MARKETWATCH

How Direct-To-Consumer Television Advertising For Osteoarthritis Drugs Affects Physicians' Prescribing Behavior

DTC advertising of COX-2 inhibitors appears to have increased the number of prescriptions written for these products.

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ABSTRACT: Concern about the potential pernicious effect of direct-to-consumer (DTC) drug advertising on physicians' prescribing patterns was heightened with the 2004 withdrawal of Vioxx, a heavily advertised treatment for osteoarthritis. We examine how DTC advertising has affected physicians' prescribing behavior for osteoarthritis patients. We analyzed monthly clinical information on fifty-seven primary care practices during 2000–2002, matched to monthly brand-specific advertising data for local and network television. DTC advertising of Vioxx and Celebrex increased the number of osteoarthritis patients seen by physicians each month. DTC advertising of Vioxx increased the likelihood that patients received both Vioxx and Celebrex, but Celebrex ads only affected Vioxx use. [*Health Affairs* 25, no. 5 (2006): 1371–1377; 10.1377/hlthaff.25.5.1371]

THE U.S. FOOD AND DRUG Administration (FDA) issued new regulations in August 1997 governing television advertising of prescription drugs. Shortly thereafter, spending on direct-to-consumer (DTC) advertising for prescription drugs soared—from $596 million in 1995 to approximately $1.2 billion in 1997 and an estimated $3.8 billion by 2004.[1] The effects of this spending have been the subject of much debate, although little is known about its actual impacts. We studied this issue by examining the use of a popular (and controversial) class of prescription drugs: the anti-inflammatory and pain-relieving cyclooxygenase-2 (COX-2) inhibitors. The most popular of these were Vioxx (Merck) and Celebrex (Pfizer). We studied how prescriptions for these two drugs for patients with osteoarthritis responded to changes in television advertising during 2000–2002.

■ **The Vioxx effect.** One of the most

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heavily advertised products in recent years was Vioxx (rofecoxib). In calendar year 2000, Merck spent more than $160 million on advertising this product to consumers.[2] Merck withdrew Vioxx from the market in September 2004 because of evidence of increased risk of myocardial infarction and stroke associated with its use.[3] Its side effects have sparked much criticism of Merck's advertising strategy.[4]

■ **Previous studies.** Published studies on the impact of television advertising for prescription drugs have yielded conflicting results. Advancing an argument made by Alison Masson and Paul Rubin, Alison Keith found that patients' suggestions regarding drugs (aspirin for cardiovascular disease) were important determinants in prescription decisions and that advertising tended to lead to more appropriate care.[5]

Other studies found that drug companies' TV promotional activities preserved market share for existing products and also caused patients to be less responsive to price.[6] The post-1997 era presented an opportunity for examination of the new policy regime for DTC advertising. As Woodie Zachry and Diane Ginsburg pointed out, however, few studies examine the actual effects of DTC advertising.[7] In one of these studies, John Calfee and colleagues examined whether the 1997 FDA policy change increased the demand for statins but were unable to find any significant direct effect.[8] There are also studies that examined DTC advertising, using survey data. These studies tended to find that patients were positively disposed toward DTC advertising and that advertising had some effect on patient-physician interactions.[9]

Study Data And Methods

To assess the impact of DTC advertising, we examined separate models for (1) the average patient flow into each physician practice, (2) prescribing for Vioxx, and (3) prescribing for Celebrex, using the practice as the unit of analysis. We examined data on visits to fifty-seven primary care practices each month over three years (2000–2002). After exclusions (discussed below), this resulted in 1,589 observations in the form of visits per practice per month.

■ **Patient data.** Data were obtained from the Practice Partner Research Network (PPRNet), located at the Medical University of South Carolina (MUSC). PPRNet is a practice-based learning and research organization among primary care practices across the United States that use a common electronic medical record (EMR) (Practice Partner by Physician Micro Systems Inc. in Seattle). PPRNet pools longitudinal data on diagnoses, laboratory studies, medications, vital signs, and other nonidentifiable information quarterly for research and quality improvement activities. PPRNet has access to all EMR extracts of ninety-one community-based primary care practices in thirty-two states. To create our practice-level data set, we extracted data on all patients who had a diagnosis for osteoarthritis from practices active during 2000–2002. Because many unobservable factors might drive prescribing, we restricted the original data to osteoarthritis patients.

These patient data were then aggregated to the practice level by month. Also, we eliminated practices located more than 100 miles from the geographic center of the nearest media market. We also eliminated practices that were in the database for fewer than twenty months or that wrote fewer than ten COX-2 inhibitor prescriptions cumulatively over the three-year study period. Fifty-seven practices from forty-four markets remained after these restrictions were implemented.

■ **Advertising data.** We obtained national and local advertising information from Competitive Media Reporting Inc. (CMR), which collects data on media advertising for all products, including pharmaceuticals, at the market (for example, city) level. The data are specific to the product's brand name and show which products were advertised and how many times they were advertised on both national and local television each month. We used counts of ads broadcast by month as our measure of DTC advertising. Patients and practices were assigned to the nearest local media market. (In the advertising data we received, media markets were identified by metropolitan area,

such as Philadelphia or Denver.)

■ **Dependent variables.** We examined the impact of DTC ads on three dependent variables: (1) the number of visits (for any reason) to the practice each month by osteoarthritis patients; (2) the fraction of these visits associated with a prescription (new or renewed) for Celebrex; and (3) the fraction of these visits associated with a prescription (new or renewed) for Vioxx (Exhibit 1). We could not distinguish reliably between the number of new and renewed prescriptions, although this is not a limitation with respect to our study's goal.

■ **Explanatory variables.** *Advertising exposure.* We measured advertising exposure as the number of ads broadcast for each brand advertised. We included separate measures for national and local advertising, because national and local ads tend to be shown during different times of the day and during different programs.

Retained information from ads. Since information presented in ads will not be immediately forgotten, we needed to account for retained information. To do this, we constructed two versions of each of our three models. First, we estimated models for the three dependent variables that included the number of ads placed in the current month. Second, we estimated models for the three dependent variables that included the number of ads placed in both the current month and the previous month.[10]

Clinical and income variables. We also included variables we expected to affect either the demand for treatment by patients or the supply of office visits (and therefore treatment) by practices. Factors expected to affect patients' demand for treatment were patients' clinical comorbidities, average age, and sex. These clinical variables were calculated using the PPRNet data on osteoarthritis patients in the practice. The income variable was taken from the Area Resource File (ARF) and was measured at the county rather than the patient or practice level (and is thus a crude measure of average patient income for the practice).

Factors affecting general demand for health care. Factors expected to affect the general demand for health care were county population; county per capita income; the average price of a physician office visit; and the percentage of county population that is over age sixty-five, employed, and either Caucasian or African American. We imputed the price of an intermediate-length office visit with an established patient from the Council for Community and Economic Research's (ACCRA's) quarterly Cost of Living Index (using the average price

EXHIBIT 1
Means And Standard Deviations Of Dependent And Key Explanatory Variables, Study Of Direct-To-Consumer Television Ads And Prescribing For Osteoarthritis (OA), 2000–2002

Variable	Mean	Standard deviation
Number of monthly office visits by OA patients	341.952	420.814
Number of monthly Celebrex prescriptions per OA office visit	0.014	0.035
Number of monthly Vioxx prescriptions per OA office visit	0.012	0.028
Number of local Vioxx ads	0.259	0.761
Number of national Vioxx ads	105.848	37.742
Number of local Celebrex ads	12.296	22.980
Number of national Celebrex ads	102.262	54.018
Number of local Vioxx ads, previous month	0.243	0.727
Number of national Vioxx ads, previous month	104.274	38.237
Number of local Celebrex ads, previous month	11.755	23.057
Number of national Celebrex ads, previous month	97.820	55.620

SOURCE: Authors' calculations, using data from PPRNet and the Centers for Medicare and Medicaid Services.
NOTE: N = 1,589.

in the metropolitan area nearest the primary care practice site). Finally, we captured the market-level supply of services by including the number of full-time physicians (both primary and specialty care) actively engaged in patient care in the county per thousand population, taken from the ARF.

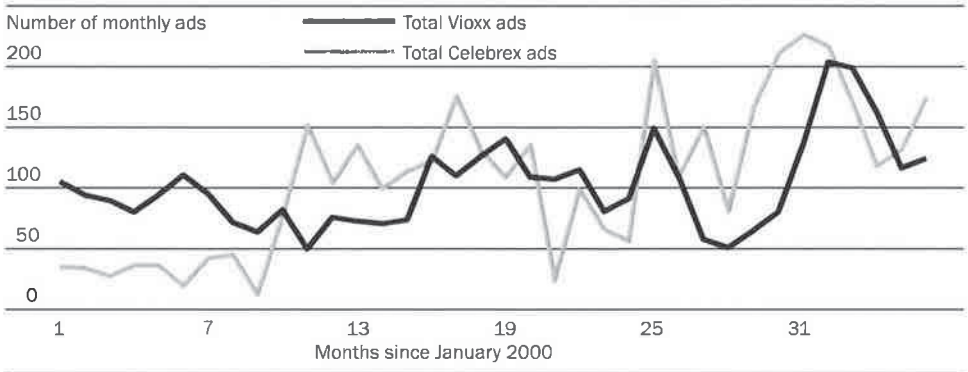
■ **Clinical publications.** Besides DTC advertising and demand/supply-side economic factors, articles in medical journals might affect physicians' prescribing habits. We controlled for confounding effects of clinical publications in two ways. First, we conducted a Medline search using the keywords rofecoxib, celecoxib, Vioxx, Celebrex, and osteoarthritis (restricting the range to English-language journals and the years 2000–2002). We included measures of the number of articles each month that focused on Celebrex or Vioxx, or both. We did not attempt to characterize whether the articles were favorable or unfavorable. We also included a variable that equals 0 when the month of publication is before an important August 2001 publication by Debabrata Mukherjee and colleagues, and 1 otherwise.[11] This article was the first in a major clinical journal to document concerns about Vioxx's cardiovascular side effects.

■ **Statistical analysis.** Two of the three models had dependent variables that were numbers of prescriptions written to osteoarthritis patients divided by the number of visits by such patients. By measuring these dependent variables as percentages of the potentially "treated" population, we normalized the results for differences in practice size. We also included practice-level fixed effects in each of the three models (which controlled for any time-invariant practice characteristics). We estimated these models as linear regressions and adjusted the standard errors for clustering at the practice level (to control for the fact that we had repeated monthly observations on each practice) using the Stata "xtreg" procedure. We adjusted for clustering at the practice level rather than at the media-market level because we generally have only one practice per media market.

Study Results

Although Merck (Vioxx) invested in nearly twice as many ads as Pfizer (Celebrex) for the first nine months of 2000, advertising exposure for the two brands was roughly comparable over the remaining 2000–2002 time period (Exhibit 2). However, a different picture emerged at the local level throughout this period: Celebrex local ads aired slightly more than twelve times a month on average, while Vioxx local ads aired fewer than once a month on average (data not shown). There was also evidence in the raw data of a more concentrated

EXHIBIT 2
Monthly Counts Of Direct-To-Consumer Television Advertising Of Drugs For Osteoarthritis, Nationally And In Local Markets, By Brand Name, 2000–2002



SOURCE: Authors' analysis of data from Competitive Media Reporting Inc.

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