Does Attorney Advertising Stimulate Adverse Event Reporting?

ELIZABETH C. TIPPETT & BRIAN K. CHEN*

ABSTRACT

Law firms and legal referral companies spend about $114 million per year[1] on television advertisements soliciting patients for mass tort lawsuits against drug companies and medical device makers ("drug injury advertising").[2] These advertisements warn viewers about a particular adverse event associated with a drug or medical device, and advise them to call the number listed on-screen if they have experienced that adverse event.[3]

This study is the first to investigate whether drug injury advertising volume is associated with increased adverse event reporting through the Federal Adverse Event Reporting System (FAERS). The study analyzed 412,901 adverse event reports to FAERS, involving twenty-eight groups of drugs targeted in drug injury advertising over a one-year period. These individual reports were then aggregated on a weekly and monthly basis and analyzed to test associations between FAERS reporting volume and attorney advertising volume, relative Google search volume, media hits, and Food and Drug Administration (FDA) safety interventions. The study revealed no significant relationship between drug injury advertising volume and the volume of adverse event reports. By contrast, FDA safety actions, Google search volume, and media hits were positively correlated with FAERS reports.

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* Elizabeth C. Tippett, Associate Professor, University of Oregon School of Law; Brian K. Chen, Associate Professor, Arnold School of Public Health, University of South Carolina. The authors have no conflicts of interest to disclose. We are grateful to Jacob Woods for processing the raw data from the FAERS database, Alexander Baker for research assistance with the media variable, and to Hayley Porter and Jordan Couey for research assistance with the citations. We are also grateful to the anonymous reviewers for their helpful feedback.

[1] *Examining Ethical Responsibilities Regarding Attorney Advertising: Hearing before the H. Judiciary Comm.'s Subcomm. on the Constitution and Civil Justice* (2017) (statement of Elizabeth Tippett, Associate Professor, Univ. of Or. Sch. of Law).

[2] Jesse King & Elizabeth Tippett, *Drug Injury Advertising*, 18 YALE J. OF HEALTH POL'Y, L. & ETHICS 114, 114 (2019).

[3] Elizabeth Tippett, *Medical Advice from Lawyers: A Content Analysis of Advertising for Drug Injury Lawsuits*, 41 AM. J. L. & MED. 7, 8–9 (2015); Daniel M. Schaffzin, *Warning: Lawyer Advertising May Be Hazardous to Your Health! A Call to Fairly Balance Solicitation of Clients in Pharmaceutical Litigation*, 8 CHARLESTON L. REV. 319, 324–25 (2013-14); Lars Noah, *Giving Personal Injury Attorneys Who Run Misleading Drug Ads a Dose of Their Own Medicine*, 2019 U. ILL. L. REV. 701, 704 (2019).

I. INTRODUCTION

A. Adverse Event Detection and Reporting

The informational ecosystem associated with drug-related adverse events is complex. Many adverse events only emerge after a drug has already received marketing approval from the FDA.[4] The limited nature of premarketing clinical trials means that rare adverse events, especially those arising from long-term use, or those affecting only certain subpopulations, may not be discovered until months or years after a drug is approved.[5] Premarketing studies also do not detect adverse events associated with subsequent off-label use, which is estimated to account for 25-60% of prescriptions.[6]

The FDA's adverse event reporting system is mandatory for manufacturers and distributors but voluntary for patients and medical professionals.[7] Consequently, only a small fraction of adverse events is reported through the FDA's adverse event reporting system. Studies from the early 2000s estimated reporting rates between one and ten percent of all adverse events.[8] Reports have however increased substantially since that time, primarily through increased reporting by consumers.[9]

Adverse event reports can arise spontaneously, for example, when a patient presents at a physician's office with a condition the physician attributes to a drug regimen and reports it through FAERS.[10] Other times, academics[11] or the FDA[12] might detect a safety signal through pharmacovigilance databases. The dissemination of information

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[4] Brian K. Chen & Tony Yang, *Post-Marketing Surveillance of Prescription Drug Safety: Past, Present, and Future*, 34 J. LEGAL MED. 193, 197 (2013).

[5] *Id.*; *see also* Jennifer S. Bard, *Putting Patients First: How the FDA Could Use its Existing Power to Reduce Post-Market Adverse Events*, 10 IND. HEALTH L. REV. 495, 504–06 (2013).

[6] Justin M. Mann, *FDA Adverse Event Reporting System: Recruiting Doctors to Make Surveillance a Little Less Passive*, 70 FOOD & DRUG L. J. 371, 377–78 (2015).

[7] *Id.* at 372; Margaret Gilhooley, *Addressing Potential Drug Risks: The Limits of Testing, Risk Signals, Preemption, and the Drug Reform Legislation*, 59 S.C. L. REV. 347, 361, 377 (2008); 21 C.F.R. § 803.3 (2019) (manufacturers of medical devices required to report adverse events); Phil B. Fontanarosa et al., *Postmarketing Surveillance-Lack of Vigilance, Lack of Trust*, 292 J. AM. MED. ASS'N 2647, 2647 (2004); Kelly Jones & Frederick Fern, *'AER'ing on the Side of Caution: Complying with the FDA's Adverse Event Reporting System*, 50(2) FOR THE DEFENSE (2008) (discussing law requiring over-the-counter drug manufacturers and distributors to submit adverse event reports to the FDA).

[8] Mann, *supra* note 6, at 381; U.S. Gen. Accounting Office, *Adverse Drug Effects: Substantial Problem but Magnitude Uncertain*, GAO (2000), https://www.gao.gov/assets/110/108212.pdf [https://perma.cc/U94J-9ZU3]; Mara McAdams et al., *Estimating the Extent of Reporting to FDA: A Case Study of Statin-Associated Rhabdomyolysis*, 17 PHARMACOEPIDEMIOLOGY & DRUG SAFETY 229, 234 (2008); *In re Zyprexa Products Liability Litigation*, RICO Business Disputes Guide 11559 (2008) ("reported events are thought to represent only 1% to 10% of total complications"). *See also* H. Denman Scott et al., *Rhode Island Physicians' Recognition and Reporting of Adverse Drug Reactions*, 70 R.I. MED. J. 311 (1987).

[9] Mann, *supra* note 6, at 381.

[10] Gilhooley, *supra* note 7, at 361 ("The present system largely depends upon spontaneous adverse event reports.").

[11] Brian K. Chen et al., *Key Elements in Adverse Drug Reactions Safety Signals: Application of Legal Strategies*, 171 CANCER TREATMENT RES. 47 (2019).

[12] *FDA's Sentinel Initiative*, U.S. FOOD & DRUG ADMIN. (2018) www.fda.gov/safety/fdas-sentinel-initiative [https://perma.cc/J4H4-YACW].

about the potential risk through the media[13] or the FDA[14] can then generate further adverse event reporting.

B. The Hypothesized Role of Drug Injury Advertising

Researchers have documented a relationship between various informational sources and adverse event reporting. Initial FDA safety actions have been associated with increases in adverse event reports, though follow-up FDA safety actions do not appear to make a difference.[15] Researchers have also documented a link between media coverage and adverse event reporting.[16] In recent years, researchers have also examined how social media posts and Google searches relate to other drug safety communications[17] and how those might serve as an independent drug safety signal for researchers.[18] However, researchers have not yet examined the possible link, if any, between drug injury advertising and adverse event reporting.

Both the content and the volume of drug injury advertising render a hypothesized link between drug injury advertising and adverse event reporting plausible. The advertising places heavy emphasis on drug risks. A content analysis of drug injury advertisements on television found that, on average, they devoted more than twenty seconds of time to discussing the risks associated with a drug or medical device, "often . . . in stark, alarming terms."[19] Some of these ads use attention-getting language like "warning" or "consumer alert." They can also use ominous imagery to attract attention,

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[13] Elizabeth C. Tippett & Brian K. Chen, *Association of Attorney Advertising and FDA Action with Prescription Claims: A Time Series Segmented Regression Analysis*, 38 DRUG SAFETY 1169, 1172 (2015) (finding that "media hits appear to respond to, and in some cases precede regulatory action").

[14] The FDA disseminates new drug safety information in various ways, including through "Dear Health Care Provider" letters, requiring a Black Box warning, placing the drug on Risk Evaluation and Mitigation Strategy status ("REMS demand"), and/or requesting that a drug be relabeled. *Dear Health Care Provider Letters: Improving Communication of Important Safety Information*, U.S. FOOD & DRUG ADMIN. (2017), https://www.fda.gov/regulatory-information/search-fda-guidance-documents/dear-health-care-provider-letters-improving-communication-important-safety-information [https://perma.cc/ZJR2-J89M]; *Risk Evaluation and Mitigation Strategy*, U.S. FOOD & DRUG ADMIN. (2019), https://www.fda.gov/drugs/drug-safety-and-availability/risk-evaluation-and-mitigation-strategies-rems [https://perma.cc/LR3S-E5P7]; 21 C.F.R. § 201.57(c)(6)(i) (2019) ("the labeling must be revised to include a warning about a clinically significant hazard as soon as there is reasonable evidence of a causal association with a drug; a causal relationship need not have been definitely established").

[15] Keith Hoffman et al., *Stimulated Reporting: The Impact of US Food and Drug Administration-Issued Alerts on the Adverse Event Reporting System*, 37 DRUG SAFETY 971, 972 (2014) (summarizing literature); McAdams, *supra* note 8, at 234.

[16] Kate Faasse et al., *Bad News: The Influence of News Coverage and Google Searches on Gardasil Adverse Event Reporting*, 35 VACCINE 6872, 6873–74 (2017); Monsif Ben-Hamou et al., *Spontaneous Adverse Event Reports Associated with Zolpidem in Australia 2001-2008*, 20 J. OF SLEEP RES. 559, 562 (2011); Elaine Miller et al., *Chapter 21: Surveillance for Adverse Events Following Immunization Using the Vaccine Adverse Event Reporting System (VAERS)*, in VPD SURVEILLANCE MANUAL 7 (Sandra W. Roush et al. eds., Centers for Disease Control and Prevention 2017), https://www.cdc.gov/vaccines/pubs/surv-manual/chpt21-surv-adverse-events.pdf [https://perma.cc/8TKJ-EW5E].

[17] Michael S. Sinha et al., *Social Media Impact of the Food and Drug Administration's Drug Safety Communication Messaging about Zolpidem: Mixed-Methods Analysis*, 4 JMIR PUB. HEALTH & SURVEILLANCE 1, 4–6 (2018) (analyzing Google trends and social media posts before and after drug communications by the FDA).

[18] Mei Sheng Duh, *Can Social Media Data Lead to Earlier Detection of Drug-Related Adverse Events?*, 25 PHARMACOEPIDEMIOLOGY & DRUG SAFETY 1425, 1425–26 (2016).

[19] Tippett, *supra* note 3, at 21.

such as illustrations of blood or a stock image of a patient lying in a hospital bed.[20] The ads then ask viewers if they have taken the drug at issue and experienced an associated adverse event. For example, a drug injury advertisement for Xarelto features the header "Xarelto/Blood Thinner Injuries," with an illustration of a burst blood vessel.[21] It then warns that Xarelto has caused "uncontrollable bleeding, hemorrhaging and DEATH."

Drug injury advertising volume on television is quite high. Over a one-year period between 2015 and 2016, over 53,000 drug injury advertisements were broadcast on national cable and broadcast television.[22] Research confirms that exposure among relevant patient populations is quite high. A 2014 study of female patients in urology waiting rooms found that a majority (58%) reported that they first learned about pelvic mesh through drug injury advertisements.[23] A similar study conducted between 2014 and 2016 found that 88% of female urology patients surveyed had seen a drug injury advertisement about pelvic mesh and half reported having seen the ads more than once per week.[24]

The absence of scientific literature has not stopped parties from contesting the role of such advertising in mass tort litigation. Plaintiffs in such cases use adverse event reports to establish a causal link between the drug and the adverse event,[25] while drug makers insist that some of those reports were merely "stimulated"[26] by drug injury advertising.[27]

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[20] King & Tippett, *supra* note 2, at 120.

[21] *Id.* at 120.

[22] Tippett testimony, *supra* note 1, at 3.

[23] Michelle Elaine Koski et al., *Patient Perception of Transvaginal Mesh and the Media*, 84 FEMALE UROLOGY 572, 576 (2014). *See also* Christopher F. Tenggardjaja et al., *Evaluation of Patients' Perceptions of Mesh Usage in Female Pelvic Medicine and Reconstructive Surgery*, 85 FEMALE UROLOGY 326, 327 (2015).

[24] Elizabeth Tippett et al., *Does Attorney Advertising Influence Patient Perceptions of Pelvic Mesh?*, 111 UROLOGY 65, 68 (2018).

[25] David Faigman & Jennifer Mnookin, *The Curious Case of Wendell v. Glaxosmithkline LLC*, 48 SETON HALL L. REV. 607, 622–27 (discussing the limitations of using adverse event data to establish causation); Richard Goldberg, *Epidemiological Uncertainty, Causation, and Drug Product Liability*, 59 MCGILL L. J. 777, 813–14 (2014) (describing a causation model used in a medical device case where "a product . . . creates a material risk of an adverse event where the risk is at least twice the risk of the adverse event occurring in the absence of the product's use" or when a comparator product is used); Paul D. Rheingold, *Drug Products Liability and Malpractice Cases*, 17 AM. JUR. 1, *Trials*, Cumulative Supplement (1970 & Supp.2019) ("Adverse event reports (AERs) created by manufacturers when users of their over-the-counter pain reliever experienced adverse events or problems, were admissible to show notice" of the elevated risk.); Fred S. Longer, *The Federal Judiciary's Super Magnet*, 45 TRIAL 18, 18 (July 2009) (arguing that "adverse events . . . established a causal association between Piccolomal and liver disease at statistically significant levels"); James O'Reilly, 26:29 *Developments in Liability and Causation*, FOOD AND DRUG ADMINISTRATION (4th Ed., July 2019 update) ("FDA's action regarding an over-the-counter drug shows the agency has acknowledged an association, but merely showing association is far removed from proving causation. A more strident FDA warning is not a sound basis for an inference of causation, so the FDA Notice 'relies heavily on adverse event reports without sufficient controls.'").

[26] The term "stimulated" reporting has appeared in the research literature to refer to the effect of FDA safety interventions on reporting volume. McAdams, *supra* note 8, at 231; Keith Hoffman et al., *Stimulated Reporting: The Impact of US Food and Drug Administration-Issued Alerts on the Adverse Event Reporting System*, 37 DRUG SAFETY 971, 972 (2014) (defining stimulated reporting).

[27] *See, e.g.*, Bonnie L. Mayfield, *Preventing Compelled Disclosure of Adverse Event Reports*, 63 DEF. COUNS. J. 79, 83–84 (1996) (arguing that "[n]o reasonable inference relevant to the issue of causation can

These disputes play out through motions over the admissibility of expert testimony regarding adverse event data.[28] They also arise through motions *in limine* over the admissibility of evidence about drug injury advertising.[29]

Such disputes can form an important part of the drugmaker's defense.[30] For example, in litigation over hip implants, the manufacturer argued that it "should be allowed to present evidence of attorney advertising as an alternative—and perhaps more credible—explanation for the post-recall spike in complaint[s]."[31] During depositions in a case involving the acne drug, Accutane, the company's lawyer questioned the plaintiff's expert on whether he had "studied the effects of stimulated reporting as a result of plaintiff lawyer advertisements," suggesting that some of the 369 adverse event reports were the result of the advertising.[32] In a deposition for a case

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be drawn from an FDA report or its underlying adverse reports in a particular case" and that "adverse drug reports . . . have been inflated greatly by mass media attention or possibly by reports made for litigation purposes"). Litigation filings and deposition transcripts do not generally elaborate on the inference the court—or jury—should draw from "stimulated reporting," if proven. The idea that reporting rates are inflated would be most relevant if adverse event rates for a heavily advertised drug are compared to a related drug that has not been the subject of drug injury advertising. There, reporting rates for the comparator drug may be under-counted in the absence of publicity. However, where the plaintiff looks only at adverse event rates for a single drug, the documented presence of "stimulated reports" would only be relevant, perhaps, to estimate the number of unreported cases, or to explain the timing of reports, unless there were reasons to believe the reports themselves were spurious.

[28] *See, e.g.*, Opposition Brief of Defendants-Appellees Pfizer Inc., Pfizer Intl., LLC, Greenstone LLC and McKesson Corp., *In re* Lipitor, No. 17-01189 (4th Cir. filed Feb. 10, 2017), 2017 WL 4050005 at *29–30) (arguing that trial court properly excluded expert report because it "relied only on adverse events"); *In re* Ethicon, Inc., Pelvic Repair Sys. Prod. Liab. Litig., MDL No. 2327 (S.D. W. Va. Mar. 29, 2017), 2017 U.S. Dist. LEXIS 47973, at *15 (granting motion to exclude expert's opinions "regarding . . . plaintiffs' counsel's TV advertisements"); *In re* Xarelto (Rivaroxaban) Prod. Liab. Litig., MDL No. 2592, (E.D. La. April 12, 2017), 2017 WL 1352860, at *7–8 (granting plaintiff's motion to exclude expert testimony on attorney advertising, and that proposed "commentary on attorney advertising and the effect of that advertising on patients is argumentative").

[29] *See. e.g.*, Herrera-Nevarez by Springer v. Ethicon, Inc., No. 17-C-3930, (N.D. Ill. Aug. 6, 2017), 2017 WL 3381718, at *2 (granting plaintiff's motion to exclude evidence of attorney advertising); Herrera v. Eli Lilly & Co., No. 2:13–cv–02702, (C.D. Cal. Aug. 3, 2015), 2015 WL 12911753, at *4 (motion to exclude references to attorney advertising); *In re* Seroquel Prod. Liab. Litig., Nos. 6:06–md–1769, 6:07–cv–15733, (M.D. Fl. Feb. 4, 2009) 2009 WL 260989, at *7 (drug company argues advertising evidence relevant to "a particular Plaintiff's treatment decisions, or . . . belief that he or she suffered injury"); *In re* Testosterone Replacement Therapy Prod. Liab. Litig. Coordinated Pretrial Proceedings, No. 14-C-9178, (N.D. Ill. May 29, 2017) 2017 WL 2313201, at *9 (court grants motion to exclude evidence about "whether plaintiffs viewed attorney advertising before filing their cases"); Smith v. Pfizer, Inc., No. 3:05-0444, (M.D. Tenn. May 14, 2010) 2010 WL 1963379, at *7 (granting motion to exclude references to attorney advertising, including expert's claim that "the adverse event data base was corrupted by attorney advertising and publicity surrounding the litigation").

[30] David Faigman and Jennifer Mnookin observe that "admissibility decisions about the expert's testimony may well be case-dispositive: admit the expert evidence, and the case . . . comes before the jury, but exclude that evidence, and summary judgment is a foregone conclusion because no admissible evidence supports causation." Faigman & Mnookin, *supra* note 25, at 608. In drug injury cases, it is generally the defendant who seeks to introduce evidence regarding drug injury advertising. As a result, these motions tend not to be fatal to the plaintiff's case. However, attorneys for drug makers consider the evidence important enough to their defense that they file and contest motions over the advertising and question the plaintiff's experts about it in litigation.

[31] Kelly Brilleaux & Stephen G.A. Myers, *Attorney Advertising: Reevaluating the 401/403 Balance in Twenty-First Century Mass Torts*, 56 DRI FOR THE DEF. 48, 48 (2014).

[32] Deposition of Ronald P. Fogel at 48–50, *In re* Accutane Prod. Case Liab. Litig., No. 8:04-MD-2523 (M.D. Fla. July 15, 2009) 2009 WL 3555924. *See also* Deposition of Suzanne Parisian at 252, *In re* Ethicon, Inc., Pelvic Repair Sys. Prod. Liab. Litig., No. 212MD02327 (S.D. W. Va. July 20, 2016) 2016 WL 5940251

involving the association between Neurontin and suicide risk, the defense lawyer urged the plaintiff's expert to admit that it was "possible" that drug injury "advertising may have impacted the number of reports."[33]

From our limited review of expert reports in litigation, their efforts to evaluate the effect, if any, of attorney advertising is largely qualitative, since their analysis is limited to a single drug and does not appear to include advertising data or data on other sources of publicity.[34] Sometimes, the analyses used in litigation also appear to fall below the standards for academic rigor. For example, an expert report in a Neurontin case shows a graph (see Figure 1) of suicide reports associated with the drug over a fourteen-year period, and shades four years' worth of that data with the label "publicity bias," claiming that "spontaneous reports . . . well after the time of the introduction of publicity bias . . . do not mean much."[35] The presentation does not differentiate among the sources of publicity or convey the volume of publicity involved. Although specific drugs may have had negative publicity in the post-2003 period, it is unclear why *all drugs* would have the same timeframe designated as the publicity bias period. (The judge ultimately refused to admit the expert's testimony because the shaded area fell outside the legally relevant time period.)[36] Together, the existing academic and non-academic literature shows a clear need for a more rigorous empirical examination of the relationship between drug injury advertising and FAER reporting volume.

(questioning expert on the effect of drug injury advertising and asking expert to quantify the number of reports originating from lawyers).

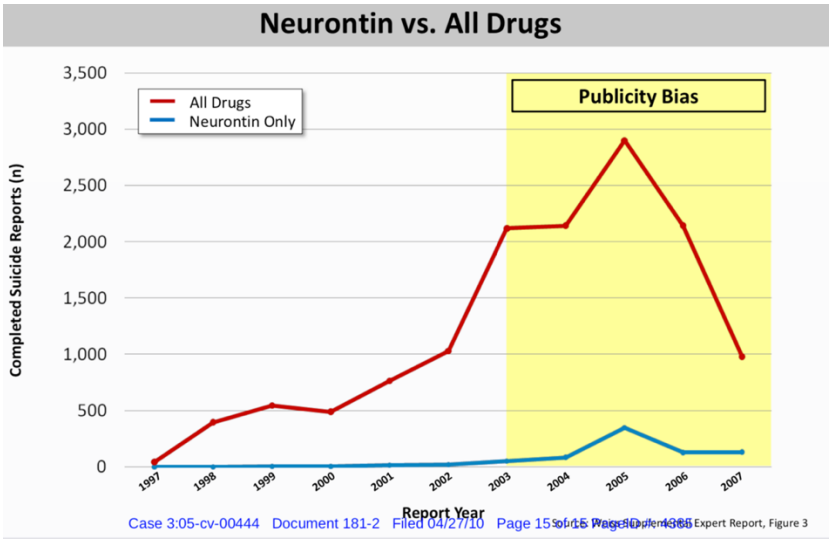
[33] Deposition of Cheryl Blume at 201–02, *In re* Neurontin Marketing, Sales Practices, and Products Liability Litigation, No. 05-CV-00444 (M.D. Tenn. April 27, 2010) 2010 WL 2008615. *See also* Deposition of David Kessler, M.D., at 106–08, *In re* C.R. Bard, Inc. Pelvic Repair Sys. Prod. Liab. Litig., Nos. 2:10-cv-01224, 2:11-cv-00012, 2:11-cv-00114, 2:11-cv-00195, 2:10-cv-01355 (S.D. W. Va. December 20, 2012) 2012 WL 9085635 (extensive questioning on whether plaintiff's expert controlled for drug injury advertising in his model); Videotaped Deposition of Robert Babkowski at 178, Mitchell et al. v. C.R. Bard, Inc., No. 2:12CV05532 (S.D. W. Va. February 24, 2015) 2015 WL 10818801 (expert testimony, "I believe that patient recruitment efforts . . . the background music, the words that incite have certainly fueled patient complaints"); *In re* Ethicon, Inc., Pelvic Repair Sys. Prod. Liab. Litig., No. MDL 2327, 2014 WL 505234 at *2 (S.D. W. Va. Feb. 5, 2014).

[34] Trial Testimony of Sheila Weiss Smith, Smith v. Pfizer, Inc., No. 3:05-0444, (M.D. Tenn. April 27, 2010) 2010 WL 2008696, at *11 [hereinafter Smith Trial Testimony].

[35] Smith Trial Testimony, *supra* note 34 at *11, 13. *See also* Expert Report Timothy A. Ulatowski, *In re* Pelvic Mesh Litig., No. 1305003913, (Pa. Ct. Com. Pl., August 9, 2015) 2015 WL 9805200 at *84, 86 (expert report asserting that there was an "atypical surge" of reports "after the increase in media attention, e.g., lawyer ads, in 2011 concerning pelvic mesh," with a similar graph).

[36] Smith v. Pfizer, Inc., No. 3:05-0444, (M.D. Tenn. May 14, 2010) 2010 WL 1963379, at *7.

Figure 1. Sample Figure from an Expert Report in Litigation Expressing an Opinion on the Effect of Drug Advertising on Adverse Event Report.



This study seeks to fill some of the research gap on this important legal question through a quantitative analysis of all of the adverse event reports involving drugs targeted by drug injury advertisers on national cable and broadcast television over a one-year period. Our model controls for two other sources of information about drug risks—media coverage and FDA safety interventions. We also control for Google search volume as a proxy for consumer information-seeking behavior. Our results fail to identify any statistical relationship between drug injury advertising volume and adverse event reports.

II. METHODS

A. Data and Variables

1. Primary Dependent Variable: Adverse Events

Adverse event reporting data was downloaded from the FDA's adverse event reporting system for the relevant study period (June 30, 2015 to June 30, 2016), which consisted of 4,094,691 adverse event reports. These reports were then matched to the drugs featured in attorney advertising, creating a subset of 412,901 reports for analysis. The adverse event database included multiple reporting dates, including the date the adverse event was reported by the manufacturer and the date the event was reported to FDA. We conducted various exploratory analyses, but ultimately used whichever date was chronologically earlier, to capture when the reporter first acted on the information.

FDA gathers reports of adverse events involving medical devices in a separate database. Consequently, we did not include medical devices in this study, with the exception of the birth control implant, Mirena, which provided sufficient volume of reports in the FAERS database to include in the analysis. We selected the drug database rather than the device database because a greater variety of drugs had been subject to advertising. In addition, drug injury advertising tended to refer to medical

devices in a generic way (e.g., hip implants) that would be difficult to trace to a particular device.

From the FAERS database, we constructed our primary dependent variable of interest—the number of adverse reports by drug and by week. We also separately calculated the numbers of reports by the type of reporter, including all reports, reports by medical providers and patients (collectively, "consumers"), lawyers, and all other reports.

2. Primary Independent Variable: Advertising Data

Television advertising data was obtained from Kantar Media, which, to the researchers' knowledge, is the only private company that tracks and preserves the content of national television advertising. The researchers obtained data for the period June 30, 2015 to June 30, 2016, which was then the most recent time period when this research project began. Advertising data for a longer time period could not be obtained due to budgetary limitations and the high cost of procuring the data.

The dataset included all national cable and network advertising over that one-year period, which Kantar identified as attorney advertising relating to drugs or medical devices. It consisted of 53,765 advertising "spots," where each spot represented a broadcast of an advertisement. The dataset also included access to copies of the advertisements themselves. The dataset did not include local television advertising, which Kantar does not collect. [37]

The Kantar data identified the drug(s) that had been the subject of the advertising in the file name. The advertisements were then coded by drug name. Table 1 in the Appendix lists the drugs included in the study.

Drugs in the same class or containing the same active ingredient that were frequently mentioned together in a single ad were grouped together in our analyses, such as Prilosec and Zegerid, and Onglyza and Kombiglyze. Where advertisements referred to a single drug (e.g., Xarelto), that drug was analyzed individually.

Attorney advertising tended to refer to drugs by their branded name. However, drugs are sometimes listed in the Federal Adverse Event database by their generic name.[38] Thus, we combined multiple prescription drugs into the same group based on the generic name of the primary active agent. However, we did not combine birth control drugs into groups, and instead matched these drugs to the drugs specifically referenced in the advertising, as the active agents were associated with a very large number of generic names.

In a few cases, drugs containing the same active ingredient as a branded drug were associated with a different branded name than the drug named in the advertisement (e.g., Revatio, which contains the same active ingredient as Viagra). These related

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[37] A prior study, however, suggested that the local television ad market for drug injury ads is much smaller. For example, in 2009, the seventh largest media market, Boston, broadcast only thirty unique drug injury ads (which were broadcast repeatedly, producing 649 advertising "spots"). Tippett, *supra* note 3, at 18. The eighth largest media market, Atlanta, market broadcast thirteen unique drug injury ads (producing 389 unique "spots"). *Id.* If national advertising volume in 2009 was similar to advertising volume in 2016, an average consumer in those cities with access to both cable and local television would be expected to see at least seventy-five nationally broadcast ads for every local ad.

[38] Even when a drug remains patented and no generic versions are available, the adverse event report might still refer to the drug by its generic name. Thus, references to the branded name and the generic name are included in the analysis.

branded drugs, which were not referenced in the advertisement, but were otherwise the same as the branded and generic version of the drug, were also included in the drug group.

This process ultimately produced twenty-eight groups of drugs for analysis, each with a metric that described the intensity of attorney advertising by drug and by week.

3. Control Variables

We include two control variables—FDA safety interventions and media coverage—in our statistical analyses to account for alternative sources of information which may also prompt the reporting of adverse events to FAERS. A third control variable, Google search volume, may be thought of as an additional source to gather information about an adverse drug reaction, but also as a measure of how much interest exists in understanding more about potential adverse effects of the drug. Either way, Google search volume may be associated with FAERS reporting, and is therefore included as a control variable in our analyses.

a. FDA Safety Interventions

Prior research suggests that drug injury advertising and FDA safety interventions are correlated,[39] and that FDA actions can spur later adverse event reports.[40] We thus collected the timing of FDA safety interventions for the drug at issue to serve as a control variable in our analyses. Information on FDA safety interventions was obtained by looking up the individual drugs on the drugs@FDA database. Safety interventions included relabeling, black box warnings, Risk Evaluation and Mitigation Strategy (REMS) demand, REMS approval, or a recall. The FDA safety intervention variable consisted of a dummy variable indicating whether one of the drugs in the group had been subject to a safety intervention in a particular week.

b. Media Variable

To approximate media coverage of a drug in a given week, we conducted a search of the LexisNexis news database for articles containing the name one or more of the branded drugs. The LexisNexis database aggregates "over 26,000 news sources and 1.3 billion documents," including newswires, newspapers, magazines, press releases, and blogs.[41] The variable consisted of the number of unique media items referencing the applicable drug in a given week. Overall, media volume was quite low for the drugs at issue, with most drug groups the subject of zero media hits for most weeks.

c. Google Search Data

We included Google search data as a control variable as an additional source of information and/or consumer interest in the drug from all informational sources. Google search data was obtained from Google Trends, based on a search for the drug's brand name. Google Trends produces a weekly value that reflects relative search

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[39] Tippett & Chen, *supra* note 13, at 1172.

[40] McAdams, *supra* note 8, at 234 (initial FDA "Dear Healthcare Provider letter" associated with increased reporting, subsequent letter not associated with increased reporting). *See also* Hoffman, *supra* note 15, at 976 (some FDA alerts appeared to stimulate reporting, though others did not produce "substantial changes").

[41] *Source description: News*, LEXISNEXIS, https://www.lexisnexis.com/en-us/products/nexis.page [https://perma.cc/6GB6-BS98].

interest, where 100 represents "peak popularity," and fifty "means the term is half as popular." While a score of zero indicates insufficient data to produce a result, none of the drugs at issue produced a score of zero.

B. Analysis

We conducted two primary statistical analyses for our study to explore the correlations between FAERS reporting and four covariates: attorney advertising volume, Google search volume, media mentions, and FDA safety communications. First, we conducted a simple multivariable regression analysis. Then, we followed with a segmented regression analysis to identify potential changes in FAERS reporting volume following the week or month of peak attorney advertising.

Our primary unit of observation is the drug-week. Specifically, we counted the number of FAERS reports per week for a given drug group, as well as the number of media mentions, volume of Google searches, and volume of attorney advertising for that drug group in that week. We also created a dichotomous variable that indicated whether an FDA safety warning was in place in that week. We began first by plotting all these variables over time for each drug group for an overall view of our data. Note that we repeated the analyses counting the drug-month rather than drug-week, but we obtained similar results when using drug-week as the unit of analysis.

For our regression analyses, we chose a log-linear specification, regressing the log-transformed outcome variable FAERS report number on the volume of attorney advertising, volume of Google searches, and whether there was any media mention, all lagged by one week. We also included the dichotomous variable FDA safety action to indicate whether FDA announced any type of risk communication in the previous week. The log-transformed dependent variable reduces skewness for a variable with only positive values (0 and above). In our log-linear specification, the coefficients can be interpreted as "a unit increase in e.g., attorney advertising is associated with a Y percent increase in FAERS reports." While we reported our study results using the specification with predictor variables lagged by one week, we also conducted sensitivity analyses with different lags (by two, three, and four weeks). Our results with various time lags were broadly consistent, so we chose to present the results with a one-period lag.

In addition, we conducted a segmented regression analysis with peak attorney advertising in the data defining the threshold between two segments. This method seeks to identify whether there is a discontinuity or change in trend of an outcome (FAERS reporting) at a triggering event (peak attorney advertising). For each drug group, we calculated the attorney advertising volume by week and marked the week with the highest volume. To provide sufficient pre- and post-peak advertising volume observations to find breaks and trends before and after the peak, we limited our analyses to drug groups where advertising peak occurred in the middle third of the one-year time period.

In the segmented regression analysis, we regressed attorney advertising volume on a counter variable that represents the number of weeks from week 26, 2015 (the first week in our study period), a dichotomous variable that is set to 1 in the week of peak advertising (and all weeks thereafter, with 0 in all prior weeks), and a second counter variable that starts counting the number of weeks in the week of peak advertising. For this second counter variable, all weeks prior to the peak advertising are set to 0. In this regression, the coefficient on the dichotomous variable captures any discontinuous jump in FAERS volume at peak attorney advertising, and the coefficient on the second

counter variable represents a change in magnitude in and/or direction of the trend in FAERS reporting post-peak advertising volume relative to the pre-peak period. The coefficient on the first counter variable represents the trend in FAERS reporting prior to peak injury advertising.

III. RESULTS

The FAERS data enabled us to analyze reports by the source of the initial report (see Table 1). Half of all reports were submitted by consumers themselves (50%). Health care workers—physicians, pharmacists, and other health professionals—submitted nearly 40% of all other reports (39%).

Lawyers submitted only six percent of reports. However, this average is skewed by a high proportion of attorney reports for a single drug: testosterone, for which attorneys submitted 68% of reports. For comparison, the median proportion of adverse event reports from attorneys was 0.6%. Indeed, for five of the drug groups in the sample, fewer than five reports were submitted by attorneys, compared to thousands of reports from consumers and medical professionals.

In other words, if the hypothesis is that increases in adverse event reporting are driven by reports submitted by lawyers directly, lawyers do not appear to be reporting adverse events with sufficient frequency to be substantial contributors to "stimulated" FAERS reporting in our data. In addition, to the extent expert witnesses believe reports from attorneys should be discounted, these reports can be easily excluded from the expert's analysis by removing all attorney-submitted reports in the FAERS database, which identifies the type of the reporter.[42]

Table 1. Occupation of Person Submitting Initial Adverse Event Report

Occupation	Frequency	Percent
Consumer	206,062	50
Physician	81,834	20
Other health professional	58,851	14
Lawyer	23,824	6
[Unknown]	21,448	5
Pharmacist	20,882	5
Total	412,901	100

We now turn to reporting results from our multivariable regressions analyses. As seen in Table 2, Google searches were consistently positively associated with FAERS reports. FDA safety actions were also associated with a higher volume of reports for FAERS reports overall and FAERS reports by individual consumers. Media coverage was also positively associated with FAERS reports.

[42] Attorney reports are included in our analysis.

By contrast, attorney advertising was not a statistically significant predictor of FAERS reports, even as to reports submitted by lawyers. There were no statistically significant predictors of FAERS reporting by attorneys at the five percent level.

Table 2. Association Between Log Weekly FAERS Reports and Lagged Media/FDA Variables

	(1)	(2)	(3)	(4)
VARIABLES	Log FAERS	Log FAERS (consumer)	Log FAERS (lawyer)	Log FAERS (other)
Lagged weekly attorney advertising volume	-0.000685	-0.00113	0.00147	-0.000253
	(0.000780)	(0.000995)	(0.00128)	(0.000875)
Lagged weekly Google searches	0.00672***	0.00867***	0.00409*	0.00547***
	(0.00132)	(0.00141)	(0.00224)	(0.00116)
Lagged FDA action	0.175**	0.155**	0.426	0.0613*
	(0.0831)	(0.0745)	(0.269)	(0.0363)
Lagged media coverage	0.0846**	0.0776	0.0211	0.0401*
	(0.0323)	(0.0519)	(0.119)	(0.0222)
Constant	3.872***	2.805***	0.893***	3.152***
	(0.123)	(0.131)	(0.263)	(0.110)
Observations	1,968	1,929	743	1,932
R-squared	0.038	0.043	0.012	0.028
Number of drugs[†]	39	39	35	39

[†]*The analysis disaggregated drug groups to separately analyze branded versions of the drug and related generic drugs.*

Robust standard errors in parentheses

**** p<0.01, ** p<0.05, * p<0.1*

Similarly, monthly regressions of attorney advertising volume and Google searches compared to FAERS reporting showed significant associations for Google searches but not advertising volume, regardless of whether the control variables were log-transformed (specification (1)) or lagged (specification (2)) (see Table 3).

Table 3. Association Between Log Monthly FAERS Reports and Log/Lagged Advertising Volume and Google Search

	(1)	(2)
VARIABLES	Log FAERS reports	Log FAERS reports
Log ad volume	0.0757	
	(0.0663)	
Log Google searches	1.349***	
	(0.233)	
Lagged ad volume		0.0728
		(0.0735)
Lagged Google searches		1.178***
		(0.265)
Constant	-1.964	-0.918
	(1.366)	(1.549)
Observations	198	179
R-squared	0.216	0.172

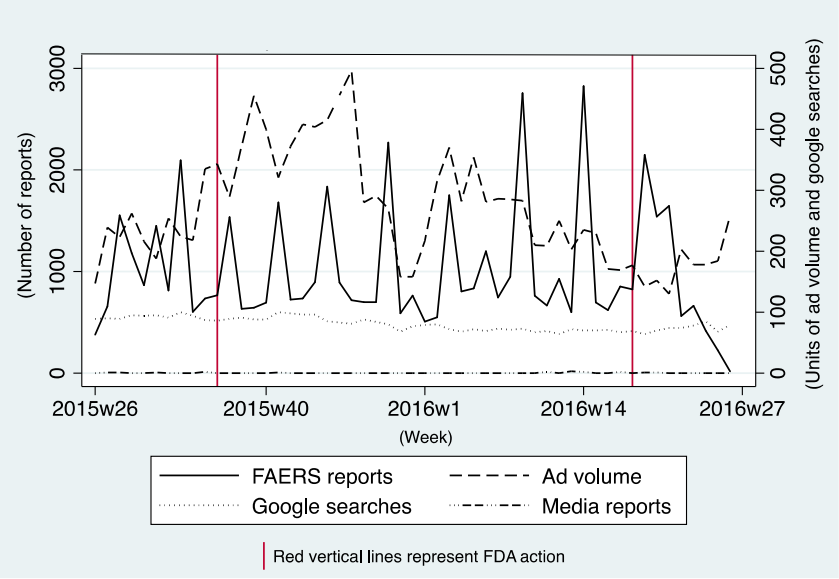
Robust standard errors in parentheses

**** p<0.01, ** p<0.05, * p<0.1*

The absence of a statistically significant relationship between drug injury advertising and adverse event reports can be seen in graphs for individual drugs plotting the trends in FAERS reporting and in drug injury advertising (see Figures 2–7). Here we included graphs of drugs involving substantial drug injury advertising volume, since any impact on FAERS reporting would presumably be strongest for those drugs. However, we created and reviewed graphs for all of the drugs in our analytical data set (not shown), and none of these graphs suggested a relationship between FAERS reporting and drug injury advertising, even after considering various lags in reporting time.

For example, consider the drug Xarelto. This drug was subject to a high volume of advertising, which peaked in late 2015, followed by a sharp fall off. However, the growth of advertising volume was not associated with increases in FAERS reports. (see Figure 2). For this particular drug, FDA actions likewise did not appear to alter the slope of FAERS reports.

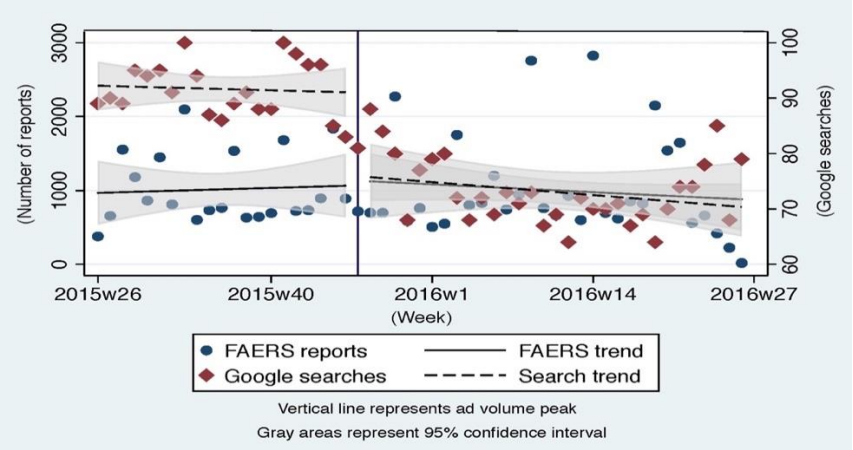
Figure 2. Xarelto—FAERS Reports, FDA Actions, and Media Variables



Turning to Figure 3, we compare the levels and trends of FAERS reporting before and after peak advertising (near week 47 of 2015). This figure does not support the hypothesis that peak advertising is associated with a subsequent increase in FAERS reports. The FAERS reporting trend is mostly flat and trends slightly downwards following peak advertising.

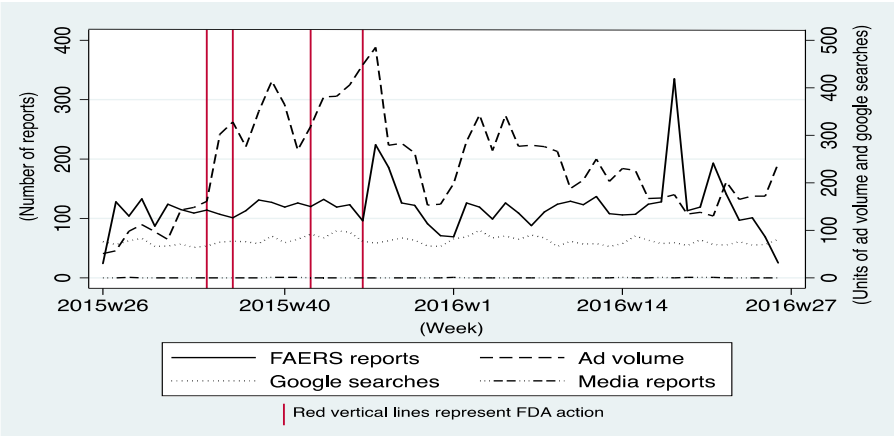
Interestingly, Google searches fell sharply after peak drug injury advertising. This suggests that advertising may have caused or coincided with an interest in searching for information online, which tapered off after attorneys stopped advertising as much. Therefore, it is theoretically possible that drug injury advertising stimulated Google searches, which we show to be positively and significantly associated with FAERS reporting. A concern is that the drug injury advertising and Google searches are so highly correlated that including both variables in our regressions affected the estimation of drug injury advertising, biasing the results toward a finding of no statistical relationship. To address this concern, we re-ran the analyses described in Table 2, but excluded the Google search volume variable. We found that even without Google searches as a control variable, the coefficients on the "ad volume" remained not statistically different from 0. This finding alleviates the concern over multicollinearity affecting the coefficient variance of our key independent variable of interest, "(drug injury) ad volume."

Figure 3. Xarelto—FAERS Reports and Google Searches Pre- and Post-Peak Advertising



In Figure 4, we turn our attention to the drug Pradaxa, for which attorneys also broadcast large numbers of ads. The growth in advertising in 2015 coincided with a number of FDA safety interventions (see Figure 4). FAERS reports remained at a comparatively low level (around 100 per week) and did not grow as drug injury advertising increased. There was a small increase in reporting at the very height of attorney advertising, but there was also an FDA safety action at around the same time. FAERS reporting soon returned to the average reporting level for the period. The largest spike in reporting occurred during a brief period in 2016, long after attorney advertising trailed off.

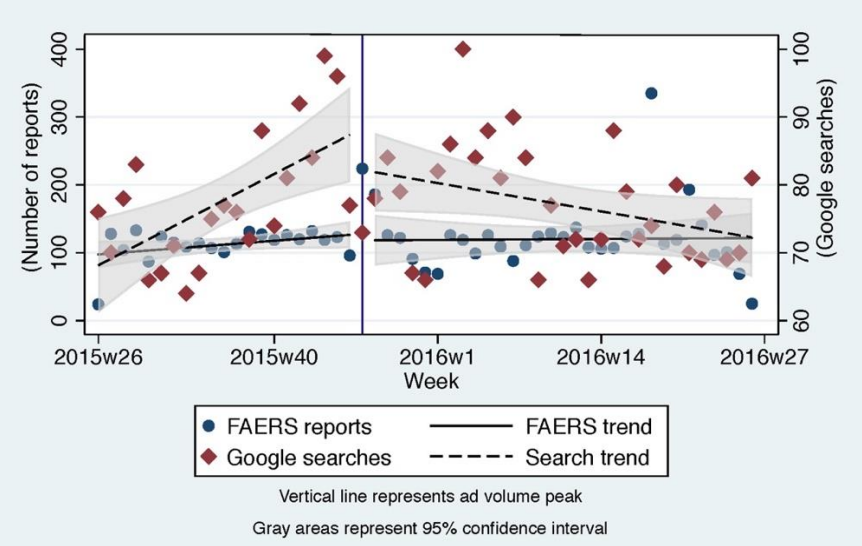
Figure 4. Pradaxa—FAERS Reports, FDA Actions, and Media Variables



The absence of a clear relationship between FAERS reporting volume and drug injury advertising can also be seen in Figure 5, which illustrates changes in FAERS reporting trends before and after peak drug injury advertising for Pradaxa. The vertical line in Figure 5 represents the peak in advertising. The slope of the FAERS reports does not perceptibly change before and after drug injury advertising peaked. By

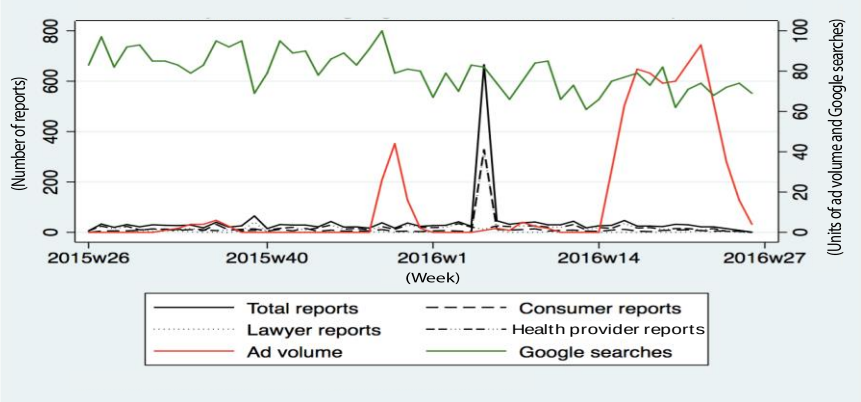
contrast, a statistically significant relationship likely would have produced an increase in trend in FAERS reports as attorney ad volume increased, with a possible trailing off after the peak. Again, there is some evidence that attorney advertising may have influenced Google searches, as consumer search behavior increased with attorney advertising and decreased after advertising peaked. As noted above, however, we verified that the multicollinearity between drug injury advertising and Google searches did not bias the estimated coefficients on drug injury advertising. We did so by removing Google searches as a control variable and verified that the coefficients on drug injury advertising volume remained statistically insignificant.

Figure 5. Pradaxa—FAERS Reports and Google Searches Pre- and Post-Peak Advertising



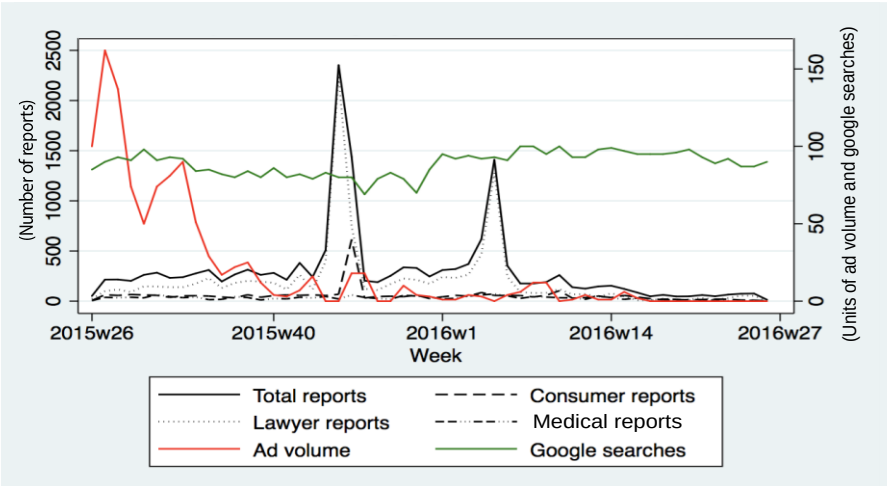
A third example involves the drug Avelox (see Figure 6). The drug was subject to a small burst of advertising near the end of 2015. It was followed by a large spike in reports in February 2016. This suggests that perhaps a delayed burst of reporting occurred in response to drug injury advertising. However, two other features of the graph undermine such an inference. First, Google search trends were highest in early 2015 and slowly decreased over the course of the measured period, peaking slightly before the drug injury advertising—suggesting that factors other than drug injury advertising influenced interest in the drug. In other words, interest in understanding this adverse event (reflected in Google search trends) was high even before drug injury advertising peaked. In addition, a much larger volume of drug injury advertising was broadcast in March 2016 (week 24), with no corresponding increase in reporting.

Figure 6. Avelox—FAERS Reports, Google Searches, and Attorney Ad Volume by Source of Report



Testosterone-based drugs (see Figure 7) are also noteworthy, because they involved an uncharacteristically high volume of adverse event reporting by attorneys. The summer of 2015 (2015 weeks 26 to 42) started with a high level of drug injury advertising, which decreased over time. Throughout that period, however, FAERS reporting remained relatively low and constant. A very high volume of reporting took place in concentrated bursts many weeks after peak advertising, and again in early 2016. The intensity and concentration of the attorney reporting months after peak advertising volume (see the dotted line which peaks sometime after 2015 week 40) suggests that factors other than the predictors we study may have influenced the timing of the reporting.

Figure 7. Testosterone—FAERS Reports, Google Searches, and Attorney Ad Volume by Source of Report



IV. DISCUSSION

The results of this study did not identify a statistically significant relationship between drug injury advertising and adverse event reports. First, for most of the twenty-eight drugs and drug groups analyzed in this study, attorneys represented a very small proportion of reports overall. Instead, about half of all reports originated directly from individuals, and about 40% from health care providers. Second, drug injury advertisements do not appear to have spurred patients, providers, attorneys, or other individuals to file a FAERS report, as shown in our regression and graphical results. Our empirical specifications tested the robustness of our primary findings by using various lags in the independent variables—including one, two, three, and four weeks (for the weekly analysis), and one and two months (for the monthly analysis). Changing the lags between the independent variables and the outcome variable (FAER reports) did not alter our primary findings.

The absence of a statistically significant relationship between advertising volume and adverse event reports stands in stark contrast to results observed for other variables included in the model. Google searches were statistically associated with subsequent adverse event reports for consumers, other individuals, and for all reports overall. This result is consistent with existing research suggesting that Google searches may be associated with adverse event reports.[43] The finding is also intuitive—both health care providers and consumers might be expected to do some research online before taking the step of reporting an adverse event to FDA.[44] FDA actions were also associated with adverse event reports overall. Media coverage, despite low volume of media overall, was also associated with adverse event reports, although at higher thresholds for statistical significance.

Given that the model was sufficiently sensitive to detect an association with Google searches, FDA safety actions, and media coverage, the failure to detect a statistically significant relationship between drug injury advertising and FAERS reporting likely signifies that there is a true lack of association between the two variables (rather than simply a lack of power or insufficient time to detect a statistical relationship). If the other variables capturing sources of adverse drug information (e.g., Google searches and FDA safety actions) are able to affect the FAERS reporting within a short one-year study period, there is little reason to believe that attorney advertising could not produce a similar result. Indeed, by nature, our exposure of interest is not of the type for which long exposure is required to lead to the predicted outcome. In an age of information overload, it is not likely that attorney advertisements will take years to show an effect on FAERS reporting. In fact, memories could be fleeting, and if a would-be reporter does not report an adverse event within a short period of time after viewing an attorney advertisement, he or she will likely not file the report at all.

There are several possible reasons why we did not find that drug injury advertising influenced FAERS reporting. First of all, Google searches and drug injury advertising are highly correlated. Indeed, in some of our figures, we see that Google search volumes are high when drug injury advertising peaks. Including both variables may therefore create multicollinearity, reducing the statistical precision of estimating the

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[43] Faasse, *supra* note 16, at 6873.

[44] Sinha et al., *supra* note 17, at 1 (finding that Google searches increased following a drug safety communication from FDA about zolpidem).

impact of attorney advertising because most of its effect may be captured by the Google search variable. However, we re-ran the primary regression equation excluding Google searches as an independent variable, and the results show that coefficients on the attorney advertising variable remain statistically insignificant.

It is also possible that consumers may be influenced by the advertising, but in ways unrelated to filing a report through FAERS. Filing an adverse event report is not a legal prerequisite to filing a legal claim. In fact, attorneys may discourage their clients from talking about their case with anyone—including the FDA—to avoid making statements over which they could later be impeached. Likewise, lawyers may be reluctant to call the FDA on their client's behalf to avoid serving as a fact witness in their client's case.

It is also possible that some consumers call the number listed on the screen erroneously believing that they are making a report to a government agency or that information will be shared with a government agency.[45] In fact, attorney advertising generally contains no information about making a FAERS report, so awareness of the drug risks would bring them no closer to making a report. Another possible explanation is that the medical information in drug injury advertising can be somewhat stale. Although drug injury advertisers respond relatively quickly to new medical information,[46] they are generally not the originators of initial drug safety signals. Drug injury advertising can also linger on the airwaves for months or years after a drug safety signal is identified. It is possible that consumers do not respond to drug injury advertising because they are already aware of the adverse event risk and those interested in making a report have already done so.

Finally, consumers and health care providers may selectively ignore or discount medical information in attorney advertising. This result would align with prior observational research suggesting that prescription rates for drugs do not decrease in response to drug injury advertising.[47] Similarly, an experimental study of drug injury advertisements found that consumers discounted the risk information in the ads when they understood the underlying purpose of the ads.[48]

This final explanation aligns with a widely used conceptual framework from the marketing literature known as the "persuasion knowledge model."[49] This model posits that consumers approach advertising with a high degree of sophistication, bringing to bear their knowledge about the source of the information, their knowledge about persuasion techniques that marketers use against them, and their knowledge about the topic of the advertising. If consumers and medical professionals deem attorneys to be untrustworthy sources of medical information, they may pay little heed to the risk-

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[45] One experimental study found that when consumers were presented with a sample drug injury advertisement containing deceptive content, about a quarter of them erroneously believed that the advertisement originated from sources other than law firms or legal referral services. King & Tippett, *supra* note 2, at 148.

[46] David N. Juurlink et al., *The Effect of Publication on Internet-Based Solicitation of Personal-Injury Litigants*, 177 CAN. MED. ASS'N J. 1369, 1370 (2007).

[47] Tippett & Chen, *supra* note 13, at 1173.

[48] King & Tippett, *supra* note 2, at 148.

[49] Marian Friestad & Peter Wright, *The Persuasion Knowledge Model: How People Cope with Persuasion Attempts*, 21 J. CONSUMER RESEARCH 1, 1–2 (1994).

related information contained in their advertising.[50] By contrast, because the FDA is viewed to be a trustworthy source of information, safety interventions are more likely to spur consumers and medical professionals to act.

This study is subject to a number of limitations. First, it was limited to a one-year period. A multi-year analysis may have provided a broader context for evaluating changes in adverse event reporting over time. However, even in a short one-year time frame, we were able to study as many as twenty-eight groups of drugs. Moreover, due to the high cost of the Kantar dataset, a study with a longer time horizon would require significant additional funding support. In addition, as previously noted, we feel that the exposure of interest (knowledge of a potential adverse event from advertising) is fleeting, and that an effect, if it is to be found at all, should theoretically be detected in a relatively short time period. Second, our model did not take into account the strength of the underlying drug safety signal and the relative frequency of the adverse event, both of which might influence the volume of adverse event reporting. Nevertheless, our work sheds light on an important and previously understudied question that often underlies drug manufacturers' response to litigation.

V. CONCLUSION

In mass tort litigation against drug manufacturers, attorneys for the defendant drug makers often characterize evidence derived from FAERS reporting as "stimulated" by drug injury advertising. Despite the prevalence of these claims, to our knowledge no study exists to assess this claim using objective empirical data. Our study sought to fill this important gap in the literature by empirically examining the relationship between adverse event reporting and drug injury advertising, controlling for other types of negative publicity relating to a drug—FDA safety interventions and media coverage. We also controlled for Google search volume as a way to capture consumer information-seeking behavior elicited by an amalgam of other information sources. For most drugs, few adverse event reports were submitted by attorneys. Overall, in both our regression and graphical results, we found that drug injury advertising did not appear to have spurred consumers or health care providers to report adverse events in subsequent weeks and months. By contrast, both FDA safety interventions and media coverage were both positively associated with adverse event reports. Google search volume was also positively associated adverse event reports. These results preliminarily support a claim that FAERS reports on adverse drug reactions are not "stimulated" by direct attorney submission or drug injury advertising. Moving forward, additional studies investigating other time frames should be conducted to verify our findings.

[50] King & Tippett, *supra* note 2, at 134–36 (applying persuasion knowledge model to attorney advertising).

APPENDIX

Table 1. Drug Groups Analyzed

Branded Name	**Generic Name/Active Ingredient**
Abilify	aripiprazole
Avelox	moxifloxacin
Benicar, Azor, Tribenizor* (Plaunac, Olmetec, Plaunazide, Rezaltas, Vocado, Alteis, Coolmetec, Bivis, Olpress, Votum, Axeler, Alteisduo, Azorga, Ixia, Sevikar)**	olmesartan
Byetta (Bydureon)	exenatide
Chemotherapy[51]	
Cialis (Adcirca)	tadalafil
Cipro	ciprofloxacin
Depakote	divalproex
Eliquis	apixaban
Farxiga, Xigduo	dapagliflozin
Invega (Xeplion)	paliperidone
Invokana, Invokamet	canaglifozin
Januvia	sitagliptin
Levaquin	levofloxacin
Lipitor	atorvastatin
Mirena[52]	Not included[53]
Nexium	esomeprazole
Onglyza, Kombiglyze	saxagliptin
Pradaxa	dabigatran
Prevacid	lansoprazole
Prilosec, Zegerid	omeprazole
Risperdal	risperidone
Taxotere	docetaxel
Testosterone[54]	testosterone
Viagra (Revatio)	sildenafil
Xarelto	rivaroxaban

[51] Chemotherapy refers to many different drugs. The attorney advertisements referred imprecisely to "chemotherapy." Thus, we searched adverse event reports for references to "chemotherapy," which would have excluded reports from doctors using the actual drug name.

[52] Mirena is a medical device, but nevertheless appeared both in attorney advertising and (at low volumes) in the FAERS database.

[53] *See infra* note 56.

[54] Testosterone is associated with many branded names. However, the attorney advertisements tended to use the generic term "testosterone."

Yaz, Yasmin, Ocella, Nuvaring, Orthoevra, Depoprovera, Paragard, Nexplanon, Implanon, Essure[55]	Not included[56]
Zofran	ondansetron

** Drugs were grouped together when attorney advertising referenced them jointly in advertisements.*

*** Parentheses refers to other branded names for the drug with the same active ingredient that were not specifically referenced in attorney advertisements. These alternate names were analyzed separately to test for any potential "spillover" effect, but no such effect was detected. The data was then included in the analysis together with the other branded and generic names.*

[55] Attorney advertising typically referred generically to "birth control" and would then highlight varying groupings of specific birth control drugs. For example, drospirenone-based drugs (Yaz, Yasmin, and Ocella) were often advertised together, though also in combination with other drugs.

[56] As discussed, our analysis of birth control drugs was limited to the brand names referenced in the advertisement, as the active ingredients (particularly estradiol) were associated with scores of other drug names.