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The impact of the mass media on obstetricians' behavior in Norway

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Abstract

Little is known about how physicians and hospitals respond to the risk of being negatively exposed in the mass media. We assume that newspapers will cover events more closely in the areas where they have most of their circulation. Within such areas the likelihood of negative publicity increases. The research question is whether obstetricians respond to negative newspaper coverage by choosing the least risky method of delivery, i.e. Caesarean section. This was tested on a large set of data from the Medical Birth Registry of Norway for the period 2000-2011. The Registry contains detailed medical information about all deliveries, for both the mother and the infant. This set of data was merged with a set of data that contained information about newspaper coverage for the municipalities in which all hospitals were located. Altogether, more than 620 000 deliveries in 46 municipalities were included in the study. The data were analyzed using a hospital

fixed effects regression. The main result was that newspaper coverage had a significant positive effect on the probability of having a Caesarean section. Several supplementary analyses supported the main finding. Altogether, our results indicate that obstetricians are sensitive to the risk of being exposed in the mass media. This is likely to be because obstetricians care about their reputation.

Key words: Caesarean section, defensive medicine, mass media, newspaper coverage, doctors' reputation, public image

1. Introduction

Health care is regularly a top story in the news. Often, we see that physicians, hospital managers and elected politicians are publicly criticized for lengthy waiting times, low quality of services, and malpractice. The mass media appear to be a key mechanism for keeping physicians, hospital managers and elected politicians accountable. Yet little is known about how physicians and hospitals respond to the risk of being negatively exposed in the mass media.

At the same time, an expanding literature on political economy has addressed the impact of mass media on various policy outcomes. For example, Strömberg showed that access to radio induced US state governors to allocate greater amounts of New Deal spending [1]. Similar results have been obtained for newspapers. Snyder and Strömberg found that counties in the USA that were well covered by newspapers during the period 1991-2002 received more federal funding [2]. Similar results have been reported from other countries. Bruns and Himmler showed that an increase in local newspaper circulation induced Norwegian municipalities to improve efficiency in public service provision [3]. Based on data from India, Besley and Burgess indicated that newspaper circulation was positively related to calamity relief expenditure [4].

The key hypothesis in these studies derives from the political economy literature. We have used that literature as a starting point for our study. The underlying idea is that physicians care about their reputation, and therefore they want to avoid negative publicity in the mass media. One way to avoid negative

publicity is to practice defensive medicine. Defensive medicine has been studied extensively in the USA. The focus in most of the studies has been to examine whether physicians deviate from sound medical practice because they fear malpractice claims. In that case, physicians supply medical services of no or only marginal value because they want to reduce the risk of adverse outcomes [5]. For example, they may order more tests than are medically necessary or choose types of treatment with little risk of making errors.

We examined the effect of newspaper coverage on the probability of having a Caesarean section when giving birth. The setting for our study was the maternity services in Norway. We expect that obstetricians respond to negative publicity by choosing the least risky method of delivery, i.e. a Caesarean section. Following Snyder and Strömberg [2] and Bruns and Himmler [3], the key idea is that newspapers will cover events more closely in those areas where newspapers have most of their circulation. Within such areas the likelihood of negative publicity increases.

The choice of Caesarean section as our outcome measure was triggered by numerous studies that have shown that obstetrics is a specialty that is particularly impacted by defensive medicine [6-11]. In the case of a birth injury, the obstetrician is more likely to be suspected of negligence when the baby is delivered vaginally compared to by Caesarean section. For example, in one study from the USA failure to deliver the baby by Caesarean section was cited 10 times more often as the reason for a malpractice claim than failure to deliver vaginally [12]. Caesarean

section is meant to be a safer mode of delivery, mainly because the obstetrician has more control of the progress of the birth. In particular, the chances of asphyxia are greater when the mother has a vaginal delivery. Asphyxia is a risk factor for brain damage and perinatal death [13, 14]. The most important allegations of obstetric claims are for infants who are neurologically impaired, and for stillbirth and perinatal death [15]. Therefore, in a situation where the baby may be at risk, the obstetricians often follow the rule: “when in doubt, cut it out” [16]. In that case, concern about negative publicity may influence obstetricians to perform more Caesarean sections than are medically indicated.

Below, we first describe the main characteristics of the study population. We then describe the data and the empirical model. Finally, the results are presented and discussed.

1.1. Institutional setting

There are two advantages of using data from Norway for our study. First, Norwegians are avid newspaper readers [17]. Nearly 80% of people in the age group 15-79 years read at least one newspaper daily. The mean number of newspapers people read is 1.7, and each reader spends about 40 minutes per day reading newspapers. Nearly 80% of people subscribe to at least one newspaper. The newspaper landscape is diverse, with a few national newspapers and many local newspapers. The latter, encompassing nearly 200 newspapers, play a primary role in providing local information, including events at local hospitals [18]. Norway ranks

among the top countries in terms of press freedom. This means that the newspapers are not restricted in what they want to report, even if they are critical of the system/hospitals.

Second, births take place within a standardized institutional health care setting with public funding. There are no incentive-based payment systems for maternity care. Obstetricians receive a fixed salary, and there are no user fees. In that way, neither the obstetricians nor the women who give birth have any personal economic advantage of the type of delivery (Caesarean section or vaginal delivery). This reduces the possibility for bias in our results. For a detailed description of the organization and financing of the maternity services in Norway see: [19, 20].

2. Material and Methods

2.1. Data and key variables

In this study we used several sets of data to construct our key variables and to perform our analyses. A detailed description of the two main data sources and how our key variables were constructed is given below.

2.1.1. Data for construction of newspaper coverage

Our key independent variable, *newspaper coverage*, was derived from the database Aviskatalogen, which is maintained by Mediebedriftenes Landsforening (www.aviskatalogen.no). For each municipality, the database contained circulation

figures per edition for nearly all local newspapers, national newspapers and tabloids in Norway from 2000 and onwards. Bruns and Himmler have made a data file, which they generously made available to us, with the relevant circulation figures for newspapers for the period 2001-2005 [3]. We extended that file to include data for the period 2000-2011. Altogether, the data file then included 158 newspapers for 2000-2011.

The variable *newspaper coverage* was constructed in three steps. First, similar to Bruns and Himmler, we defined a new variable, termed *reach*, as: $\sum_n \text{circulation}_{ni}/\text{households}_i$ where *n* denotes newspapers and *i* denotes municipality [3]. Second, we defined a weighting variable *reader share* as the share of readers that newspaper *n* had in its municipality *i*: $\text{circulation}_{ni}/\sum_i \text{circulation}_{ni}$. Third, we multiplied *reach* by *reader share*, and denoted the new variable *newspaper coverage*. The latter variable takes into account that newspapers will give most cover contextually to events in municipalities where the sale is large. Conversely, there will be less reporting from municipalities where there is little sale. Snyder and Strömberg have given convincing evidence that this is the case [2].

2.1.2. Data on Caesarean section and risk factors

The core set of data for our analyses was the Medical Birth Registry of Norway (MBRN) (www.fhi.no). MBRN contains detailed medical information about all deliveries in Norway – further details are given below. Maternity units report all births to MBRN [21]. During the period 2000-2011, MBRN encompassed more than

620 000 deliveries in the 48 hospitals. MBRN was merged with the set of data that contained information about *newspaper coverage* for the municipalities in which the hospitals were located. Three hospitals were located in the same municipality, hence our set of data encompassed 46 municipalities.

2.2 Main analysis - empirical specification

Our outcome variable was the occurrence of Caesarean sections as opposed to vaginal deliveries. Let C_{ijt} = 1 if a mother delivered her infant by Caesarean section in hospital j in year t, and let C_{ijt} = 0 otherwise. The most comprehensive model specification can be written as:

$$\Pr(C_{ijt} = 1) = \alpha Newspaper\ coverage_{jt} + \sum_j \delta_j \cdot Hospital_j \ + Controls_{ijt} \ + \sum_t \delta_t\ Year\ dummy_t + \varepsilon_{ijt} \qquad (1)$$

In order to take account of potentially confounding effects, Equation (1) includes several controls. First, the equation includes fixed hospital effects. This was done in order to control for all time-invariant heterogeneity between hospitals, for example differences in the quality of obstetric care. In that way, unobserved characteristics that vary cross-sectionally between hospitals, are cancelled out. Second, the equation includes year dummies for each of the years 2001-2011. These were included to take account of events that can vary from year to year, but that affect all hospitals equally. Third, the equation includes controls for several risk factors of the infant and the mother. Previous research has shown that the

prevalence of the risk factors has changed over time [22]. Unless these factors are properly controlled for, our estimates for the effects of media coverage may be biased. The risk factors of the infant and the mother are well described in the literature, and have been shown to be correlated with Caesarean section.

Several medical conditions and socio-demographic factors are correlated with slow or no progress in labour or sign of fetal distress (for a review see: [23-25]). A Caesarean section is then indicated to prevent damage to the infant. The following risk factors of the mother were included in the analyses: age and the presence of predisposing factors such as preeclampsia and whether the mother had a chronic disease or not. The mothers were classified as having a chronic disease if they had one or more of the following diseases: asthma, diabetes, epilepsy, heart disease, chronic hypertension, chronic kidney failure, rheumatoid arthritis. Risk factors of the baby were low or high birthweight, short or long length of gestation, abnormal presentation and multiple births. The likelihood for a Caesarean section also increases if the mother has previously had a Caesarean section. Obstetricians might take the mother's preferences into account when deciding on mode of delivery [26, 27]. Previous research has shown that these preferences are determined to a large extent by mothers' level of education and their immigrant background [22, 28, 29].

Equation (1) was specified as a linear probability model, where the standard errors were clustered on hospital [30]. Support for defensive medicine would imply that $\alpha > 0$. To test the robustness of our findings, we also present results without hospital fixed effects included in Model (1). The coefficient for the newspaper

coverage variable may be different in the regression without hospital fixed effects as opposed to in the regression with hospital fixed effects. If a difference exists, this may indicate differences in quality between hospitals.

Negative publicity in the media may lead to fewer adverse effects. We examined this by estimating the effect of newspaper coverage on fetal death. This was done by re-estimating Equation (1) with a binary dependent variable that had the value 1 if the baby was stillborn, 0 otherwise.

2.3. Supplementary analyses

We performed supplementary analyses. The set of data that we used for these analyses and their empirical specification are described below.

2.3.1. Test for external validity

An underlying assumption for our study is that the variable *newspaper coverage* reflects the extent of adverse events covered in the newspapers. This was tested using data on the number of newspaper articles reporting adverse events. The data collection was done by the media research company Retriever (www.retriever-info.com). The sample encompassed the local and national newspapers and tabloids that were published in the municipalities in which the hospitals were located – altogether 137 newspapers for the period 2000-2005. Most of the articles contained factual information about the adverse events. For example, 30% of the articles described reports of adverse events from the hospital to the supervision

authorities, and warnings from the supervision authorities to the hospitals (for further details see Supplementary, Table 1).

The search for relevant newspaper articles encompassed adverse events related to *birth injury* and *complications during delivery*. The following key words were used: rupture, fetal/infant death, death of the mother, infections, pain and bleeding. Characteristic examples of the articles identified in the newspapers are shown in Supplementary, Fig. 1. For every hit, the name of the maternity unit/hospital was registered. Altogether 864 articles were identified, i.e. a mean of 19.6 articles per maternity unit. This set of data was merged with the set of data that contained information about *newspaper coverage*. We estimated a regression model in which newspaper coverage was the independent variable, and the number of newspaper articles was the dependent variable. The names of the gynaecologists were not given in the newspaper articles. This would not be in accordance with the Code of Ethics of The Norwegian Press (http://presse.no/pfu/etiske-regler/vaer-varsom-plakaten/vvpl-engelsk/). Therefore, the individual gynecologist could not be the unit of analysis in this supplementary analysis.

2.3.2. Who benefits the most from defensive medicine?

In Equation (1) we included an interaction term between *newspaper coverage* and mother's highest level of education (reference category: compulsory school). We estimated the following model:

$$\Pr(C_{ijt} = 1) = \alpha Newspaper\ coverage_{jt} + \gamma_1 University/college + \gamma_2 Upper\ secondary + \gamma_3 Newspaper \cdot University/college + \gamma_4 Newspaper \cdot Upper\ secondary + \sum_j \delta_j \cdot Hospital_j + Controls_{ijt} + \sum_t \delta_t\ Year\ dummy_t + \varepsilon_{ijt} \quad (2)$$

We would expect the sign of the regression coefficients γ_3 and γ_4 to be positive. In that case the newspaper effect would be strongest for the mothers with the highest education. These are resourceful women who can easily express their opinions to the newspaper if something goes wrong when they give birth. In Equation (2), we tested whether the obstetricians take this into account when deciding on mode of delivery. We also present results without hospital fixed effects included in Model (2).

2.3.3. A longer time series

Our main analysis is based on a fairly short time series, from 2001-2011. We wanted to test the robustness of our findings over a longer time span. Such data were available for only one newspaper, Verdens Gang. This is a tabloid newspaper that mostly covers national news.

For the period 1967-2011, we did a text search in Verdens Gang for the five largest hospitals in Norway: Aker University Hospital, Ullevål University Hospital,

Rikshospitalet University Hospital, Haukeland University Hospital and St. Olav's University Hospital (www.retriever-info.com). During that period, 23 per cent of all deliveries in Norway occurred in these hospitals. From the search in Verdens Gang, we created a variable that measured the annual number of newspaper articles in which the hospitals had been mentioned. That set of data was merged with data from MBRN. In that way, we were able to run fixed-effects regression over 45 years, encompassing 605 053 deliveries.

The issue we examined was whether more newspaper articles in which the hospitals had been mentioned led to more defensive medicine, independent of type of article. We estimated the following fixed effects regression for the five largest hospitals:

$$\Pr(C_{ijt} = 1) = \theta Newspaper\ articles_{jt} + \sum_j \varphi_j Hospital_j^j + Controls_{ijt} + \sum_t \delta_t\ Year\ dummy_t + \varepsilon_{ijt} \quad (3)$$

The coefficient θ measures the effect that the annual number of newspaper articles in which the hospitals had been mentioned has on mode of delivery. We expect this coefficient to be positive. The standard errors were clustered at the hospital level [30]. We also present results without hospital fixed effects included in Model (3).

3. Results

3.1. Descriptive results

In Supplementary, Fig. 2 we show the level of *newspaper coverage* for 2005 for each of the 46 municipalities in which the hospitals were located. The index of *newspaper coverage* shows marked variation. For example, for 18 of the municipalities the index value was less than 0.35, and for 13 the value was 0.50 or larger.

3.2. Main results

Newspaper coverage had a positive and significant effect on the probability of having a Caesarean section (Table 1). The sizes of the regression coefficients were fairly similar in both models, with and without hospital fixed effects included. This indicates that, after controlling for a large number of medical risk factors of the infant and the mother, the difference in quality between the hospitals is small.

(Table 1 here)

The regression coefficient was 0.058 in the model with hospital fixed effects. This figure is equal to the difference in having a Caesarean section for mothers who live in a municipality without newspaper coverage compared to mothers who live in a municipality where the coverage is equal to 1. This finding, illustrated in a different way, is that an increase in one standard deviation in *newspaper coverage* (= 0.2) leads to an increase in the probability of having a Caesarean section of 0.01.

The effects of the control variables were as expected. Older mothers have more Caesarean sections than younger mothers, and mothers with a university/college education have fewer Caesarean sections than mothers with compulsory school education only. Small babies are more often delivered by Caesarean section compared to babies of normal birth weight. Preeclampsia, previous Caesarean section, abnormal presentation and multiple births increase the probability of having a Caesarean section.

Newspaper coverage had no statistically significant effect on fetal death (Table 1). This indicates that negative publicity in the media does not necessarily lead to fewer adverse events.

3.3. Supplementary analyses

In Table 2, we show the relationship between *newspaper coverage* and the number of newspaper articles that deal with birth injury and complications during delivery. The regression coefficient was positive, and statistically significant at conventional levels. The size of the coefficient is 16. This implies that an increase of one standard deviation in *newspaper coverage* (= 0.2) leads to an increase of about 3 newspaper articles that deal with birth injury and complications during delivery.

(Table 2 here)

The results from the analyses where *newspaper coverage* was interacted with mother's highest level of education are presented in Table 3. The interaction terms

had the correct sign and were statistically significant at conventional levels. This was the case in both model specifications, with and without hospital fixed effects included.

(Table 3 here)

The annual number of newspaper articles in Verdens Gang in which the five hospitals had been mentioned over time is shown in Supplementary, Fig. 3. For these five hospitals there was a marked increase in the number of articles from the early 1990s. This increase was particularly large for Ullevål University Hospital and Rikshospitalet University Hospital. From the late 1990s the number of articles levelled off for most of the other hospitals.

The annual number of newspaper articles in Verdens Gang had a positive and statistically significant effect ($p<0.05$) on the probability of having a Caesarean section (Table 4). This was the case in both models, with and without hospital fixed effects included. The size of the regression coefficient was slightly larger in the model without hospital fixed effects included. All the control variables had the expected sizes and signs.

(Table 4 here)

4. Discussion

Our results indicate that obstetricians are sensitive to the risk of being exposed in the mass media. They are more likely to practice defensive medicine when the

likelihood of negative publicity increases. Our results complement recent findings within the field of political economy [1-4]. These studies indicate that elected representatives are responsive to the needs and the preferences of their constituency when they are closely monitored by the media. The media provide information, which puts voters in a position where they can keep their representatives accountable. The results from the present study indicate that the results from the field of political economy also apply in health care. Since the publicly-owned hospital is one of the most exposed institutions in the mass media, it is perhaps not surprising that the media contribute to hospital accountability. This is supported by a survey of hospital directors in Norway that examined how different sources contacted hospital directors in order to try to influence them to alter their activities or priorities (Supplementary, Fig. 4). The most frequent source was the mass media [31]. Our findings are consistent with this result.

The driving force behind our results is likely to be that obstetricians care about their reputation. This could partly be because good reputation is important for establishing a trustworthy doctor patient relationship, which further forms the basis for good medical practice. In that way our results support previous research, which has shown that doctors are concerned about their public image, and how their image can be undermined by negative publicity [32-34]. In our setting this means that obstetricians opt for the least risky method of delivery, i.e. a Caesarean section.

There are at least two other ways that might lead the obstetricians to practice defensive medicine: fear of malpractice claims and fear that pregnant women select

another hospital for giving birth [35, 36]. Both these reasons are unlikely. First, obstetricians have no personal responsibility for compensation, either for the mother or the hospital, if something goes wrong with the delivery [37]. In Norway, there is a public body (the Norwegian System of Compensation to Patients), which is responsible for compensation for all types of incorrect medical treatment (http://www.npe.no/). Therefore, obstetricians can recommend the type of delivery on the basis of medical criteria, without taking account of the risk of claims for compensation against themselves in the case of an adverse event. Second, there is little competition between hospitals for women giving birth. The country is divided into hospital areas in which the capacity of maternity units is planned according to the expected number of births within the catchment area. As a general rule, women give birth at the maternity unit in their catchment area [38]. Only a very small proportion (less than 5 %) give birth outside their catchment area [39]. Therefore, the fear that pregnant women select another hospital for giving birth is not likely to influence the obstetricians to practice defensive medicine.

Decisions about type of delivery should be determined on the basis of medical criteria only. This is not always the case. Obstetricians' fear of negative publicity drives them to practice defensive medicine (Table 1). This has, at least two implications: First, it leads to a too high Caesarean section rate in most countries [40-45]. For example, Caesarean sections are now performed in over 22 per cent of all births in Great Britain [43] and in 30 per cent of all births in the USA [42]. With this high rate of Caesarean section, the cost of maternity care has also markedly increased [46]. Second, Caesarean sections that are performed for non-medical

reasons, may have adverse side effects, such as: increased risk of stillbirth in the next pregnancy, reduced fertility, and allergy or asthma in the child [47-52]. Therefore, there are good reasons to be critical of the way the media try to influence obstetricians' medical decision making. This is further supported by our results, which show that the media had no effect on the quality of the services in terms of a reduction in fetal deaths (Table 1).

Media attention appears to benefit educated mothers more than those with less education. In a broader perspective, this accentuates the distributional effects of the media, in particular whether media attention can explain why some patients get more costly medical care than others. This relates to the broader question of cost control in the health care sector, and the role of the media in explaining the spiraling increase in health care spending. It would therefore be of great interest to explore this further.

Our analyses have some strengths that make the results credible. First, the study was carried out in a homogenous population in which neither the obstetrician nor the mother had economic incentives that could influence their choice of method of delivery. Second, our data contain a large number of medical control variables at the individual level, both for the mother and the infant. Third, we performed supplementary analyses, in which the results supported our main findings. In particular, our analyses for the five hospitals for the period 1967-2011, provided additional evidence that obstetricians are sensitive to the risk of being exposed in the mass media (Table 4).

5. Conclusion

In conclusion, we found that the mass media matter, and that the media seem to influence obstetricians' behaviour. In order to avoid negative publicity, obstetricians tend to practice defensive medicine. Thus, our results highlight a potential mechanism that may partly explain the increase in the number of Caesarean sections in most western countries during the last decades. We believe that our study is important, as it is one of the first of its kind to measure the potential power of the media in influencing medical decision making. This is an important area for future research, not least because the health care sector has become much more open and transparent to the public over the past few years.

References

[1] Strömberg D. Radios impact on public spending. Quarterly Journal of Economics 2004;119(1):189-221.

[2] Snyder JM, Strömberg D. Press coverage and political accountability. Journal of Political Economy 2010;118(2):355-408.

[3] Bruns C, Himmler O. Newspaper circulation and local government efficiency. Scandinavian Journal of Economics 2011;113(2):470-92.

[4] Besley T, Burgess R. 2002. The political economy of government responsiveness: theory and evidence from India. Quarterly Journal of Economics 2002;117(4):1415-51.

[5] Studdert DM, Mello MM, Sage WM, DesRoches CM, Peugh J, Zapert K, Brennan TA. Defensive medicine among high-risk specialist physicians in a volatile malpractice environment. Journal of American Medical Association 2005;293(21):2609-17.

[6] Localio AR, Lawthers AG, Bengtson JM, Herbert LE, Weaver SL, Brennan TA, Landis RJ. Relationship between malpractice claims and cesarean delivery. Journal of American Medical Association 1993;269(3):366-73.

[7] Tussing AD, Wojtowycz MA. Malpractice, defensive medicine, and obstetric behavior. Medical Care 1997;35(2):172-91.

[8] Dubay L, Kaestner R, Waidmann T. The impact of malpractice fears on cesarean section rates. Journal of Health Economics 1999;8(4):491-522.

[9] Grant D, McInnes MM. Malpractice experience and the incidence of cesarean delivery: a physician-level longitudinal analysis. Inquiry 2004;41(2):170-88.

[10] Shelton Brown H. Lawsuit activity, defensive medicine, and small area variation: the case of cesarean sections revisited. Health Economics, Policy and Law 2007;2(3):285-96.

[11] Shurtz I. The impact of medical errors on physician behavior: evidence from malpractice litigation. Journal of Health Economics 2013;32(2):331-40.

[12] Kravitz RL, Rolph JE, McGuigan K. Malpractice claims data as a quality improvement tool. I. Epidemiology of error in four specialties. Journal of American Medical Association 1991;266(15):2087-92.

[13] MacDonald HM, Mulligan JC, Allen AC, Taylor PM. Neonatal asphyxia. I. Relationship of obstetric and neonatal complications to neonatal mortality in 38 405 consecutive deliveries. The Journal of Pediatrics 1980;96(5):898-902.

[14] Finer NN, Robertson CM, Richards RT, Pinnell LE, Peters KL. Hypoxic-ischemic encephalopathy in term neonates: perinatal factors and outcome. The Journal of Pediatrics 1981:98(1):112-7.

[15] Klagholz J, Strunk AL. Overview of the 2012 ACOG survey on professional liability. 2012. Avaiable at: https://www.acog.org/About_ACOG/ACOG_Districts/District_II/~/media/Departments/Professional%20Liability/2012PLSurveyNational.pdf [accessed 24.11.2016].

[16] Cyr R. Myth of the ideal cesarean section rate: commentary and historic

perspective. American Journal of Obstetrics and Gynecology 2006;194(4):932-6.

[17] Høst S, Vaage OF. 2010. Aviser – opplag, lesning, abonnement. Avislesing ikke lenger for alle. Samfunnsspeilet. 2010;(4). Available at: https://www.ssb.no/a/samfunnsspeilet/utg/201004/03/ [accessed 24.11.2016].

[18] Høst S. Avisåret 2013. Rapport nr 48. Høgskolen i Volda. 2014. Available at: http://www.hivolda.no/neted/services/file/?hash=055efcc72eada8a858d29161f3666889 [accessed 24.11.2016].

[19] Ministry of Health. Behovsbasert finansiering av spesialisthelsetjenesten. Oslo: Ministry of Health; 2002.

[20] Grytten J, Monkerud L, Skau I, Sørensen R. Regionalization and local hospital closure in Norwegian maternity care – the effect on neonatal and infant mortality. Health Services Research 2014;49(4):1184-1204.

[21] Irgens LM. The Medical Birth Registry of Norway. Epidemiological research and surveillance throughout 30 years. Acta Obstetricia et Gynecologica Scandinavica 2000;79(6):435-9.

[22] Grytten J, Skau I, Sørensen R. Do expert patients get better treatment than others? Agency discriminination and statistical discrimination in obstetrics. Journal of Health Economics 2011;30(1):163-80.

[23] Menacker F, Declercq E, MacDorman MF. Cesarean delivery: background, trends, and epidemiology. Seminars in Perinatology 2006;30(5):235-41.

[24] Kolås T, Hofoss D, Daltveit AK, Nilsen ST, Henriksen T, Häger R, et al. Indications for cesarean deliveries in Norway. American Journal of Obstetrics and Gynecology 2003;188(4):864-70.

[25] Penn Z, Ghaem-Maghami S. Indications for caesarean section. Best Practice & Research Clinical Obstetrics & Gynaecology 2001;15(1):1-15.

[26] Paterson-Brown S. Should doctors perform an elective caesarean section om request? Yes, as long as the woman is fully informed. BMJ 1998;317:462-5.

[27] Marx H, Wiener J, Davies N. A survey if the influence of patients' choice on the increase in the caesarean section rate. Journal of Obstetrics and Gynaecology 2001;21(2):124-27.

[28] Grytten J, Skau I, Sørensen R. Do mothers decide? The impact of preferences in healthcare. Journal of Human Resources 2013;48(1):142-68.

[29] Habiba M, Kaminski M, Da Fré M, Marsal K, Bleker O,Librero H, et al. Caesarean section on request: a comparison of obstetricians' attitudes in eight European countries. BJOG 2006;113(6):647-56.

[30] Cameron AC, Miller DL. A practioner's guide to cluster-robust inference. Journal of Human Resources 2015;50(2):317-72.

[31] Ministry of Health and Social Affairs. Hvor nært skal det være? NOU 1999:15. Oslo: Ministry of Health and Social Affairs;1999, p. 156-7.

[32] Hibbard JH, Stockard J, Tusler M. Hospital performance reports: impact on quality, market share and reputation. Health Affairs 2005;24(4):1150-60.

[33] Riewpaiboon W, Chuengsatiansup K, Gilson L, Tangcharoensathien V. Private obstetric practice in a public hospital: mythical trust in obstetric care. Social Science and Medicine 2005;61(7):1408-17.

[34] Sage WM. Reputation, malpractice liability, and medical error. In: Sharpe VA, editor. Accountability: Patient safety and policy reform. Washington, D.C.: Georgetown University Press; 2004. p. 159-3. Available at: http://ssrn.com/abstract=681925 [accessed 24.11.2016].

[35] Berwick DM, James B, Coye MJ. Connections between quality measurement and improvement. Medical Care 2003;41(1):I-30-I38.

[36] Baldwin LM, Hart LG, Lloyd M, Fordyce M, Rosenblatt RA. Defensive medicine and obstetrics. JAMA 1995;274(20):1606-10.

[37] Jørstad RG, Thomsen MW, Foyn T, Hagen B, Øian P, Eraker R. Norsk pasientskadeerstatning – en kilde til læring. The Journal of the Norwegian Medical Association 2007;127(6):760-2.

[38] Ministry of Health and Care Services. En gledelig begivenhet. St. meld. Nr. 12 (2008-2009). Oslo: Ministry of Health and Care Services; 2009, p. 41-51.

[39] Christensen Ø. Fritt sykehusvalg i Norge. SINTEF Rapport A6256. Oslo/Trondheim: SINTEF; 2004.

[40] Belizán JM, Althabe F, Barros FC, Alexander S. Rates and implications of Caesarean sections in Latin America: ecological study. BMJ 1999;319:1397-1400.

[41] Leone T, Padmas SS, Matthews Z. Community factors affecting rising caesarean section rates in developing countries: an analysis of six countries. Social Science & Medicine 2008;67(8):1236-46.

[42] MacDorman MF, Menacker F, Declercq E. Cesarean birth in the United States; epidemiology, trends, and outcomes. Clinics in Perinatology 2008;35(2):293-307.

[43] Mayor S. Caesarean section rate in England reaches 22%. BMJ 2002;324:1118.

[44] WHO. Appropriate technology for birth. *Lancet* 1985;326(8452):436-7.

[45] WHO. Indicators to monitor maternal health goals: report of a technical working group**.** WHO/FHE/MSM/94.14. Geneva: WHO;1994.

[46] Henderson J, McCandlish R, Kumiega L, Petrou S. Systematic review of economic aspects of alternative modes of delivery. BJOG 2001;108(2):149-57.

[47] Häger RME, Daltveit AK, Hofoss D, Nilsen ST, Kolaas T, Øian P, et al. Complications of cesarean deliveries: Rates and risk factors. American Journal of Obstetrics and Gynecology 2004;190(2):428-34.

[48] Gray R, Quigley MA, Hockley C, Kurinczuk JJ, Goldcare M, Brocklehurst P. Caesarean delivery and risk of stillbirth in subsequent pregnancy: a retrospective cohort study in an English population. BJOG 2007;114(3):264-70.

[49] Hansen AK, Wisborg K, Uldbjerg N, Henriksen TB. Risk of respiratory morbidity in term infants delivered by elective caesarean section: cohort study. BMJ 2008;336:85-7.

[50] MacDorman MF, Declercq E, Menacker F, Malloy MH. Neonatal mortality for primary cesarean and vaginal births to low-risk women: application of an “intention-to-treat” model. Birth 2008;35(1):3-8.

[51] Oral E, Elter K. The impact of cesarean birth on subsequent fertility. Current Opinion in Obstetrics Gynecology 2007;19(3):238-43.

[52] Salam MT, Margolis HG, McConnell R, McGregor JA, Avol EL, Gilliland FD. Mode of delivery is associated with asthma and allergy occurrences in children. Annals of Epidemiology 2006;16(5):341-46.

Table 1

The effect of newspaper coverage on the probability of having a Caesarean section and on the probability of fetal death. Regression coefficients with standard errors in brackets.

Variables	Caesarean section		Fetal death	
Newspaper coverage	0.046	**	0.058	**	-0.0035	
	(0.021)		(0.030)		(0.0026)	
Characteristics of the mother:						
Age:[1]						
31-35 years	0.039	***	0.037	***	0.0005	***
	(0.002)		(0.002)		(0.0001)	
> 35 years	0.091	***	0.088	***	0.0011	***
	(0.004)		(0.003)		(0.0003)	
Mother's highest education:[2]						
University/college education	-0.022	***	-0.022	***	-0.0004	*
	(0.002)		(0.002)		(0.0002)	
Upper secondary school education	-0.004	**	-0.004	**	0.0001	
	(0.002)		(0.002)		(0.0002)	
Immigrant background:						
Non-western immigrant	0.038	***	0.035	***	0.0007	**
	(0.004)		(0.005)		(0.0002)	
Western immigrant	0.013	***	0.012	***	0.0006	**
	(0.003)		(0.002)		(0.0003)	
Predisposing factors - mother:						
Preeclampsia[3]	0.147	***	0.147	***	-0.0070	***
	(0.005)		(0.005)		(0.0004)	
Chronic disease[4]	0.035	***	0.035	***	-0.0002	
	(0.004)		(0.004)		(0.0002)	
Risk factors of the infant:						
Birth weight:[5]						
< 2500 g	0.131	***	0.131	***	0.0303	***
	(0.008)		(0.008)		(0.0021)	
Gestation length:[6]						
< 37 weeks	0.093	***	0.092	***	0.0130	***
	(0.007)		(0.007)		(0.0010)	
> 41 weeks	0.043	***	0.043	***	-0.0003	
	(0.003)		(0.003)		(0.0002)	
Abnormal presentation[7]	0.344	***	0.343	***	0.0043	***
	(0.008)		(0.008)		(0.0005)	
Multiple baby birth	0.092	***	0.091	***	-0.0145	***
	(0.010)		(0.009)		(0.0011)	
Caesarean section previously	0.389	***	0.387	***	-0.0002	
	(0.009)		(0.010)		(0.0003)	

Hospitals fixed effects	No	Yes	Yes
Number of deliveries	620 691	620 691	620 691
Number of hospitals	48	48	48

Notes: Regression coefficients with standard errors clustered by hospitals in brackets. Fixed effects for year included (2000-2011).

[1] Reference category: < 30 years

[2] Reference category: compulsory school education

[3] Including unspecified, mild and severe preeclampsia

[4] Whether the mother has one or more of the following diseases: asthma, diabetes, epilepsy, heart disease, chronic hypertension, chronic kidney failure, rheumatoid arthritis

[5] Reference category: ≥ 2500 g

[6] Reference category: 37-41 weeks

[7] Including breech presentation, transverse presentation, abnormal cephalic presentation and other.

* p≤0.10, ** p≤=0.05, *** p≤0.001.

Table 2

Newspaper coverage and number of newspaper articles dealing with birth injury and complications during delivery.

Variables	Regression coefficients
Intercept	-4.38
	(3.70)
Newspaper coverage	16.81 *
	(8.44)
Number of hospital years	276

Notes: Regression coefficients with standard errors clustered by hospitals in brackets. Fixed effects for year included (2000-2005.)

* p≤=0.05

Table 3

Newspaper coverage, mother's highest education and the probability of having a Caesarean section.

Variables	Regression coefficients			
Newspaper coverage	0.028		0.038	
	(0.019)		(0.027)	
Mother's highest education:[1]				
University/college education	-0.038	***	-0.032	***
	(0.005)		(0.004)	
Upper secondary school education	-0.016	***	-0.014	***
	(0.003)		(0.003)	
Interaction terms:				
Newspaper coverage * University/college education	0.026	**	0.016	*
	(0.011)		(0.009)	
Newspaper coverage * Upper secondary school education	0.018	**	0.018	**
	(0.008)		(0.008)	
Hospitals fixed effects	No		Yes	
Number of deliveries	620 691		620 691	
Number of hospitals	48		48	

Notes: Regression coefficients with standard errors clustered by hospitals in brackets. Fixed effects for year (2000-2011). All control variables reported in Table 1 are included in the analyses

[1] Reference category: compulsory school education

* p≤0.10, ** p≤=0.05, *** p≤0.001

Table 4

Number of newspaper articles in *Verdens Gang* and the probability of having a Caesarean section.

Variables	Regression coefficients			
Number of newspaper articles/100	0.025	**	0.013	**
	(0.008)		(0.004)	
Characteristics of the mother:				
Age:				
31-35 years	0.041	***	0.039	***
	(0.003)		(0.003)	
> 35 years	0.100	***	0.098	***
	(0.006)		(0.006)	
Mother's highest education:				
University/college education	-0.009	**	-0.012	***
	(0.004)		(0.003)	
Upper secondary school education	-0.001	**	-0.002	***
	(0.001)		(0.001)	
Immigrant background:				
Non-western immigrant	0.037	***	0.029	***
	(0.009)		(0.009)	
Western immigrant	0.012	***	0.008	**
	(0.003)		(0.003)	
Predisposing factors - mother:				
Preeclampsia	0.162	***	0.162	***
	(0.012)		(0.012)	
Chronic disease	0.053	***	0.052	***
	(0.005)		(0.006)	
Risk factors of the infant:				
Birth weight:				
< 2500 g	0.113	***	0.113	***
	(0.001)		(0.001)	
Gestation length:				
< 37 weeks	0.092	***	0.091	***
	(0.001)		(0.002)	
> 41 weeks	0.021	***	0.022	***
	(0.001)		(0.001)	
Abnormal presentation	0.264	***	0.266	***
	(0.032)		(0.032)	
Multiple baby birth	0.085	***	0.085	***
	(0.006)		(0.006)	

Caesarean section previously	0.397	***	0.396	***
	(0.018)		(0.018)	
Hospitals fixed effects	No		Yes	
Number of deliveries	605 053		605 053	
Number of hospitals	5		5	

Notes: Regression coefficients with standard errors clustered by hospitals in brackets. Fixed effects for year included (1967-2011).

Hospitals: Aker University Hospital, Ullevål University Hospital, Rikshospitalet University Hospital, Haukeland University Hospital, St. Olavs University Hospital.

For variable definitions see footnotes in Table 1.

* p≤0.10, ** p≤=0.05, *** p≤0.001

Figure captions (Supplementary content):

Fig. 1. Characteristic examples of the articles identified in the newspapers

Fig. 2. Distribution of newspaper coverage for the municipalities in which the hospitals were located.

Fig. 3. Number of newspaper articles dealing with each of the 5 largest hospitals in Norway.

Fig. 4. Mean number of contacts from different sources with hospital directors.

DØDFØDSEL KOSTET MAMMA LIVET

VG, 19.09.2000.

"Mother died after stillbirth"

Mor og barn døde under fødsel

Bergensavisen, 03.03.2003.

"Mother and child died during childbirth"

DØDE

på operasjonsbordet: Trebarnsmor blødde trolig i hjel etter fødsel

VG, 22.05.2003.

"Died on the operating table. Mother of three bled to death after giving birth"

Agderposten

Fødeavdelingen får kritikk av Helsetilsynet

Agderposten, 17.01.2005.

"Maternity unit receives criticism from the supervision authority"

Ufør av dødfødsel - millionerstatning etter legetabbe

VG, 06.10.2003

"Mother disabled after a stillbirth - awarded compensation after medical mistake"

Stavanger Aftenblad

Rekorderstatning etter fødselsskade

Stavanger Aftenblad, 04.05.2005.

"Record compensation for birth injury"

Gransking etter at nyfødd døydde

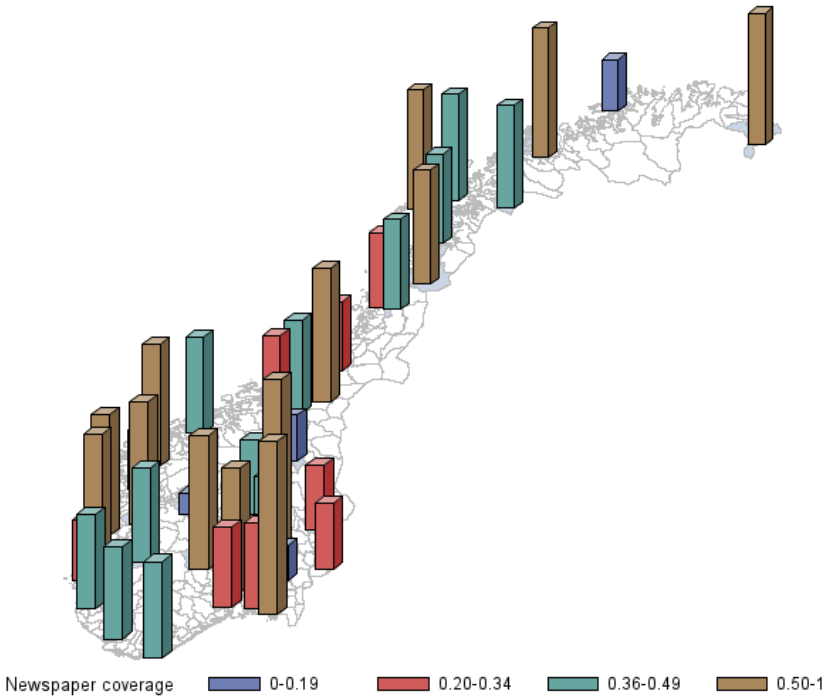
NRK, 26.05.2004.

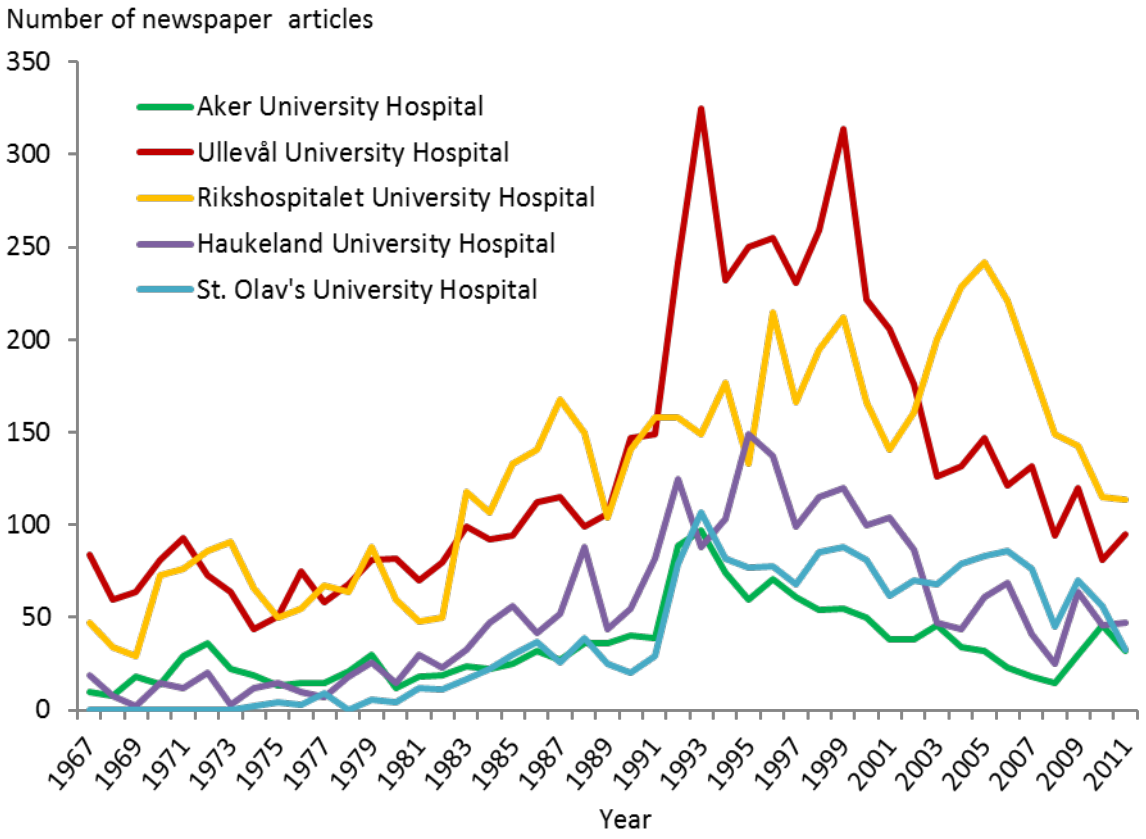
"Investigation after baby died"

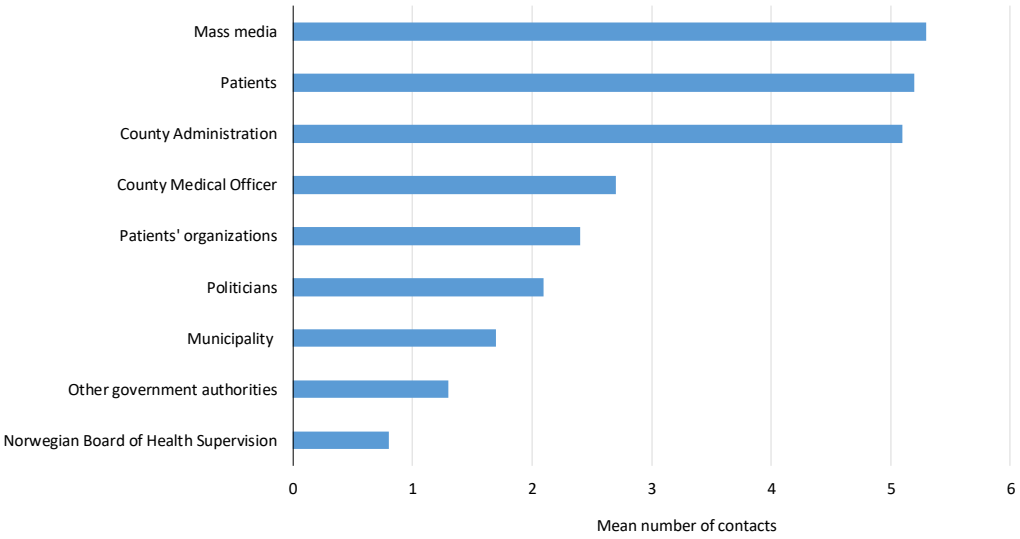
Helsetilsynet ber om tiltale mot lege

Sunnmørsposten, 01.11.2002.

"The Norwegian Health Supervision Authority requests investigation of an obstetrician"


Newspaper coverage
0-0.19
0.20-0.34
0.36-0.49
0.50-1


Number of newspaper articles
350
300
250
200
150
100
50
0
Aker University Hospital
Ullevål University Hospital
Rikshospitalet University Hospital
Haukeland University Hospital
St. Olav's University Hospital
1967
1969
1971
1973
1975
1977
1979
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
Year


Mass media
Patients
County Administration
County Medical Officer
Patients' organizations
Politicians
Municipality
Other government authorities
Norwegian Board of Health Supervision
0
1
2
3
4
5
6
Mean number of contacts

Supplementary Table 1
The consequences of the adverse events reported in the newspapers

Consequence	Per cent (n=864)
Reports of adverse events from the hospital to the supervision authority	27
Warnings from the supervision authority to the hospitals	2
Change of hospital routines ordered by the supervision authority	38
Patient compensation	17
No consequence/dismissed	8
Other	9
Total	100