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Recently, the Centers for Medicare & Medicaid Services made available to the public for the first time detailed data regarding the Medicare Part B program. The data cover all of 2012 and contain a wealth of information—more than 9 million records of data for more than 880,000 healthcare providers. For the first time, one can look up a doctor by name in a publicly available data set and observe a great deal of information, including the services provided, the drugs administered, and the amounts paid for those services and drugs by the Medicare Part B program.¹

Not surprisingly, these data have garnered a great deal of attention in the popular press, with prominent articles appearing in many of the country's most widely read newspapers, websites, and other periodicals.² Many of these articles have focused on high-billing doctors, highlighting the sheer amounts they have been paid by Medicare and in some cases questioning the medical practices in which they have engaged.³ Ophthalmologists specifically have received considerable scrutiny as a result of the data's public release, with several articles in the press identifying these physicians as frequent high billers.⁴

One reason that ophthalmologists are often high billers is because the drugs that they provide to Medicare beneficiaries can be very expensive. In particular, several articles have focused on Lucentis, a drug manufactured by Genentech that ophthalmologists inject into a patient's eye in order to treat wet age-related macular degeneration ("wet AMD"), a condition that can cause blindness.⁵ The drug sells for about \$2,000 per injection and accounted for almost \$1 billion in

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1. Medicare Part B covers doctors' services and outpatient care. Centers for Medicare & Medicaid Services, "Medicare Part B," last updated Mar. 5, 2012, <http://www.cms.gov/Medicare/Medicare-General-Information/MedicareGenInfo/Part-B.html>.
 2. See, e.g., Reed Abelson and Sarah Cohen, "Sliver of Medicare Doctors Get Big Share of Patients," *New York Times*, Apr. 9, 2014, available at http://www.nytimes.com/2014/04/09/business/sliver-of-medicare-doctors-get-big-share-of-payouts.html?_r=0; Tami Luhby, "Doctors Make Millions Off of Medicare," CNN Money, Apr. 9, 2014, <http://money.cnn.com/2014/04/09/news/economy/medicare-doctors/>; Caroline Chen and Sophia Pearson, "Top Medicare Doctor Paid \$21 Million in 2012, Data Show," Bloomberg, Apr. 9, 2014, <http://www.bloomberg.com/news/2014-04-09/top-medicare-doctor-paid-21-million-in-2012-data-shows.html>.
 3. *Id.*
 4. *Id.*
 5. Note that Lucentis received FDA approval in June 2006 to treat wet AMD. Lucentis also received FDA approval for two additional indications. In June 2010, Lucentis was approved for the treatment of Macular Edema Following Retinal Vein Occlusion (RVO). In August 2012, Lucentis was approved for the treatment of Diabetic Macular Edema (DME). See Food and Drug Administration, "Lucentis—Label and Approval History," accessed May 14, 2014, http://www.accessdata.fda.gov/scripts/cder/drugsatfda/index.cfm?fuseaction=Search.Set_Current_Drug&ApplNo=125156&DrugName=LUCENTIS&ActiveIngrid=RANIBIZUMAB&SponsorApplicant=GENENTECH&ProductMktStatus

Medicare Part B payments in 2012. Of particular emphasis in the press is that a similar, less expensive drug, Avastin, can also be used to treat wet AMD. Avastin, also manufactured by Genentech, is approved for cancer treatments but can be, and often is, used by ophthalmologists off label to treat wet AMD. The dose of Avastin typically administered by ophthalmologists sells for approximately \$50 per injection.⁶

Medicare Part B payment to doctors when they inject these drugs is set at a 6% markup over the drug's Average Sales Price (ASP), and hence a drug that costs more for a doctor to acquire (i.e., has a higher selling price) has a higher Medicare payment. Drugs that cost more also have a potentially higher profit for the doctor, because the 6% markup will be larger for a drug with a higher selling price. For example, a 6% markup on the average sales price of Lucentis is \$120 (\$2,000 times 6%), whereas a 6% markup on the average sales price of Avastin is only \$3 (\$50 times 6%).

The difference in the Medicare Part B payment between these two products has been cited in articles to suggest that it may be irresponsible for ophthalmologists to use Lucentis instead of Avastin. Moreover, some articles cite the potential difference in profits to further suggest that doctors may be using Lucentis because of a financial incentive, not because it is the right choice for patients.⁷ In making such assertions, several articles have focused on the total amounts that certain doctors have been paid by Medicare Part B for their administrations of Lucentis and have inferred from these amounts that the doctors are likely driven by financial incentives. Such limited analysis is not particularly informative from the standpoint of generating insights about doctors' motivations or whether patients are getting the best treatment for their medical conditions.

The newly released data can be used to perform a more careful analysis that tests two competing hypotheses regarding doctors' use of these drugs.⁸ In particular:

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6. See, e.g., Peter Whoriskey and Dan Keating, "An Effective Eye Drug is Available for \$50. But Many Doctors Choose a \$2,000 Alternative," *Washington Post*, Dec. 7, 2013, available at http://www.washingtonpost.com/business/economy/an-effective-eye-drug-is-available-for-50-but-many-doctors-choose-a-2000-alternative/2013/12/07/1a96628e-55e7-11e3-8304-caf30787c0a9_story.html.
7. *Id.*, stating that "Avastin costs about \$50 per injection. Lucentis costs about \$2,000 per injection. Doctors choose the more expensive drug more than half a million times every year, a choice that costs the Medicare program, the largest single customer, an extra \$1 billion or more annually. Spending that much may make little sense for a country burdened by ever-rising health bills, but as is often the case in American health care, there is a certain economic logic: Doctors and drugmakers profit when more-costly treatments are adopted." See also Sarah Kliff, "This \$2,000 Drug Says Everything about our Messed Up Health-Care System," *Washington Post*, Dec. 9, 2013, available at <http://www.washingtonpost.com/blogs/wonkblog/wp/2013/12/09/this-2000-drug-says-everything-about-our-messed-up-health-care-system/>.
8. Of course, one needs to be cautious about what inferences can and cannot be drawn based on these data alone—for example, the newly released data do not provide information on the reasons why a doctor injected one drug versus another, the severity of patients' conditions, or patient outcomes. Also, the public data do not contain claim-level information that would provide additional insight. Claim-level data, which are typically available through discovery in litigation, contains information such as the diagnosis codes that were listed for the patient's visit and

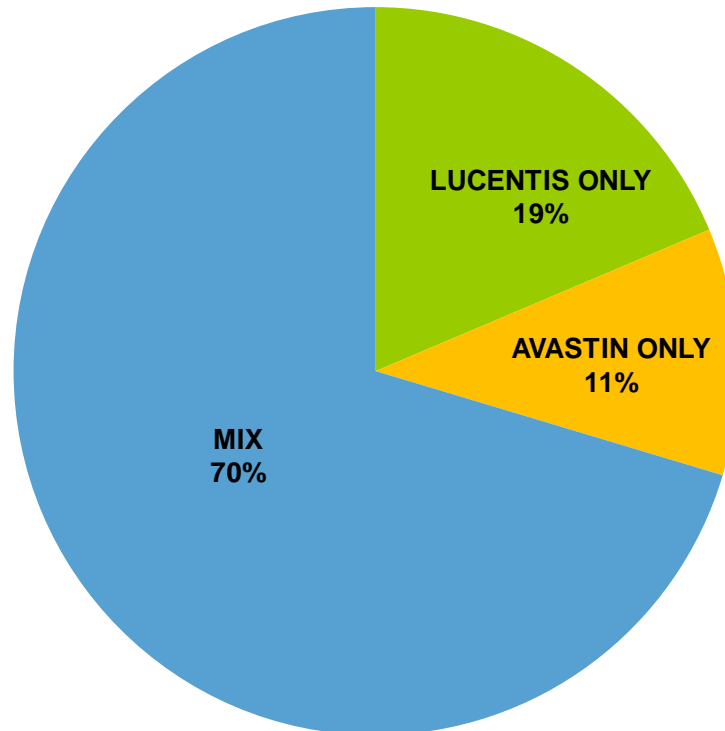
1. Do ophthalmologists that administer Lucentis appear to be doing so because they earn higher profits, as has been suggested in the press? Specifically, if doctors view Lucentis and Avastin as very similar or identical, and the only factor affecting the decision to administer one versus the other is whether the doctor is driven by profit (and hence inclined to use Lucentis) or altruistic (and hence inclined to use Avastin), then one would expect doctors to administer one or the other but not both.
2. Alternatively, do ophthalmologists who administer Lucentis appear to be doing so because they are exercising medical judgment on a patient-by-patient basis and concluding that Lucentis is the best choice in certain instances? Specifically, if doctors view Lucentis and Avastin as differentiated, then they may believe that Lucentis is best for some patients and Avastin is best for others. In this case, one would expect doctors to administer a mix of the two drugs to their patients.⁹

To investigate these competing hypotheses, we focus on ophthalmologists who tend to use these drugs frequently, because these are the type of high-billing doctors that are the focus of the articles in the popular press. Specifically, we limit the data to ophthalmologists with 200 or more patients who received injections of these drugs over the course of 2012. 547 ophthalmologists meet this criterion and are included in our analysis. As shown in [Figure 1](#), across these high-volume doctors, 11% only administered Avastin to their patients, 19% only administered Lucentis, and 70% administered a mix of the two drugs to their patients—Avastin to some patients and Lucentis to others.¹⁰ This finding is certainly consistent with the second hypothesis above. In particular, the vast majority of these doctors use Avastin on some patients and Lucentis on others, suggesting that they are exercising medical judgment in their choice of treatment on a patient-by-patient basis.^{11, 12}

can be used to see all services, drugs, and procedures provided on a given visit to the doctor. Moreover, by using claims data, individual patients can be tracked and evaluated through time to see if, for instance, the patient started on one drug and switched to the other, which may indicate that the first drug was not effective.

9. Importantly, a physician's decision to only use Lucentis and not Avastin does not mean that the physician is making decisions based on profits. Rather, it could mean that the doctor has been convinced of the benefits of Lucentis vis-à-vis Avastin and therefore has chosen Lucentis as the therapy of choice for medical reasons. As a result, one cannot draw the conclusion that the physician is motivated by profits based only upon his or her choice to use Lucentis. Nevertheless, for purposes of this article, we simply focus on the physicians that use a mix of the two as suggestive of medical judgment as opposed to financial motivation. This will understate the true effect of medical judgment.
10. We also obtained generally similar results when limiting to ophthalmologists with 100 or more patients. In particular, 18% only administered Avastin to their patients, 24% only administered Lucentis, and 59% administered a mix of the two drugs to their patients.
11. Note that the Medicare Part B data are aggregated and do not allow for the tracking of a patient through time. That is, for each doctor, the data list the total number of patients that were administered Avastin and the total number that were administered Lucentis. As a result, it is possible that a given patient may have been administered both Avastin and Lucentis during the year and thus would appear in the data as an Avastin patient and also as a Lucentis patient. Of course, to the extent that a doctor administers both drugs to a given patient, that would further support the notion that doctors are exercising medical judgment—in particular, it would show that they are exercising judgment for a patient over time.

Figure 1: Breakdown of Avastin versus Lucentis use for ophthalmologists with 200 or more patients treated with Lucentis and/or Avastin

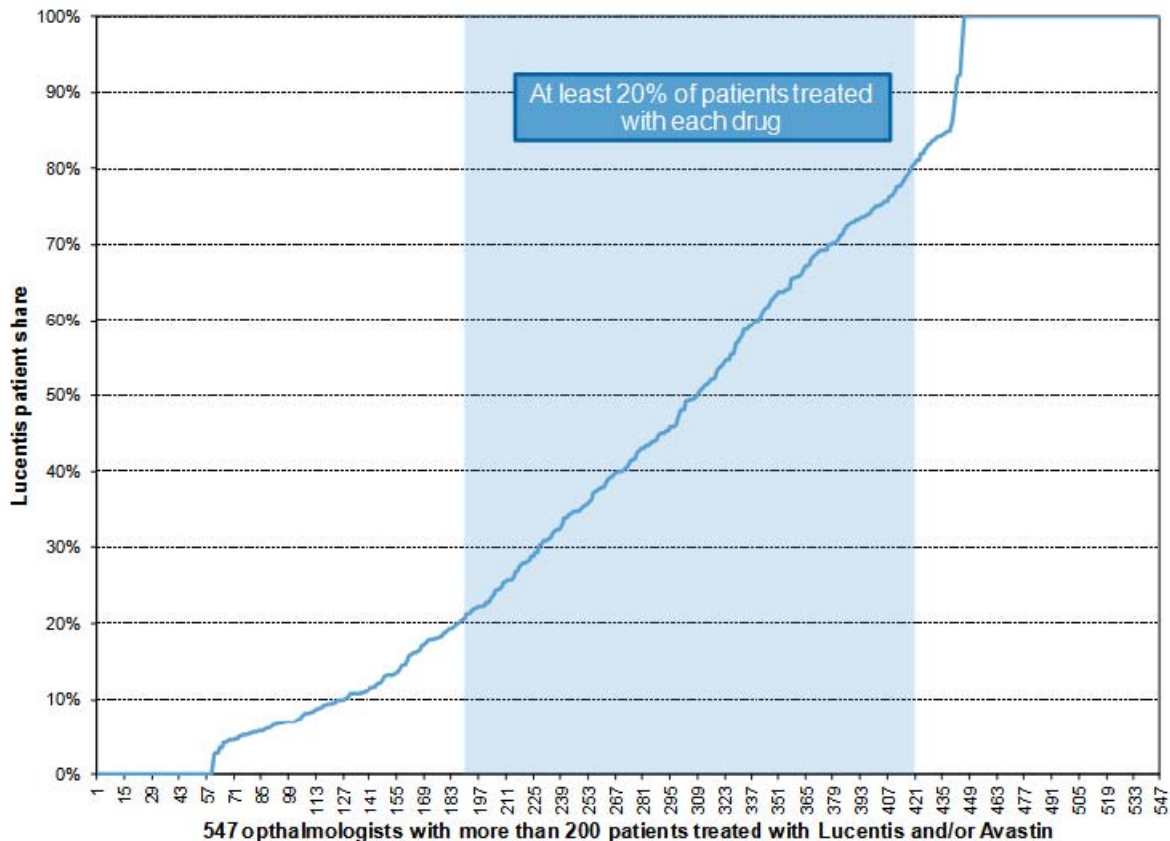


Moreover, for doctors that use these products in high volumes, the “mix” group often includes a substantial number of patients being treated with each of the products. That is, the mix group is not driven by doctors that use one drug on nearly all of their patients and the other on a small fraction. In [Figure 2](#) below, we calculate the number of patients treated with Lucentis as a fraction of the total number of patients treated with either Lucentis or Avastin for each of the high-volume doctors. Specifically, each data point represents one of 547 high-volume doctors, and the graph measures each doctor’s Lucentis “patient share.”

12. The National Provider Identifier (NPI) number is used to identify individual physicians in this analysis. It is worth noting that claims for services provided by different physicians may sometimes be submitted under a single NPI number. As a result, while a unique NPI number is a good proxy for a unique physician, it is not a perfect indicator. Thus, there is some possibility that individual physicians who only administer Avastin are mixed in with other individual physicians that only administer Lucentis under the same NPI number. This could create a misleading impression that an individual physician is administering both drugs when that is not the case. In general, we believe that this issue (multiple physicians included in a single NPI number) is not likely to be common enough to have a substantial impact on the conclusions in this article. Moreover, when multiple physicians submit claims under the same NPI number, these physicians are almost certainly in the same practice group. Therefore, even if multiple physicians billing under one NPI number were commonplace, our analysis would illustrate that the practice group is not motivated primarily by profit, because the practice group could implement protocols to only administer Lucentis if it was attempting to maximize profits.

As shown in Figure 2, many high-volume doctors administer a substantial amount of both products. For instance, the shaded region shows that many of these doctors do not concentrate more than 80% of their patients on one drug but rather use both drugs in significant shares. In fact, this shaded region amounts to more than 40% of the high-volume ophthalmologists.

Figure 2: Breakdown of Lucentis patient share for high-volume ophthalmologists



Notably, these high-volume doctors in theory have the most to gain financially from using Lucentis alone due to the higher reimbursement and the potential for rebates that could reduce their acquisition costs and increase their margins. This analysis thus casts some doubt on the hypothesis that many of these high-volume doctors are administering Lucentis primarily because they are motivated by profits and lends some support to the hypothesis that they are exercising medical judgment in their choice of treatment.

In summary, a couple of key insights can be drawn from this discussion and analysis.

- One must carefully approach inferences drawn from data.
- Many doctors choose Avastin for some patients and Lucentis for others. This is inconsistent with the hypothesis that the major factor of relevance in choosing among these two

products is financial motivation (or lack thereof) and is consistent with the hypothesis that many doctors are exercising medical judgment on a patient-by-patient basis.¹³

Finally, it is also bears emphasis that there are interesting questions pertaining to these products that are outside the scope of this analysis. First, it is important to put decisions like the use of Lucentis or Avastin into context. For instance, for patients that are potentially at risk of a life-changing event occurring (such as losing their vision), even “small” differences in efficacy can plainly be seen as relevant and important when evaluating these treatments. Standard economic analysis, including the use of quality-adjusted life years (QALYs), can shed light on these questions. Second, a question often asked about Lucentis and Avastin is whether clinical/medical differences between the two products merit the significant price differential between them. Economic principles and analysis can also shed light on this question.

13. It is possible that patient-by-patient decisions are also affected by other considerations, such as whether the patient has coverage in addition to Medicare Part B (such as a Medigap policy) and hence whether the patient will be able to cover their 20% coinsurance. However, it would seem unlikely that these considerations alone could explain the treatment decisions observed for the high-volume doctors, particularly given that the vast majority of Medicare patients (approximately 86%) have some form of supplemental insurance. *See, e.g.*, Gretchen Jacobson, Jennifer Huang, and Tricia Neuman, “Medigap Reform: Setting the Context for Understanding Recent Proposals,” Kaiser Family Foundation, Jan. 13, 2014, <http://kff.org/medicare/issue-brief/medigap-reform-setting-the-context/>.