); total deaths in municipality at data publication (column 4); total deaths in the LA-region at data publication (column 5); total deaths in municipality (column 6); total deaths in LA-region (column 7); infections per 100k in municipality at data publication (column 8); infections per 100k in LA-region at data publication (column 9); infections per 100k in municipality (column 10); infections per 100k in LA-region (column 11). All regressions control for precipitation, temperature, total news exposure, newspaper exposure and municipality and day fixed effects. Standard errors in parentheses are clustered by municipality. Significance at the 1%, 5% and 10% is denoted by ***, ** and *, respectively.

Table A.6: Covid-19 coverage and workplace mobility: alternative measures of local pandemic severity - IV estimates

Dep.Var.	Percentage change in workplace mobility										
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
C19 news exposure	-1.34***	-1.08***	-0.85*	-1.09**	-1.39***	-1.09***	-0.84*	-1.19***	-1.20***	-1.19***	-1.22***
	(0.49)	(0.40)	(0.49)	(0.45)	(0.50)	(0.40)	(0.51)	(0.42)	(0.42)	(0.42)	(0.42)
Excess deaths in region (data at publication)	0.083										
	(0.062)										
Excess deaths in municipality		-0.19									
		(0.13)									
Excess deaths in region			-0.10								
			(0.077)								
Total deaths in municipality (data at publication)				0.014							
				(0.061)							
Total deaths in region (data at publication)					0.090						
					(0.060)						
Total deaths in municipality						-0.17					
						(0.13)					
Total deaths in region							-0.098				
							(0.079)				
Infections per 100k in municipality (data at publication)								-0.0034			
								(0.0025)			
Infections per 100k in region (data at publication)									-0.0050***		
									(0.0015)		
Infections per 100k in municipality										-0.0033	
										(0.0022)	
Infections per 100k in region											-0.0047***
											(0.0013)
No. of observations	27,545	30,950	30,950	27,545	27,545	30,950	30,950	30,950	30,950	30,950	30,950
No. of municipalities	266	266	266	266	266	266	266	266	266	266	266
R-squared	-0.15	-0.13	-0.064	-0.091	-0.16	-0.13	-0.063	-0.16	-0.16	-0.16	-0.17
Mean dep. var.	-19.0	-19.4	-19.4	-19.0	-19.0	-19.4	-19.4	-19.4	-19.4	-19.4	-19.4

Notes: Observations are at the municipality-day level. The dependent variable is the percentage change in Google mobility from the baseline for workplace mobility. The main regressor is the circulation-weighted number of Covid-19 articles and the IV is the interaction between weighted excess deaths across a newspaper's circulation area and newspaper exposure. The regressions include different controls for local pandemic severity: excess deaths in the LA-region at data publication (column 1); excess deaths in municipality (column 2); excess deaths in LA-region (column 3); total deaths in municipality at data publication (column 4); total deaths in the LA-region at data publication (column 5); total deaths in municipality (column 6); total deaths in LA-region (column 7); infections per 100k in municipality at data publication (column 8); infections per 100k in LA-region at data publication (column 9); infections per 100k in municipality (column 10); infections per 100k in LA-region (column 11). All regressions control for precipitation, temperature, total news exposure, newspaper exposure and municipality and day fixed effects. Standard errors in parentheses are clustered by municipality. Significance at the 1%, 5% and 10% is denoted by ***, ** and *, respectively.

Table A.7: Covid-19 coverage and residential mobility: alternative measures of local pandemic severity - IV estimates

Dep.Var.	Percentage change in residential mobility										
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
C19 news exposure	0.43***	0.78***	0.11	0.80***	0.41***	0.79***	0.098	0.93***	0.93***	0.93***	0.93***
	(0.10)	(0.16)	(0.081)	(0.15)	(0.10)	(0.16)	(0.085)	(0.20)	(0.21)	(0.20)	(0.20)
Excess deaths in region (data at publication)	0.11***										
	(0.021)										
Excess deaths in municipality		0.14***									
		(0.042)									
Excess deaths in region			0.18***								
			(0.020)								
Total deaths in municipality (data at publication)				0.090***							
				(0.025)							
Total deaths in region (data at publication)					0.11***						
					(0.019)						
Total deaths in municipality						0.15***					
						(0.046)					
Total deaths in region							0.18***				
							(0.019)				
Infections per 100k in municipality (data at publication)								0.00049			
								(0.00046)			
Infections per 100k in region (data at publication)									-0.000017		
									(0.00057)		
Infections per 100k in municipality										0.00037	
										(0.00046)	
Infections per 100k in region											0.000042
											(0.00048)
No. of observations	13,877	15,243	15,243	13,877	13,877	15,243	15,243	15,243	15,243	15,243	15,243
No. of municipalities	141	141	141	141	141	141	141	141	141	141	141
R-squared	-0.13	-0.98	0.10	-0.76	-0.11	-1.00	0.11	-1.47	-1.48	-1.48	-1.48
Mean dep. var.	7.22	7.54	7.54	7.22	7.22	7.54	7.54	7.54	7.54	7.54	7.54

Notes: Observations are at the municipality-day level. The dependent variable is the percentage change in Google mobility from the baseline for residential mobility. The main regressor is the circulation-weighted number of Covid-19 articles and the IV is the interaction between weighted excess deaths across a newspaper's circulation area and newspaper exposure. The regressions include different controls for local pandemic severity: excess deaths in the LA-region at data publication (column 1); excess deaths in municipality (column 2); excess deaths in LA-region (column 3); total deaths in municipality at data publication (column 4); total deaths in the LA-region at data publication (column 5); total deaths in municipality (column 6); total deaths in LA-region (column 7); infections per 100k in municipality at data publication (column 8); infections per 100k in LA-region at data publication (column 9); infections per 100k in municipality (column 10); infections per 100k in LA-region (column 11). All regressions control for precipitation, temperature, total news exposure, newspaper exposure and municipality and day fixed effects. Standard errors in parentheses are clustered by municipality. Significance at the 1%, 5% and 10% is denoted by ***, ** and *, respectively.

Table A.8: Covid-19 coverage and workplace mobility: lags and leads of local pandemic severity

Dep.Var.	Percentage change in workplace mobility									
	OLS					IV				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
C19 news exposure	-0.16***	-0.18***	-0.16***	-0.16***	-0.16***	-1.04**	-1.11**	-1.04***	-0.99***	-0.88**
	(0.050)	(0.048)	(0.050)	(0.049)	(0.050)	(0.47)	(0.52)	(0.39)	(0.36)	(0.41)
Excess deaths in municipality (data at publication)										
Lagged 7 days	0.037					0.057				
	(0.048)					(0.052)				
Lagged 14 days		0.055					0.076*			
		(0.045)					(0.045)			
Forward 7 days			-0.088					-0.050		
			(0.078)					(0.083)		
Forward 14 days				-0.21*					-0.17	
				(0.11)					(0.12)	
Lagged depending on distance to Stockholm					-0.027*					-0.027*
					(0.014)					(0.014)
No. of observations	27,203	26,621	28,685	29,653	27,119	27,203	26,621	28,685	29,653	27,119
No. of municipalities	266	266	266	266	266	266	266	266	266	266
R-squared	0.86	0.86	0.85	0.85	0.86	-0.079	-0.086	-0.092	-0.092	-0.051
Mean dep. var.	-18.9	-18.8	-19.2	-19.3	-18.9	-18.9	-18.8	-19.2	-19.3	-18.9

Notes: Observations are at the municipality-day level. The dependent variable is the percentage change in Google mobility from the baseline for workplace mobility. The main regressor is the circulation-weighted number of Covid-19 articles and the IV is the interaction between weighted excess deaths across a newspaper's circulation area and newspaper exposure. The regressions include different lags and leads for local pandemic severity proxied by excess deaths in the municipality at data publication: lagged by 7 days (columns 1 and 6); lagged by 14 days (columns 2 and 7); leading by 7 days (columns 3 and 8); leading by 14 days (columns 4 and 9) and lagged excess deaths at data publication in the Stockholm municipality depending on the distance of each municipality to Stockholm (municipalities within 200km of Stockholm are assumed to be affected contemporaneously, those between 200km and 400km with a 7 day lag and those further than 400km with a 14 day lag, columns 5 and 10). All regressions control for precipitation, temperature, total news exposure, newspaper exposure and municipality and day fixed effects. Standard errors in parentheses are clustered by municipality. Significance at the 1%, 5% and 10% is denoted by ***, ** and *, respectively.

Table A.9: Covid-19 coverage and residential mobility: lags and leads of local pandemic severity

Dep.Var.	Percentage change in residential mobility									
			OLS					IV		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
C19 news exposure	0.049***	0.051***	0.043***	0.035**	0.054***	0.85***	0.80***	0.76***	0.73***	0.77***
	(0.013)	(0.012)	(0.015)	(0.017)	(0.013)	(0.16)	(0.16)	(0.15)	(0.15)	(0.15)
Excess deaths in municipality (data at publication)										
Lagged 7 days	0.072***					0.062***				
	(0.014)					(0.016)				
Lagged 14 days		0.057***					0.043***			
		(0.015)					(0.013)			
Forward 7 days			0.13***					0.11***		
			(0.016)					(0.029)		
Forward 14 days				0.17***					0.15***	
				(0.020)					(0.037)	
Lagged depending on distance to Stockholm					-0.0071					0.0026
					(0.0048)					(0.0057)
No. of observations	13,759	13,520	14,322	14,684	13,748	13,759	13,520	14,322	14,684	13,748
No. of municipalities	141	141	141	141	141	141	141	141	141	141
R-squared	0.94	0.94	0.95	0.95	0.94	-0.86	-0.76	-0.73	-0.77	-0.69
Mean dep. var.	7.20	7.14	7.35	7.44	7.21	7.20	7.14	7.35	7.44	7.21

Notes: Observations are at the municipality-day level. The dependent variable is the percentage change in Google mobility from the baseline for residential mobility. The main regressor is the circulation-weighted number of Covid-19 articles and the IV is the interaction between weighted excess deaths across a newspaper's circulation area and newspaper exposure. The regressions include different lags and leads for local pandemic severity proxied by excess deaths in the municipality at data publication: lagged by 7 days (columns 1 and 6); lagged by 14 days (columns 2 and 7); leading by 7 days (columns 3 and 8); leading by 14 days (columns 4 and 9) and lagged excess deaths at data publication in the Stockholm municipality depending on the distance of each municipality to Stockholm (municipalities within 200km of Stockholm are assumed to be affected contemporaneously, those between 200km and 400km with a 7 day lag and those further than 400km with a 14 day lag, columns 5 and 10). All regressions control for precipitation, temperature, total news exposure, newspaper exposure and municipality and day fixed effects. Standard errors in parentheses are clustered by municipality. Significance at the 1%, 5% and 10% is denoted by ***, ** and *, respectively.

Table A.10: Covid-19 coverage and working-from-home:
alternative clustered standard errors

Estimation	OLS				IV			
Standard errors clustered by	LA-Regions		Counties		LA-Regions		Counties	
Dep.Var.	Work	Residential	Work	Residential	Work	Residential	Work	Residential
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
C19 news exposure	-0.16**	0.049***	-0.16*	0.049**	-1.09*	0.80***	-1.09**	0.80***
	(0.073)	(0.015)	(0.076)	(0.023)	(0.64)	(0.11)	(0.45)	(0.12)
Local pandemic severity	-0.011	0.094***	-0.011	0.094***	0.012	0.084***	0.012	0.084***
	(0.068)	(0.013)	(0.067)	(0.013)	(0.062)	(0.012)	(0.062)	(0.010)
Precipitation	-0.041***	0.049***	-0.041***	0.049***	-0.037***	0.043***	-0.037**	0.043***
	(0.0092)	(0.0050)	(0.010)	(0.0057)	(0.011)	(0.0042)	(0.014)	(0.0044)
Temperature	-0.00070	-0.076***	-0.00070	-0.076***	-0.0021	-0.080***	-0.0021	-0.080***
	(0.033)	(0.014)	(0.035)	(0.015)	(0.032)	(0.014)	(0.033)	(0.015)
Newspaper exposure	-0.84	-0.26	-0.84	-0.26	0.0069	-0.75	0.0069	-0.75
	(0.85)	(0.30)	(0.52)	(0.29)	(1.23)	(0.48)	(0.82)	(0.50)
Total news exposure	0.018	-0.0034	0.018	-0.0034	0.094*	-0.070***	0.094**	-0.070***
	(0.015)	(0.0038)	(0.012)	(0.0029)	(0.053)	(0.011)	(0.037)	(0.014)
No. of observations	27,545	13,878	27,545	13,878	27,549	13,880	27,549	13,880
No. of municipalities	69	66	20	20	69	66	20	20
R-squared	0.85	0.94	0.85	0.94				
Mean dep. var.	-19.0	7.22	-19.0	7.22	-19.0	7.22	-19.0	7.22
Wild bootstrap p-value								
C19 news exposure	0.040	0.0050	0.082	0.091	0.026	0.0070	0.10	0.010

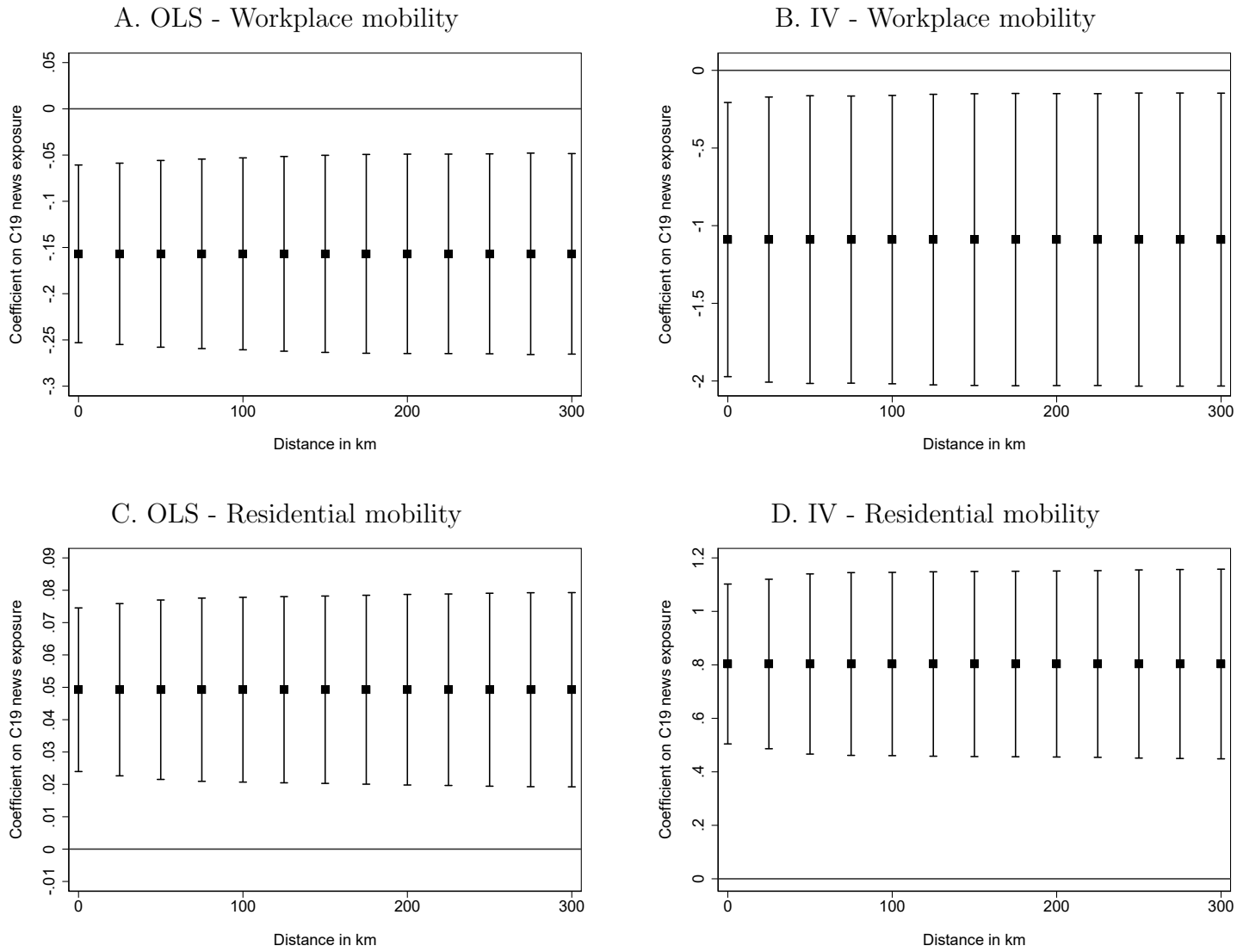
Notes: Observations are at the municipality-day level. The dependent variables are percentage changes in Google mobility for workplaces (columns 1, 3, 5 and 7) and residential areas (columns 2, 4, 6 and 8) relative to the baseline. The main regressor is the circulation-weighted number of Covid-19 articles and the IV is the interaction between weighted excess deaths across a newspaper's circulation area and newspaper exposure. All regressions control for municipality and day fixed effects. Standard errors in parentheses are clustered by LA-Regions (columns 1, 2, 5 and 6) or counties (columns 3, 4, 7 and 8). Significance at the 1%, 5% and 10% is denoted by ***, ** and *, respectively. The p-values for the t-test that the main regressor is equal to zero based on wild bootstrapped standard errors is reported at the bottom of the table.

Table A.11: Covid-19 coverage and working-from-home: lagged dependent variable

	OLS		IV	
Dep.Var.	Work	Residential	Work	Residential
	(1)	(2)	(3)	(4)
C19 news exposure	-0.046	0.028***	-0.58**	0.50***
	(0.030)	(0.0097)	(0.25)	(0.11)
Lagged dependent variable	0.41***	0.40***	0.39***	0.35***
	(0.038)	(0.028)	(0.038)	(0.034)
Local pandemic severity	-0.011	0.055***	0.0043	0.048***
	(0.033)	(0.0061)	(0.036)	(0.012)
Precipitation	-0.039***	0.047***	-0.037***	0.044***
	(0.0064)	(0.0033)	(0.0066)	(0.0035)
Temperature	0.0047	-0.063***	0.0075	-0.068***
	(0.018)	(0.0075)	(0.018)	(0.0090)
Newspaper exposure	-1.00	-0.30	-0.40	-0.83**
	(0.74)	(0.35)	(0.87)	(0.39)
Total news exposure	0.013	-0.0031	0.055***	-0.040***
	(0.0091)	(0.0035)	(0.021)	(0.0095)
No. of observations	23,375	11,360	23,375	11,360
No. of municipalities	266	140	266	140
R-squared	0.90	0.95		
Mean dep. var.	-19.3	7.26	-19.3	7.26

Notes: Observations are at the municipality-day level. The dependent variables are percentage changes in Google mobility for workplaces (columns 1 and 3) and residential areas (columns 2 and 4) relative to the baseline. The main regressors are the circulation-weighted number of Covid-19 articles and the one-day lagged dependent variable. Columns 3 and 4 show IV results using the interaction between weighted excess deaths across a newspaper's circulation area and newspaper exposure as the IV. Local pandemic severity is the latest available excess deaths figure in the municipality at the time of newspaper publication. All regressions control for municipality and day fixed effects. Standard errors in parentheses are clustered by municipality. Significance at the 1%, 5% and 10% is denoted by ***, ** and *, respectively.

Figure A.1: Covid-19 coverage and working-from-home:
robustness to spatially correlated standard errors



Notes: These charts show the robustness of the OLS (Panels A and C) and IV regressions (Panels B and D) in Table 2 to arbitrarily spatially correlated standard errors. The x-axis shows the distance cutoffs in kilometers. The y-axis shows the estimated coefficient exposure to Covid-19 news (i.e., the circulation-weighted number of Covid-19 articles) with 95 percent confidence intervals. Observations are at the municipality-day level. The dependent variables are percentage changes in Google mobility for workplaces (Panel A and B) and residential areas (Panel C and D) relative to the baseline. All regressions control for municipality and day fixed effects and the controls from Table 2.

B Detailed data appendix

B.1 Mobility

Figure B.1 shows that the largest decreases in mobility in Sweden during the pandemic were in transit and workplace locations. In contrast, people spend more time in parks and residential areas than before the pandemic. Visits of retail and recreation locations dropped during the spring of 2020, increased during the summer, and dropped again in the fall and winter. The same pattern holds for visits of grocery stores and pharmacies but the changes were much less pronounced.

The number of observations in the mobility data is the lowest for the category parks (3,844 out of 91,164 municipality-days) and highest for workplace (60,878 municipality-days); see Table 1 for details.

Figure B.2 shows the number of non-missing observations for workplace and residential mobility by municipality. The average number of days per municipality with non-missing information about workplace mobility is 197.2. There are 18 municipalities with zero observations, whereas the data are near-complete (i.e., less than 2 percent missing values) for 44 municipalities. The average number of days per municipality with non-missing information about residential mobility is 80.5. In this mobility category, the number of municipalities with zero observations is 142, whereas 11 municipalities have near-complete data.

The main factor driving the availability of mobility data is the population size of a municipality. The higher the local number of Google users, the greater the chances that mobility data are available on a given day. Table B.1 shows that mobility data are more likely to be available for municipalities that are densely populated and where residents tend to be younger, less educated, and more often foreign born. That is, our sample over-represents urban regions and under-represents rural areas. The share of households with a newspaper subscription is not correlated with the availability of mobility data.

B.2 Newspapers

B.2.1 Covid-19 coverage

We verify the assumption that Covid-19-related coverage is mostly bad news by evaluating a random sample of 500 Covid-19 stories. Out of 500 articles, we find only 2 (0.4 percent) that mention decreasing infection rates. However, one of these stories simultaneously states that five people have died of Covid-19 in the local hospital, while the other story points out that infections remain high. The remaining stories can be roughly classified as follows: reports of (increasing) infections, hospitalisations, or deaths; news stories discussing the implications of the pandemic for public health, sports, culture, the economy, and politics; reports about Covid-19-related research; descriptions of developments in other countries; articles including safety advice; summaries of restrictions and public recommendations; and reports of celebrities testing positive, falling ill, or dying. In general, the tenor of these stories is that the virus is dangerous, has negative repercussions in many areas of life, and that efforts are necessary to reduce the spread of infection.

These findings confirm the results of Sacerdote, Sehgal and Cook (2020) – who find that Covid-19-related news reports of US media outlets are predominantly negative in tone. Hence, being exposed to Covid-19 news should induce readers to reduce their social interactions. That is, mobility should decrease in the types of areas where the risk of infection is high (e.g., retail and workplace) and increase where this risk is low (e.g., parks and residential).

We observe the largest amount of reporting in March and April 2020, which coincided with the first wave of infections in Sweden (see Figure 2). The coverage decreased during the summer and increased again in the fall, when the second wave started. However, the amount of coverage during that time did not reach the extent of the first wave.

B.2.2 Publication schedules

As shown in Table B.2, most newspapers (35 of 110) are published Monday through Saturday, followed by 28 outlets that are published Monday through Sunday. The remaining 47 newspapers exhibit 15 different publication patterns.

The publication schedules of most newspapers have been unchanged for decades. The outlets occasionally deviate from their publication pattern (e.g., some issues are cancelled or pre-/postponed if the publication day falls on a holiday), but we verify that no outlet systematically changed its publication schedule during 2020.

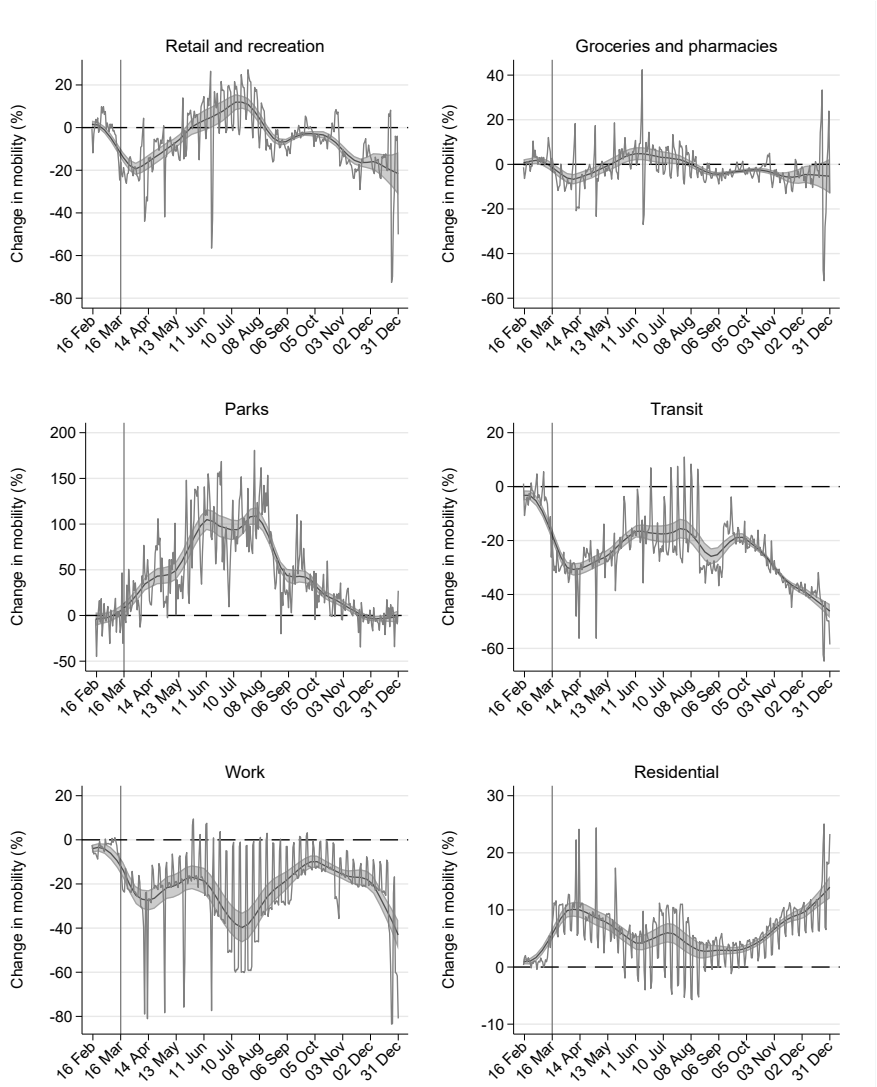
Table B.3 illustrates how newspaper exposure varies across municipalities and days of the week. There are 64 municipalities without variation across weekdays; 28 municipalities share the same publication pattern with at least one other municipality; and 192 municipalities have unique publication patterns.

B.2.3 Owners

Information on newspaper owners is gathered from the outlets' official websites. In case of multiple blockholders, we use the majority owner. There are a total of 20 distinct owners (see Table B.4). The largest owner holds 38 newspapers (Bonnier Group), followed by NTM (16 papers), Nya Wermlands-Tidningen (16 papers), and Gota Media (12 papers). There are 11 owners that hold only one newspaper.

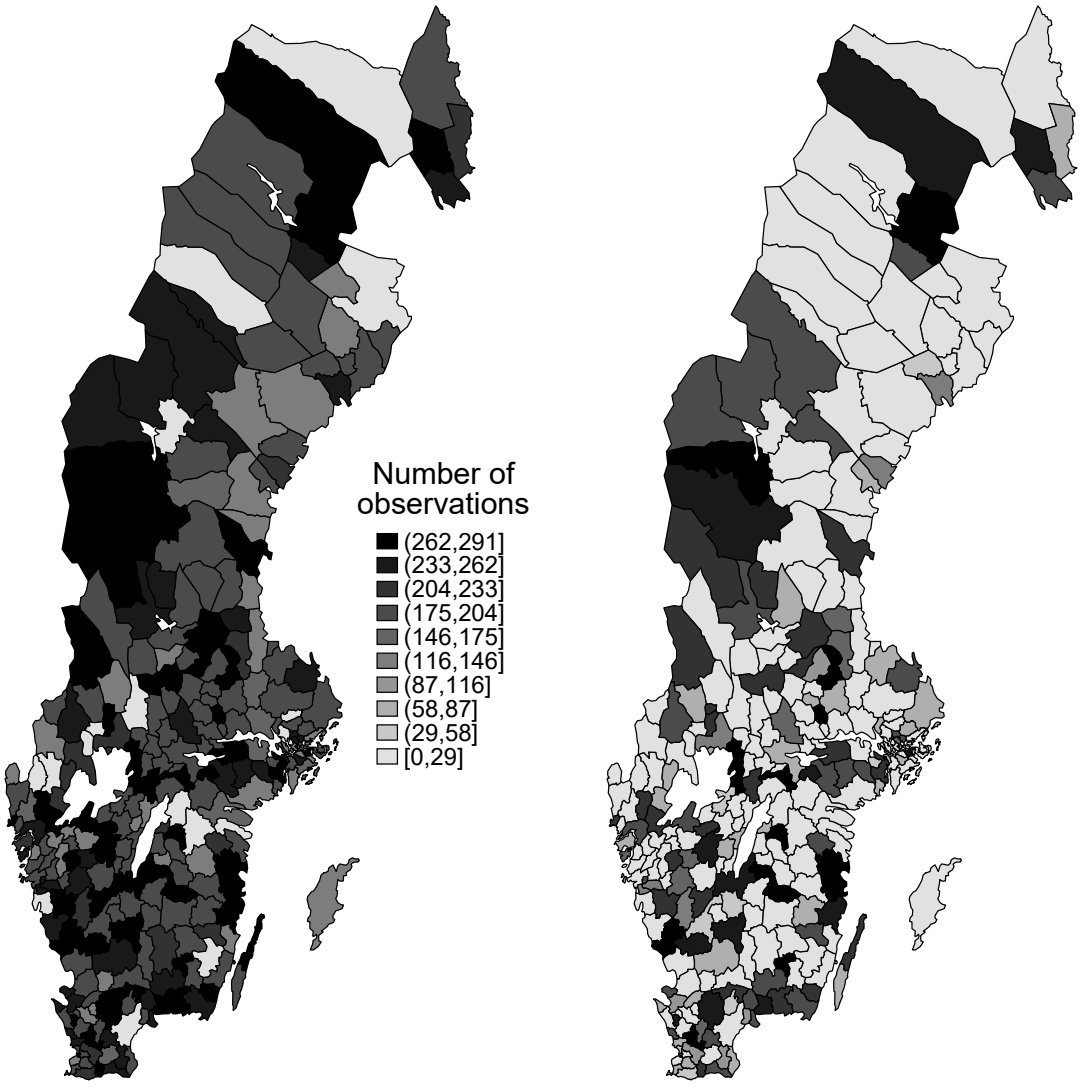
Figures

Figure B.1: Average Google mobility over time, all categories



Notes: These graphs show the daily percentage change in Google mobility compared to median values between January 3 to February 6, 2020. The grey solid lines are local polynomial smooths with 95 percent confidence intervals. Our estimation sample starts on March 16, 2020.

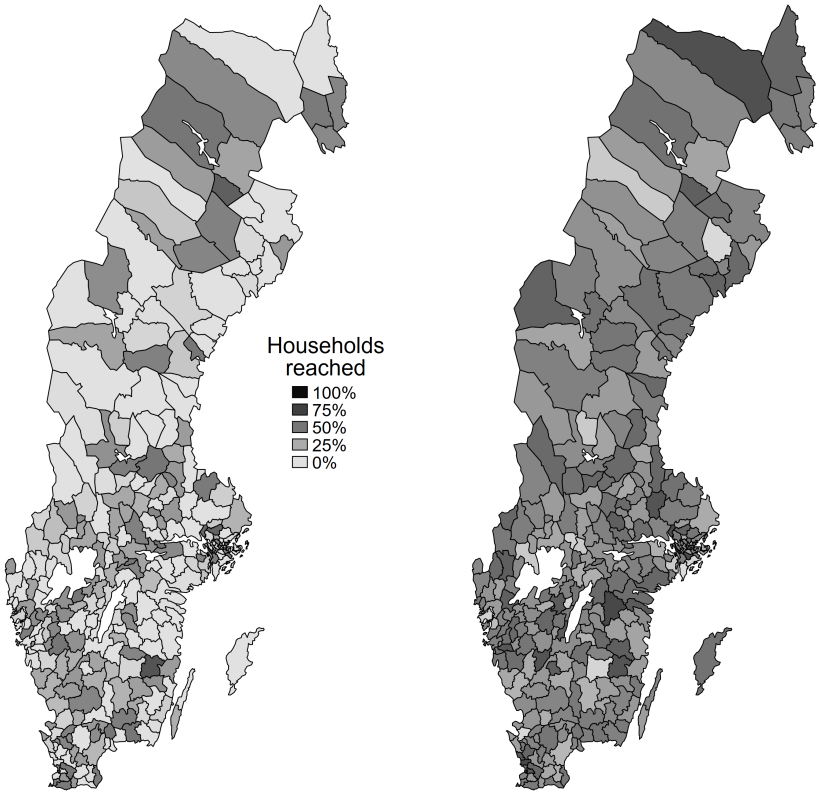
Figure B.2: Number of non-missing mobility observations, by municipality



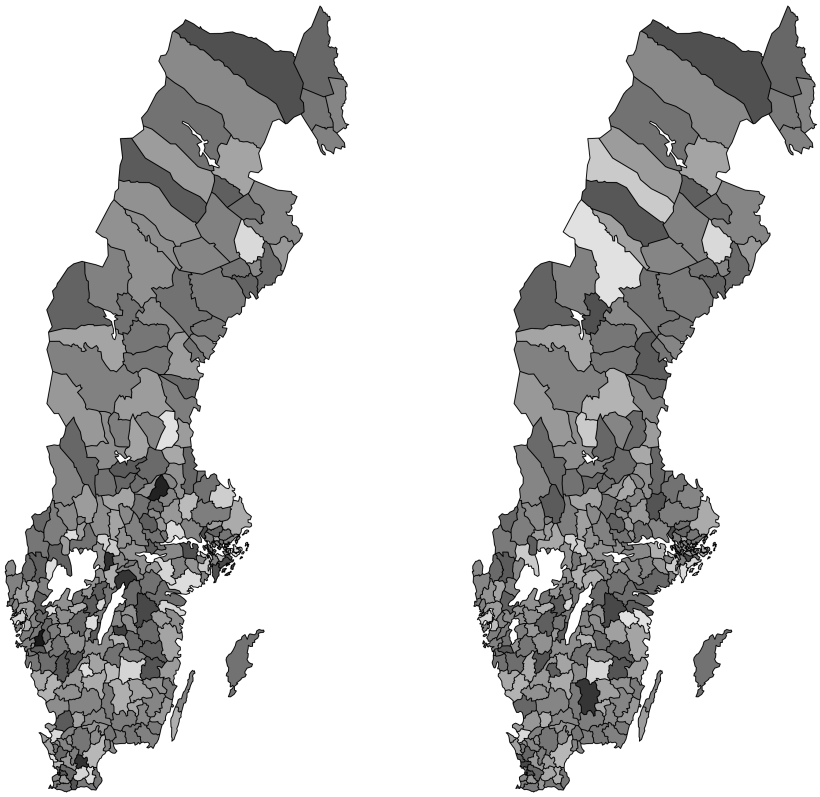
Work mobility Residential mobility

Notes: These maps show the number of non-missing observations of Google mobility data for each Swedish municipality for workplace and residential mobility.

Figure B.3: Share of households receiving a newspaper, by municipality and weekday

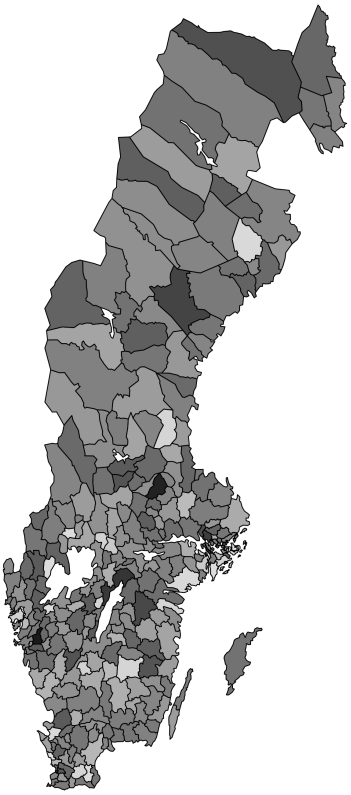


Sunday Monday

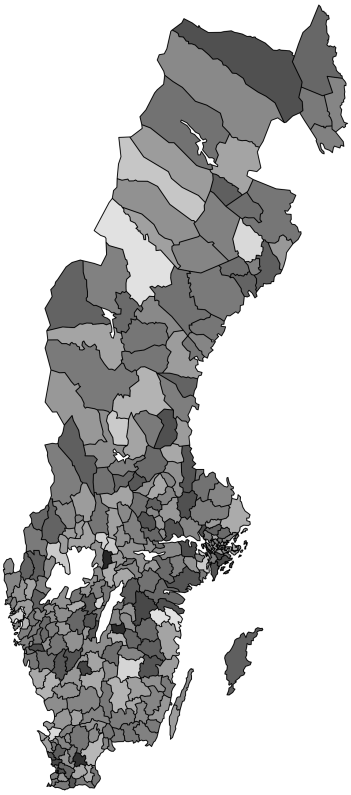


Tuesday Wednesday

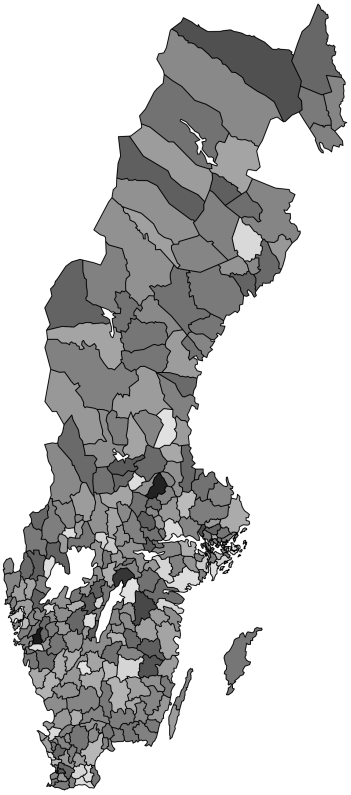
Figure B.3, continued



Thursday

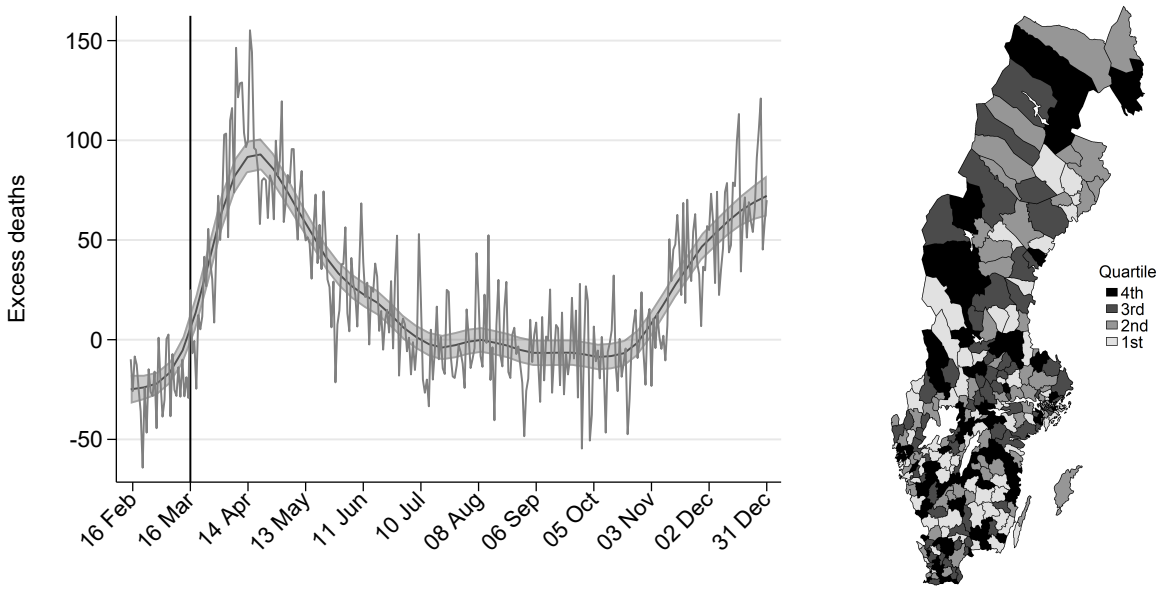


Friday



Saturday

Figure B.4: Excess mortality

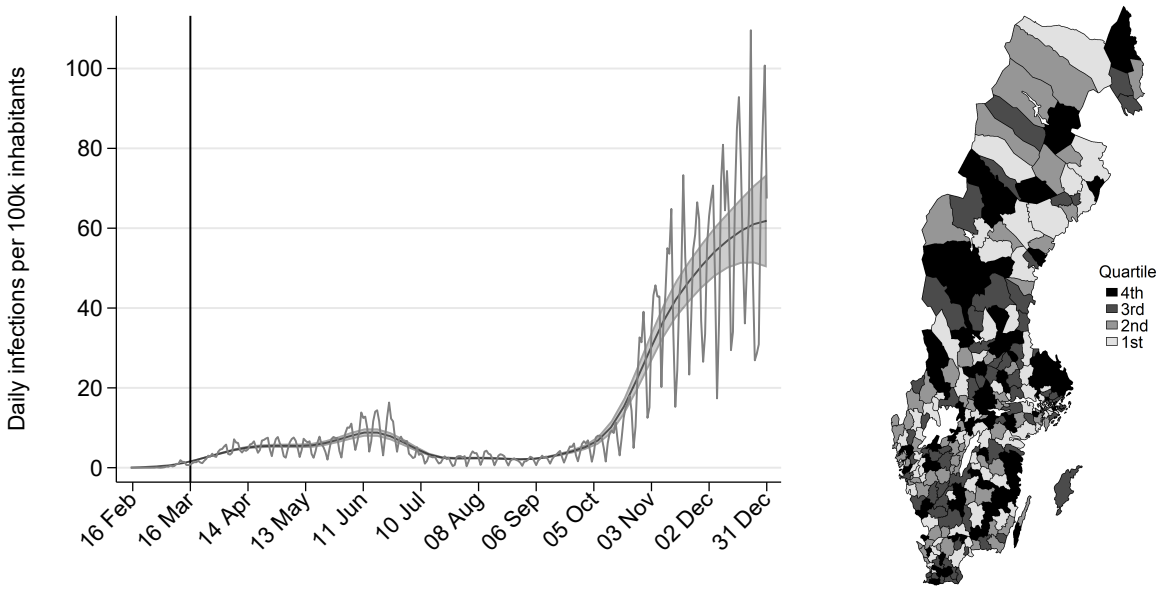


(a) Over time

(b) By municipality

Notes: These charts show excess mortality in Sweden across time and space. Excess mortality is defined as the daily number of deaths in 2020 minus the 2015–2019 average number of deaths on the same day. The grey solid line in Panel (a) is a local polynomial smooth with 95 percent confidence interval. Panel (b) shows average values between February 15 and December 31, 2020. Our estimation sample starts on March 16, 2020.

Figure B.5: Infections per 100,000 inhabitants



(a) Over time (b) By municipality

Notes: These charts show the number of Covid-19 infections per 100,000 inhabitants in Sweden across time and space. The grey solid line in Panel (a) is a local polynomial smooth with 95 percent confidence interval. Panel (b) shows average values between February 15 and December 31, 2020. Our estimation sample starts on March 16, 2020.

Tables

Table B.1: Missing mobility data and demographics of municipalities

	(1) Retail	(2) Grocery	(3) Parks	(4) Transit	(5) Work	(6) Residential
Population size	-0.50***	-0.51***	-0.70***	-0.41***	-0.40***	-0.55***
Population density	-0.33***	-0.31***	-0.31***	-0.28***	-0.24***	-0.30***
Average age	0.52***	0.53***	0.31***	0.61***	0.62***	0.61***
Median income	-0.19**	-0.14*	0.02	-0.36***	-0.28***	-0.24***
Share upper secondary degree	0.52***	0.50***	0.39***	0.57***	0.54***	0.56***
Share foreign born	-0.41***	-0.42***	-0.24***	-0.38***	-0.39***	-0.43***
Unemployment rate	-0.11	-0.14*	-0.09	-0.05	-0.10	-0.12*
Share w/ newsp. subscription	0.08	0.05	0.08	0.08	0.01	0.04

Notes: The table shows bivariate Pearson correlations between a municipality's share of days with missing observations in the mobility data and municipality-level demographic variables. The demographic data come from Statistics Sweden. N = 284 municipalities. *, **, *** denote 10%, 5%, 1% significance.

Table B.2: Newspapers' publication schedules

Pattern	Number of newspapers
Mo Tu We Th Fr Sa	35
Su Mo Tu We Th Fr Sa	28
Tu Fr	7
Mo We Fr	6
Tu Th Sa	6
Fr	5
Th	5
We	4
Mo Tu We Th Fr	3
Mo We Th Fr	3
Tu Th	2
Mo Tu Th Sa	1
Mo We Th Fr Sa	1
Sa	1
Su Mo We Fr Sa	1
Tu Sa	1
Tu We Th Fr	1
Total	110

Table B.3: Patterns of newspaper exposure

Share of households receiving a newspaper (Su / Mo / Tu / We / Th / Fr / Sa)	Number of municipalities
0.33 / 0.33 / 0.33 / 0.33 / 0.33 / 0.33 / 0.33	5
0.35 / 0.35 / 0.35 / 0.35 / 0.35 / 0.35 / 0.35	5
0.00 / 0.45 / 0.45 / 0.45 / 0.45 / 0.45 / 0.45	4
0.41 / 0.41 / 0.41 / 0.41 / 0.41 / 0.41 / 0.41	4
0.43 / 0.43 / 0.43 / 0.43 / 0.43 / 0.43 / 0.43	4
0.44 / 0.44 / 0.44 / 0.44 / 0.44 / 0.44 / 0.44	4
0.47 / 0.47 / 0.47 / 0.47 / 0.47 / 0.47 / 0.47	4
0.00 / 0.41 / 0.41 / 0.41 / 0.41 / 0.41 / 0.41	3
0.00 / 0.47 / 0.47 / 0.47 / 0.47 / 0.47 / 0.47	3
0.37 / 0.37 / 0.37 / 0.37 / 0.37 / 0.37 / 0.37	3
0.38 / 0.38 / 0.38 / 0.38 / 0.38 / 0.38 / 0.38	3
0.40 / 0.40 / 0.40 / 0.40 / 0.40 / 0.40 / 0.40	3
0.00 / 0.32 / 0.32 / 0.32 / 0.32 / 0.32 / 0.32	2
0.00 / 0.41 / 0.41 / 0.41 / 0.41 / 0.45 / 0.41	2
0.00 / 0.43 / 0.43 / 0.43 / 0.43 / 0.43 / 0.43	2
0.00 / 0.44 / 0.44 / 0.44 / 0.44 / 0.44 / 0.44	2
0.00 / 0.46 / 0.46 / 0.46 / 0.46 / 0.46 / 0.46	2
0.00 / 0.50 / 0.50 / 0.50 / 0.50 / 0.50 / 0.50	2
0.00 / 0.53 / 0.53 / 0.53 / 0.53 / 0.56 / 0.53	2
0.01 / 0.43 / 0.43 / 0.43 / 0.43 / 0.43 / 0.43	2
0.04 / 0.04 / 0.04 / 0.04 / 0.04 / 0.04 / 0.04	2
0.05 / 0.05 / 0.05 / 0.05 / 0.05 / 0.05 / 0.05	2
0.27 / 0.27 / 0.27 / 0.27 / 0.27 / 0.27 / 0.27	2
0.30 / 0.30 / 0.30 / 0.30 / 0.30 / 0.30 / 0.30	2
0.31 / 0.31 / 0.31 / 0.31 / 0.31 / 0.31 / 0.31	2
0.33 / 0.34 / 0.34 / 0.34 / 0.34 / 0.34 / 0.34	2
0.39 / 0.39 / 0.39 / 0.39 / 0.39 / 0.39 / 0.39	2
0.00 / 0.22 / 0.65 / 0.22 / 0.22 / 0.66 / 0.22	1
0.00 / 0.23 / 0.76 / 0.23 / 0.76 / 0.26 / 0.76	1
0.00 / 0.24 / 0.00 / 0.24 / 0.00 / 0.24 / 0.00	1
0.00 / 0.25 / 0.06 / 0.25 / 0.06 / 0.25 / 0.06	1
0.00 / 0.27 / 0.27 / 0.54 / 0.27 / 0.27 / 0.27	1
0.00 / 0.30 / 0.30 / 0.00 / 0.30 / 0.00 / 0.30	1
.	.
.	.
.	.
0.00 / 0.31 / 0.31 / 0.21 / 0.31 / 0.21 / 0.31	1
Total	284

Notes: Due to space constraints, the table only shows the most frequently observed patterns of daily newspaper exposure: 64 municipalities do not experience any variation in household exposure across weekdays; 28 municipalities share the same publication pattern with at least one other municipality; and 192 municipalities have unique publication patterns.

Table B.4: List of newspaper owners

Owner	Number of newspapers
Bonnier Group	38
NTM-koncernen	16
Nya Wermlands-Tidningen	16
Gota Media AB	12
Stampen	6
Ortstidningar i Väst	4
Tidningar i Norr AB	3
Skåne Tidningsägareföreningen	2
Stiftelsen VK-press	2
Dennis Johansson Hall	1
ETC Media AB	1
Jämtlands Tidning AB	1
Kurirengruppen i Sverige AB	1
Lysekilsposten AB	1
Mariefredsmedia AB	1
Mentor Media	1
Norra Halland Tidnings AB	1
Schibsted	1
Tidningsföreningen Skaraborgsbygden	1
Tranås-Posten AB	1
Total	110

Notes: The table refers to the time after the acquisition of ten newspapers by the Bonnier Group from Hall Media, which took place on February 25, 2020.

Table B.5: Correlations between excess deaths and infection rates

	Excess deaths in municipality	Excess deaths in region	Excess deaths in municipality (data at publication)	Excess deaths in region (data at publication)	Infections per 100k in municipality	Infections per 100k in region	Infections per 100k in municipality (data at publication)	Infections per 100k in region (data at publication)
Excess deaths in municipality	1							
Excess deaths in region	0.410	1						
Excess deaths in municipality (data at publication)	0.571	0.269	1					
Excess deaths in region (data at publication)	0.305	0.782	0.392	1				
Infections per 100k in municipality	0.258	0.123	0.152	0.0566	1			
Infections per 100k in region	0.125	0.265	0.0673	0.144	0.489	1		
Infections per 100k in municipality (data at publication)	0.284	0.137	0.201	0.0859	0.929	0.462	1	
Infections per 100k in region (data at publication)	0.139	0.301	0.0919	0.202	0.461	0.951	0.489	1

Notes: This table shows correlations between different excess deaths and infection rate statistics. Observations are at the municipality-day level. Excess deaths are calculated as the difference between deaths in 2020 and the 2015-2019 average.

C Content analysis of Covid-19 articles

IPTC topics "Retriever Mediearkivet" classifies each article into topics based on the subject taxonomy of the International Press Telecommunications Council (IPTC).[C.1] The Covid-19-related news stories in our sample fall in the following categories: "Medicine and health" (39.2 percent), "Social conditions" (19.5 percent), "Sports" (10.4 percent), "Economy and business" (7.2 percent), "Culture and entertainment" (6.8 percent), and "Politics" (5.0 percent).

Topic modelling We complement this categorisation with a topic classification based on Latent Dirichlet Allocation (LDA; see Blei, Ng and Jordan, 2003), which allows for a more fine grained classification. We transform the corpus of Covid-19 articles (including headlines) to lower case and remove numbers, punctuation, HTML tags, and stop words.

Our preferred model assumes 18 topics and is shown in Table C.1. We estimate a number of candidate models assuming different numbers of topics and evaluate the interpretability of the results based on each topic's most likely terms. Models assuming a slightly lower or higher number of topics (e.g., 15 or 21) yield similar results but are less interpretable.[C.2]

The model identifies four health-related topics, including elderly care, hospitalisation, research findings, and vaccination. We obtain topics that categorise the implications of the pandemic for different areas of society into culture, the economy, education, family life, jobs, social life, and sports. Two topics refer to restrictions on public gatherings and shopping and restaurants. Reports about the public health strategy are included in the topics local policies and FOHM. The model retrieves a topic on politics abroad, and another one on Covid-19-related statistics.

The articles' IPTC categorisation and the dominant LDA topic from our model shows

[C.1] See https://iptc.org/standards/media-topics/

[C.2] We also conduct hold-out tests to compute perplexity scores for different candidate models, selecting the number of topics where the out-of-sample fit is best (i.e., has the lowest perplexity score; see Blei, Ng and Jordan, 2003). The statistically optimal number of topics is larger than 100. This trade-off between statistical fit and interpretability is a common issue with large corpora.

a large overlap (Table C.2). For example, reports addressing the implications of the pandemic for culture, the economy, education, and sports – according to the LDA – are almost always classified in the corresponding categorisation of the IPTC. Articles with the LDA topics of research, statistics, vaccination, hospitalisation, and elderly care are mostly in the IPTC category "Health". Overall, the LDA matches the IPTC broad categories very well but offers more context and detail specific to the Covid-19 pandemic. We plot the evolution of the individual LDA topics in Figure C.1.

Instructive language We develop a measure of Covid-19-related public health advice by analysing the language of FOHM press releases. Using the agency's browser search feature, we manually evaluate all 145 press releases tagged as "Covid-19" and published between March 16 and December 31, 2020.[C.3] These press releases address various topics, such as research, vaccine development, symptoms, testing and public health instructions. We obtain 15 press releases that give advice to the general public about how to protect themselves and others during the pandemic, while discarding those with instructions to specific groups (e.g., hospital staff) or locations.

We tokenise these press releases and conduct part-of-speech tagging (Straka and Straková, 2017) by using the Swedish treebank *Talbanken*, which includes around 6,000 sentences from textbooks, information brochures, and newspaper articles (Nivre and Megyesi, 2007). Based on the resulting syntactic and morphological annotations, we retain all sentences that include a grammatical imperative (e.g., "Wash your hands" or "Avoid crowded rooms") or any of these modal verbs: behöva (need to), ska (supposed to), måste (have to), bör (should), and får (to be allowed to). We then create a list of all two- and three-word expressions (2,002 in total) included in these sentences, after removing stopwords as defined by the Snowball Swedish stopwords list (Porter, 2001). We refer to the resulting dictionary as "instructive expressions", which allow us to identify explicit public health advice in Covid-19 news coverage.

[C.3] See https://www.folkhalsomyndigheten.se/nyheter-och-press/.

Table C.3 presents the most frequent instructive expressions in our newspaper sample. The two most frequent expressions are "stay home" and "keep distance". We further validate the approach by ranking Covid-19 articles according to their share of instructive 2- and 3-grams in the total number of 2- and 3-grams. A high share of instructive expressions indicate newspaper articles that contain explicit public health advice. Table C.4 shows English translations of the four highest-ranked newspaper articles. These articles write that congestion should be avoided, social contact reduced, and restaurants should take special measures to prevent infections.

On average, we count 1.41 instructive expression per article. About half of the articles do not contain any relevant expressions. The highest share of instructive expressions in an article is 0.75. We use this information to compute circulation-weighted counts of Covid-19 articles split by their share of instructive expressions. Given the highly skewed distribution of shares of instructive expressions (Figure C.2), we distinguish between articles with fewer than 1.587 percent instructive expression (95th percentile), between 1.587 percent and below 3.766 percent, and above 3.766 percent (99th percentile).

Lexical diversity and uniqueness of language We further characterise the language used in Covid-19 newspaper coverage by computing indices that capture the articles' lexical diversity and uniqueness of language.

Lexical diversity refers to the range of vocabulary used within a given article. It is defined as the number of distinct words divided by the article's total number of words. Higher values of this index – which varies from 0 and 1 – reflect greater levels of lexical diversity.

The index of uniqueness of language is defined as the sum of inverse corpus-level word frequencies in a given article divided by the total number of words in that article. Higher values of this index imply that an article includes many words that are otherwise rarely used in our corpus of Covid-19 newspaper coverage. High levels of the index of uniqueness of language imply that some of the terms used in the article are likely new to the reader.

Table C.1: Topics in Covid-19 newspaper coverage

Label (*representative headline*)	Top terms
1 Jobs (*100,000 jobs disappeared during seven crisis weeks*)	jobs, work, quite, summer, done, eriksson, probably, really, cases, persson, always, late, problem, hand, quickly, vacation, manages, situation, find, most
2 Research (*Swedish researchers: Do as Israel does and advocate vitamin D*)	virus, antibodies, disease, risk, professor, researcher, infection, university, ill, symptoms, studies, affected, research, person, most, often, karolinska, infected, animal, body
3 Sports (*Corona infection at Malmö FF*)	player, law, match, club, football, game, keys, division, ifk, andersson, audience, away, last, league, water, layers, train, clubs, leader, allsvenskan
4 Statistics (*Another 109 infected in the county*)	died, figures, deaths, statistics, numbers, date, digital, reported, found, weeks, infected, ten, may, affected, reduced, total, six, most, fallen, reported
6 Shopping and restaurants (*Grocery stores reserve early time for risk groups*)	food, customers, women, johansson, stores, fredrik, act, local, restaurants, hand alcohol, goods, henrik, hotel, marie, products, driver, city, water, offers, production
7 Vaccination (*Astra Zeneca tests possible drug against covid-19*)	vaccine, dosis, vaccinate, british, johnson, agreement, phase, astra, richard, boris, zeneca, january, pfizer, december, side effects, clinical, pregnant, population, effectively, risk groups
8 Family life (*Families are forced to spend more time together*)	train, never, life, house, family, later, mother, old, dad, final, day, existed, own, each other, sitter, out, anna, music, fixed, name
9 Hospitalisation (*Higher number of patients in ICU*)	region, test, intensive care, hospital, symptom, dalarna, sampling, positive, uppsala, patients, halland, norrbotten, negative, response, operations, skaraborgs, gotland, needs, infected, deceased
10 Restriction of public gatherings (*Events for more than 500 are stopped*)	june, august, italy, may, september, spain, decision, end, international, summer, middle, ride, later, information, move, announces, planned, press release, message, tourists

Table C.1, continued

Label (*representative headline*)	Top terms
11 Local policies (*Arvika is at the second highest level of crisis preparedness*)	responsibility, municipalities, information, wrong, consider, criticism, politician, response, authorities, pandemic, problem, political, taken, existed, decision, tasks, mission, never, care, examination
12 Economy (*Volvo stops all production*)	billion, crisis, money, economic, lena, state, economy, hallengren, company, job, costs, stefan, quarter, swedish, government, economically, parliament, down, reduce, step
13 Abroad (*United States send respirators to Russia*)	trump, china, president, donald, biden, american, wuhan, twitter, country, who, political, media, leader, russia, democratic, reports, fight, consider, choice, hong kong
14 FOHM (*Tegnell: High risk of a second wave if social contacts increase*)	regions, johan, state epidemiologist, sweden, authority, carlson, municipalities, thomas, continued, johanna, annika, recommendations, preparedness, local, curve, development, wallensten, fohm, national, strategy
15 Culture (*Concerts are canceled due to corona*)	peter, nilsson, event, lars, andersson, magnus, karlsson, larsson, audience, participant, arrangement, church, members, business, activities, reason, concerts, artists, board, program
16 Elderly care (*At least 182 dead in nursing homes in Gothenburg due to Covid-19*)	protective equipment, mask, accommodation, infection, coworker, karin, care, visor, infected, working, users, concern, protect, retirement home, guidelines, information, department, symptom, contact, activities
17 Education (*New corona rules in preschools*)	school, pupils, reduce, avoid, students, recommendations, restrictions, distance, decision, outside, public transport, responsibility, stay, gatherings, rules, teaching, risk, spreading, local, november
18 Social life (*The psychiatrist's best advice for coping with the corona crisis*)	social, concern, young, digital, police, life, media, children, information, talk, physical, create, exposed, phone, adults, distancing, responsibility, psychological, worried, usual

Notes: Based on a Latent Dirichlet Allocation topic model of 190,978 Covid-19-related newspaper articles between March 16 and December 2020, assuming k = 18 topics. The table shows English translations of example headlines and top terms. The example headlines are real headlines selected from articles where the relevant topic is estimated to be the dominating topic. The top term are based on the probability that a term belongs to a given topic.

Table C.2: Correspondence between IPTC and LDA topics

	International Press Telecommunications Council (IPTC) topic								
	Culture	Economy	Education	Health	Other	Politics	Social	Sport	Total
LDA topic									
1 Jobs	4.66	7.05	5.89	6.49	9.50	2.73	4.15	6.69	6.07
2 Research	0.68	0.33	1.04	9.31	3.46	0.64	4.50	0.44	5.03
3 Sports	1.01	0.62	0.07	0.86	0.94	0.18	4.63	61.64	7.80
4 Statistics	0.74	2.47	0.68	10.36	3.95	1.74	10.13	0.20	6.74
5 Travel	0.87	3.56	0.39	3.17	4.40	8.54	6.44	0.99	3.77
6 Shopping/restaurants	1.91	15.71	0.95	2.24	7.19	1.79	2.75	0.58	3.51
7 Vaccination	0.38	1.38	0.22	4.65	1.08	2.06	4.12	0.09	2.96
8 Family life	43.16	3.26	4.90	5.12	17.16	2.95	8.12	6.94	9.54
9 Hospitalisation	0.38	1.03	0.85	13.11	1.35	0.99	3.36	1.54	6.26
10 Restrictions	5.32	3.11	0.53	1.31	3.35	2.80	5.14	9.95	3.60
11 Local policies	1.66	2.14	3.18	6.38	5.22	12.07	4.35	0.46	4.87
12 Economy	3.06	47.22	3.66	3.18	6.74	22.28	8.05	2.37	8.41
13 Abroad	2.24	2.24	0.17	4.28	5.12	26.76	9.29	0.48	5.72
14 FOHM	0.18	0.35	0.19	5.69	1.37	1.34	6.29	0.05	3.68
15 Culture	26.50	5.67	4.58	2.08	10.56	4.38	4.10	6.11	5.89
16 Elderly care	0.30	0.78	2.23	11.61	3.53	1.75	3.14	0.06	5.74
17 Education	1.06	1.05	66.62	5.20	4.51	3.69	5.48	0.80	5.40
18 Social life	5.90	2.02	3.85	4.96	10.55	3.32	5.94	0.61	5.01
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Notes: This table shows the overlap between the International Press Telecommunications Council (IPTC) topics (provided by Retriever Mediearkivet) and the dominant topic estimated via Latent Dirichlet Allocation, based on a corpus of 204,950 Covid-19-related newspaper articles between February 15 and December 2020. Each cell shows the percentage of all articles falling into the relevant category.

Table C.3: Most frequent instructive expressions in Covid-19 coverage

	Swedish original	English translation	Absolute frequency
1	stanna hemma	stay home	10795
2	hålla avstånd	keep distance	9095
3	ska gå	should go	6254
4	hela landet	whole country	5868
5	första hand	first place	4434
6	ta fram	bring forward	4142
7	särskilda boenden	special housing	4002
8	personer år	persons aged	3762
9	svårt sjuka	seriously ill	3628
10	ta ansvar	take responsibility	3498
11	måste ta	must take	3458
12	många människor	many people	3401
13	tills vidare	until further notice	3398
14	ska komma	should come	3264
15	år äldre	years older	3198
16	minska risken	reduce risk	2981
17	kommer behöva	need to	2960
18	kunna ta	can take	2878
19	risken smittspridning	risk infection spreading	2790
20	antalet personer	number people	2714
21	två dagar	two days	2633
22	ställas in	cancel	2446
23	sociala kontakter	social contacts	2437
24	allmänna råd	common advice	2358
25	andra människor	other people	2299

Notes: The counts are based on all Covid-19 newspaper articles published between March 16 and December 2020.

Table C.4: Covid-19 articles with highest shares of instructive expressions

New general advice (*Västerbottens-Kuriren, April 2, 2020*)
Stores, shopping centres and malls should limit the number of customers staying in the premises at the same time. They should also develop alternative solutions to cash queues or indicate how far customers can stand between each other. Sports associations should, if possible, hold training sessions and other sports activities outdoors, postpone matches, training matches, competitions and cups and limit the number of spectators. Non-profit associations should, if possible, postpone annual meetings and the like, if the meeting requires the participants to meet at the same place. Employers should ensure that staff and visitors keep their distance, that employees work from home and avoid unnecessary travel if possible. In public transport and public transport, the number of passengers should be limited, and the number of trips adjusted so that congestion can be avoided. (*Share of instructive expressions: 0.75*)

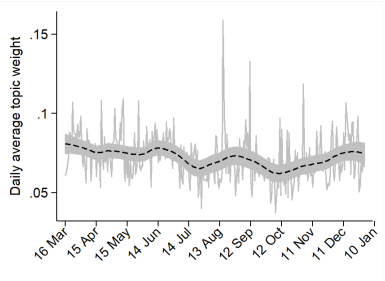
Bathhouse and arena reopen after virus closure (*Nerikes Allehanda, March 27, 2020*)
Sports and exercise activities may continue, but some precautions should be taken to reduce the risk of spreading Covid-19. Exercise outdoors is preferable. Physical activity is good for public health, sports and exercise should therefore continue, the Public Health Agency believes. Training, matches or local cups do not have to be cancelled due to the epidemic, and gyms, swimming pools and sports halls can be open. However, the activities may need to be adapted to minimise the risks of the spread of infection. The company Besök Linde AB quotes the authority in a press release sent out on Thursday afternoon. We follow the advice and instructions given by the Swedish Public Health Agency and now adapt our operations to these and to the demand for availability in our operations. We are now working to develop new cleaning routines to ensure that we have as safe an environment as possible, the municipal company states. In consultation with the associations, Besök Linde AB opens up to a certain extent for training activities. In principle, all competition activities have been closed down by the sports federations, which means that the need for times in the arena has decreased. (*Share of instructive expressions: 0.34*)

Disco and karaoke closed (*Gefle Dagblad, March 28, 2020*)
The decision to close was made following the Public Health Agency's new announcement that restaurants, bars and cafés throughout the country need to take special measures to reduce the risk of spreading Covid-19. While it is closed, they are planning for a new show in the future. (*Share of instructive expressions: 0.31*)

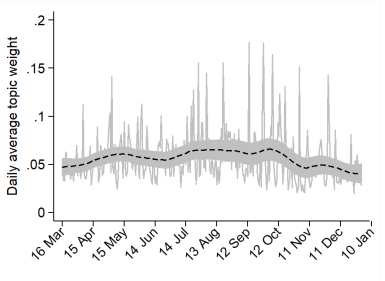
Letter to the editor: Växjö's well-meaning ad is wrong (*Smålandsposten, April 18, 2020*)
You write: You should not shop in stores, stay in rooms where there are many people at the same time, or travel by public transport. The Swedish Public Health Agency for people over the age of 70 and other risk groups writes the following in their regulations: Limit your social contacts. Avoid using public transport and other public transport. Avoid shopping in stores such as pharmacies and grocery stores or staying in other places where people gather. It is therefore not forbidden to shop in shops or to use public transport. The ad was well-intended but it went wrong. It is expected that the information that the municipality provides is correct and not distorted. (*Share of instructive expressions: 0.27*)

Notes: The table shows Google translations of newspaper articles with the highest shares of instructive two- and three-grams among all two- and three-grams.

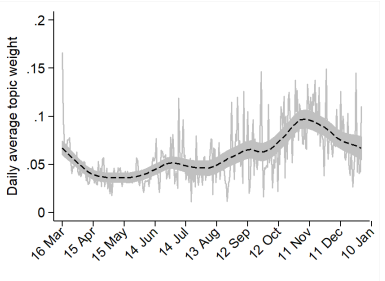
Figure C.1: Topic weights over time



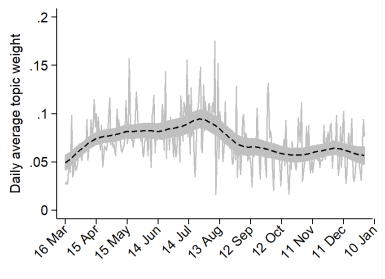
1 Jobs



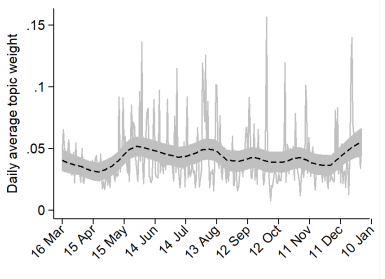
2 Research



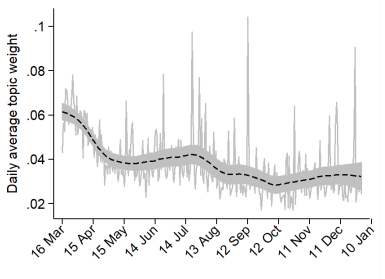
3 Sports



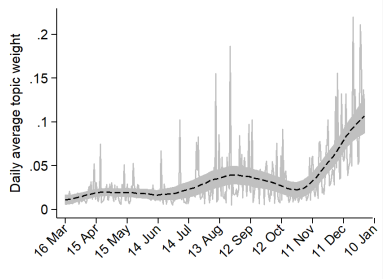
4 Statistics



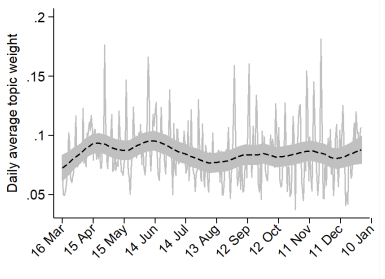
5 Travel



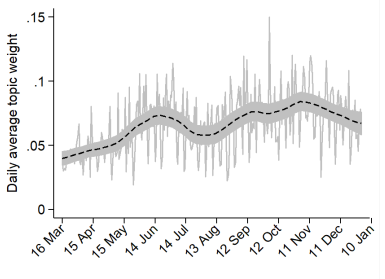
6 Shopping/restaurant



7 Vaccination

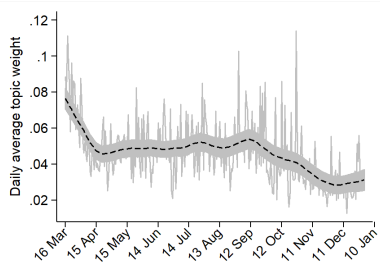


8 Family life

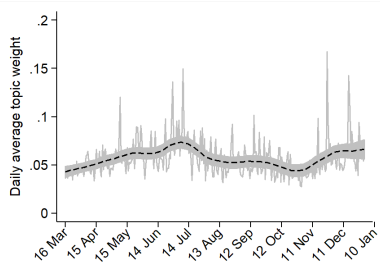


9 Hospitalisation

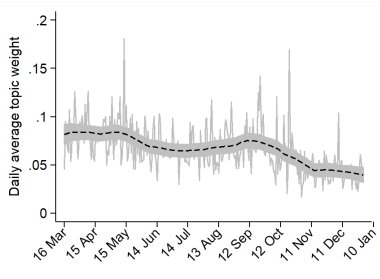
Figure C.1, continued



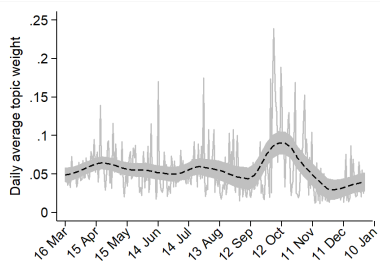
10 Restrictions



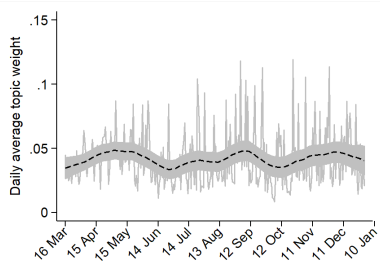
11 Local policies



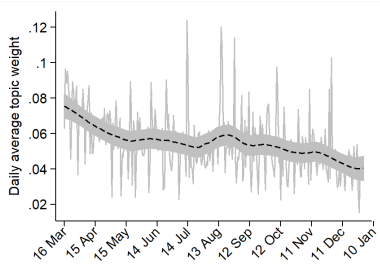
12 Economy



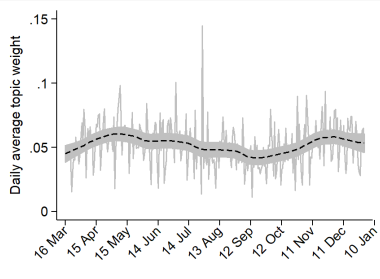
13 Abroad



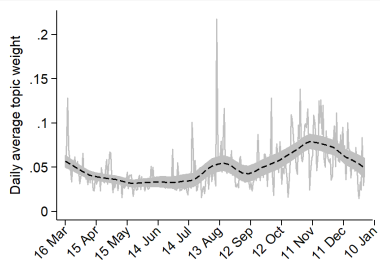
14 FOHM



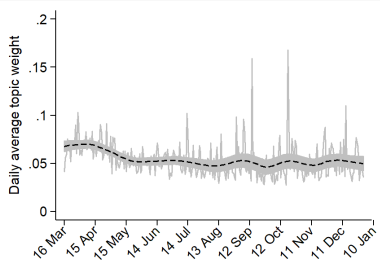
15 Culture



16 Elderly care



17 Education



18 Social life

Notes: The figure shows the topics' daily average weight. On any given day, the weights of the individual topics sum to 1. The dashed lines are local polynomial smooths and the shaded areas denote 95 percent confidence intervals.

Figure C.2: Density plot of the share of instructive expressions in Covid-19 articles

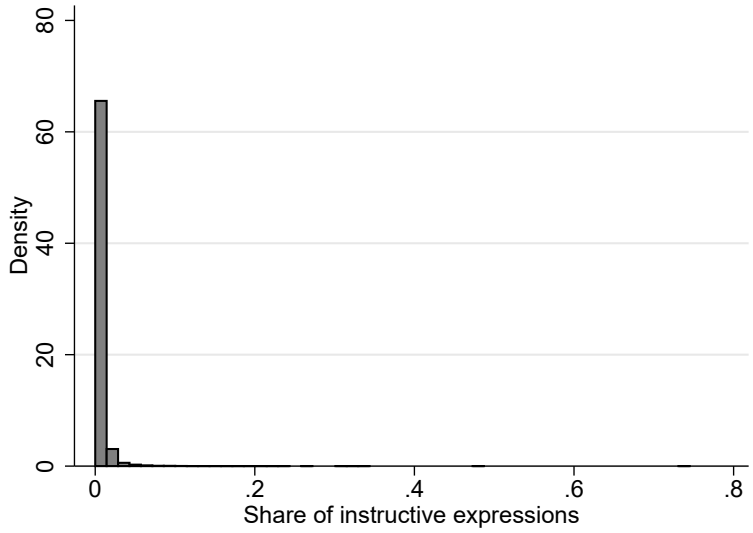
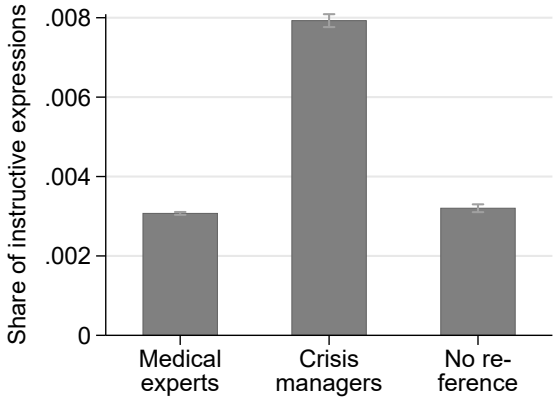
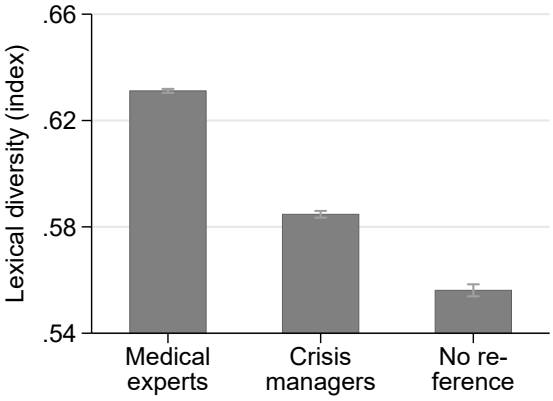


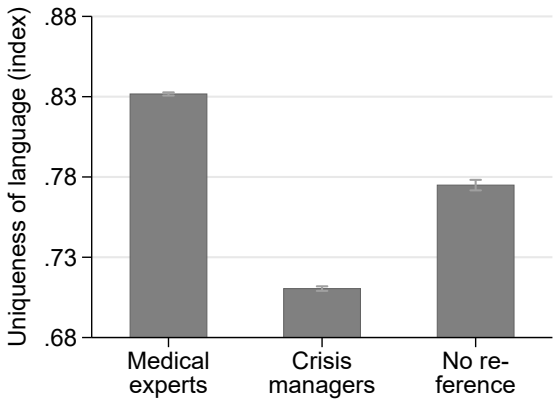
Figure C.3: Language characteristics of articles referring to medical experts and crisis managers



(a) Instructive language



(b) Lexical diversity



(c) Uniqueness of language

Notes: These charts show the difference in language between articles referring to medical experts and crisis managers. The data used to compile the graphs are at the article level and include 204,950 Covid 19-related newspaper articles between February 15 and December 2020. Articles referencing medical experts (N = 9,891) are those that include any of the terms "epidemolog*", "immunolog*", "professor*", or "virolog*", whereas articles referencing crisis managers (N = 40,596) include any of the terms "folkhälsomyndighet*", "löfven", or "hallengren". Articles that reference actors from both groups are assigned to the group of medical experts. The error bars denote the 95 percent confidence interval. For a description of the language measures see Online Appendix C.