# Introduction

The healthcare landscape is rapidly changing. From 2012 to 2016, physician practices employed by hospitals increased by more than 100% with hospitals acquiring 5,000 physician practices (Advocacy Institute Physicians 2018) and by mid- 2016, roughly 42% of all physicians were employed in a hospital setting (Advocacy Institute Physicians 2018). The push for various forms of vertical integration[[1]](#footnote-1) has been due to both pedagogical and political reasons. Pedagogically, various health care groups believe that medical professionals working together can reduce costs and increase patient outcomes (American Medical Association 2020; Improving Chronic Illness Care 2020). Politically, vertical integration has been heavily influenced through the Affordable Care Act (ACA) which encourages doctors, hospitals, and health care providers to coordinate patient care through the development of Accountable Care Organizations (ACO)[[2]](#footnote-2) (Baker, Laurence C. and Kessler 2014) Theoretically, vertical integration has the possibility to reduce costs by removing redundancy of medical software and transaction costs associated with working independently. On the other hand, vertical integration may increase costs to the healthcare system as large vertically integrated systems may behave monopolistically and negotiate higher rates from insurers(Baker, Laurence C. and Kessler 2014; Capps, Dranove, and Ody 2018). Research on the effectiveness of ACOs and vertical integration supports both theories, with some studies showing that vertically integrated systems reduce costs and improve outcomes (James and Savitz 2011), and other studies showing vertical integration increases costs and does not change outcomes (Koch, Wendling, and Wilson 2017).

When assessing the impact that vertical integration has on health outcomes, little is known about the effect vertical integration has had on prescribing rates by medical provider. Prescription drugs are an important piece of the U.S. healthcare system, as an estimated 59% of U.S. adults report using a prescription medication from 2011 – 2012 (Kantor et al. 2015) and prescription drug use is increasing for all adult age groups **(Center for Disease Control, 2016)**. Prescription drugs are a current topic within the U.S. political sphere, as congress is in the midst of proposing legislation to increase access to prescription drugs for Medicare Part D recipients (Sachs, 2019). In particular, opioid prescribing rates by practice has been shown to be influenced by the specialty of practice (Ringwalt et al. 2014), with opioid prescribing rate varying by specialty (Rosenkrantz et al. 2018; Chen JH, Humphreys K, Shah NH 2016). This study is at the intersection of vertical integration and prescribing rates by medical provider. We believe that through the spillover effects[[3]](#footnote-3) of vertical integration, medical prescribing rates will be influenced.

Our analysis uses cross-sectional data of Medicare medical providers across the U.S. for 2016 which includes opioid prescribing rates, provider specialty, and county-level characteristic data. We select opioid prescriptions as they are both well documented and used across a variety of specialties. While opioids are used across many specialties, they are not used across all specialties, thus creating a selection problem for study. To account for this, we use a statistical model that accommodates this type of selection issue[[4]](#footnote-4) and find that prescribing rates across specialties decrease when incorporating vertical integration. We hypothesize that the spillover effects of practicing in environments of varied specialties makes prescribing patterns a weighted average of all specialties a provider interacts with.

We use publicly available data from CMS’ Medicare Part D Prescription and Physician Compare data to pull opioid prescribing rates by medical provider and determine if a medical provider is in a vertically integrated health system, and the specialties within that system. We use the mix of specialties by group practice to determine if a provider is in a vertically integrated practice. However, we do not differentiate between sizes of vertically integrated practices[[5]](#footnote-5).

We find consistent evidence that vertical integration influences opioid prescribing rates. To check the robustness of the results, we use a limited sample of only nurse practitioners and find similar prescribing patterns. We use nurse practitioners as they are a flexible specialty that commonly works with a several specialties, but in certain areas, are also able to practice independently. We exploit this fact to compare nurse practitioners prescribing patterns when nurse practitioners work independently with other nurse practitioners who work with multiple specialties.

1. Vertical integration in healthcare is defined as any group of medical providers of varied specialties. Medical providers working in large hospital settings is an example of large-scale vertical integration. [↑](#footnote-ref-1)
2. ACOs are programs that set a global budget for total spending on an ACO’s population and provide incentives for the ACO to spend less than the budgeted amount while still providing high-quality care. [↑](#footnote-ref-2)
3. Spillover effect examples include being more familiar with opioids by working with medical specialties that prescribe at higher rates (i.e. pain specialists), or norms of how to treat chronic pain.

   We go into more detail on types of spillover effects in the background section [↑](#footnote-ref-3)
4. We use the two part model commonly used in health research when there are a significant amount of zeros in the dataset (Madden, 2008) (Naihua Duan, 1984) [↑](#footnote-ref-4)
5. Size being number of physicians within the group practice. A vertically integrated group practice can be as few as two physicians of different specialties or as large as several hundred physicians [↑](#footnote-ref-5)