ASHWINI SANKAR

POST-DOCTORAL RESEARCH ASSOCIATE, HEALTH ECONOMICS, UNIVERSITY OF MINNESOTA

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EDUCATION

University of Minnesota, Ph.D. Applied Economics, July 2019. Advisors: Jay S. Coggins & Paul Glewwe

Columbia University in the City of New York, M.A. Economics, May 2006

Anna University, Madras School of Economics, M.S. Economics, May 2004

University of Madras, Stella Maris College, B.A. Economics, May 2002

RESEARCH/ TEACHING/ CORPORATE EXPERIENCE

Visiting Assistant Professor (Full-time position)   **Sep 2021 - present**
Macalester College, Department of Economics, Saint Paul MN
- Teach Principles of Economics and Health Economics (undergraduate courses)

Research Associate (Full-time position)   **Aug 2019 - Aug 2021**
University of Minnesota, Carlson School of Management (*with Prof. Pinar Karaca-Mandic*)
- Evaluation of the impact of FDA regulations on de-adoption of certain therapies and drugs
- Building research design and writing a grant on using technology and analytics to reduce cost of health care

Guest Instructor   **Fall 2019**
University of St. Thomas, Department of Economics, Saint Paul MN
- ECON 251: Principle of Macroeconomics (undergraduate course)

Principal Investigator (Part-time position)   **Mar 2018 - present**
The Abdul Latif Jameel Poverty Action Lab
- Conduct evaluation of the "Ganitha Kalika Andolana Initiative" using a randomized control trial to test whether this mathematics program led to better student outcomes.

Adjunct Instructor   **Spring 2019**
University of St. Thomas, Department of Economics, Saint Paul MN
- Teach ECON 311, Forecasting, that focuses on forecasting methods and its applications
- *Summa Cum Laude* committee member

Adjunct Instructor   **Fall 2018**
Hamline University, Department of Economics, Finance, Accounting and Quantitative Methods, Saint Paul MN
- Teach ECON 5820, Econometrics, that focuses on causality, impact evaluation and predictive analytics

Research Analyst (Part-time position)   **Jan 2016 - June 2018**
Federal Reserve Bank of Minneapolis, Minneapolis, MN
- Conducted research on regional economic issues and published multiple articles for the Fedgazette and Research Digest on various topics

Teaching Assistant   **Spring 2017**
University of Minnesota, Department of Applied Economics, Saint Paul MN
- Teaching Assistant for APEC 3001, Applied Microeconomics-Consumers, Producers, and Markets, for which I won the **TA Award 2016-17**

Senior Consumer Insights Associate (Full-time position)   **Mar 2013 - Jan 2016**
General Mills, Minneapolis, MN
- Built models for, and estimated sales forecasts, market size, and new market entry for several GM brands.
- Regularly presented the analyses and models to cross-functional audiences with multi-level members from Supply Chain, Demand Planning, Finance and Marketing teams.

Senior Statistician (Full-time position)   **Jan 2010 - Feb 2013**
Source Healthcare Analytics, Florham Park, NJ
- Built survival models to explain patient persistency across drugs in the market.
- Built impact evaluation models for specific programs

Analyst (Full-time position)   **Sep 2006 - Jan 2010**
marketRx Inc, A Cognizant Company, Bridgewater, NJ
- Built forecast and promotion response models for brands of several pharmaceutical companies, who were the clients

Intern United Nations Development Program   **Mar 2006 - Aug 2006**
- Part of the Public Finance and Sovereign Debt Project, where we projected the public debt of specific developing nations

Teaching Assistant   **Fall 2005**
Columbia University in the City of New York, Department of Economics, New York, NY
- Teaching Assistant for Principles of Economics

PEER-REVIEWED PUBLICATIONS (abstracts below)

"FDA Safety Warnings and Trends in Testosterone Marketing to Physicians" (with Adeniyi Togun and Pinar Karaca-Mandic) *The American Journal of Managed Care* Forthcoming, March 2022

"Effectiveness of Air Pollution Standards in Reducing Mortality in India" (with Jay S. Coggins and Andrew L. Goodkind) *Resources and Energy Economics: First author* Volume 62, November 2020

"Experimental Evidence on Activity-based Instruction in India" (with Andreas de Barros, Johanna Fajardo-Gonzalez and Paul Glewwe) *Paper Conditionally Accepted via pre-results review process, Journal of Development Economics, Dec 2019: All authors contributed equally to this work*;

"Post-Extrasystolic Potentiation as a Predictor of Recovery of Left Ventricular Dysfunction After Radiofrequency Catheter Ablation" (with Balaji Krishnan, Inder Anand, Selcuk Adabag, Jian-Ming Li, Edward O. McFalls, David G. Benditt, Kalyanam

Shivkumar and Venkatakrishna N. Tholakanahalli) *JACC: Clinical Electrophysiology* Volume 3, Issue 11, November 2017

"Impact of pre-operative statin use on risk of mortality and early atrial fibrillation after heart transplantation" (with Balaji Krishnan, Kairav P. Vakil, Daniel Duprez and David G. Benditt) *Clinical Transplantation* Volume 30, Issue 5, 628–632, May 2016

WORKING PAPERS (abstracts below)

"Pollution Attributed Mortality in India" (with Jay S. Coggins and Andrew L. Goodkind) *First author*

"Changing Waste and Recycling Behavior through Social Norms: Evidence from Minnesota" *Solo author*

"The changing effectiveness of financial incentives: theory and evidence from residential solar rebate programs in California" (with Bixuan Sun) *Under Review* Energy Economics

"Robust Early Life Determinants of Neurocognitive Development in Children: Evidence from the Pune Maternal Nutrition Study (PMNS)" (with Chittaranjan Yajnik, Chih Ming Tan, Vidya Bhate, Souvik Bandyopadhyay and Rishikesh Behere) *Under Review* Journal of Developmental Origins of Health and Disease

"De-Adoption of Fluoroquinolone: Evaluation of Prescribing Trends after FDA Warns of Permanent Nerve Damage Risk to Patients" (with Kristi Swanson, Jiani Zhou, Anupam Jena, Joseph S. Ross, Nilay Shah, Pinar Karaca-Mandic: First author) *Under Review* Journal of Managed Care and Specialty Pharmacy

"Changes in Fluoroquinolone Prescribing after FDA Warns of Potentially Disabling Side Effects: An Evaluation of the Effects of the 2016 FDA Warning" (with Kristi Swanson, Jiani Zhou, Anupam Jena, Joseph S. Ross, Nilay Shah, Pinar Karaca-Mandic: second author)

"Longitudinal Patterns in Testosterone Prescribing After FDA Warnings" (with Alexander Everhart, Anupam Jena, Nancy Morden, Molly Jeffery, Joseph Ross, Nilay Shah, Pinar Karaca-Mandic) *First author*

"Trends in Testosterone Receipt Among Older Men Enrolled in Commercial Insurance and Medicare Advantage" (with Alexander Everhart, Katrina Harper, Molly Moore Jeffery, Zachary Levin, Nancy E. Morden, Pinar Karaca-Mandic) *Under Review* JAMA Network Open

OTHER PUBLICATIONS

"Sweat Equity: Intangible, Valuable, and Tax-Sensitive" *Research Digest*, August 2018
"Childcare Availability Raises Concerns" *Fedgazette*, July 2018
"A Rising Mountain of Student Debt" *Fedgazette*, April 2018
"Green Shoots Sprout in the Bakken" *Fedgazette*, February 2018
"The worst they've ever seen" *Fedgazette*, November 2017
"Ninth District Manufactured Exports Retrench in 2016" *Fedgazette*, July 2017
"Health Insurance for (Almost) Everybody" (with Phil Davies). *Fedgazette*, April 2017
"At Last, a Wage Bump" (with Phil Davies). *Fedgazette*, December 2016
"District GDP grew slower than the nation's in 2015" (with Rob Grunewald). *Fedgazette*,

October 2016

"From Billings to Brunei" (with Phil Davies). *Fedgazette*, September 2016

"Ninth District Manufactured Exports Slip in 2015" (with Rob Grunewald). *Fedgazette*, July 2016

"The rise and fall of career college enrollment" (with Phil Davies). *Fedgazette*, June 2016

AWARDS

Received 2016-17 TA Award, from student evaluations, University of Minnesota

Carol E. Macpherson Memorial Scholarship 2016-17, awarded to women over 28 years who pursue education after more than 5-years′ gap, University of Minnesota: $2,000

Global Consumer Insights Year-End Award 2014 - New Breakthrough Capabilities, for building forecast models for inventory levels for a Supply Chain initiative, General Mills

Faculty Fellowship 2004-06, Columbia University: $24,000

Gold Medal 2004, award for highest cumulative GPA, Anna University

Graduate Fellowship 2002-04, Anna University: 36,000INR

SELECTED PRESENTATIONS

June 2021: ASHEcon Conference
June 2020: Academy Health conference
June 2020: ASHEcon Conference
February 2020: EnviroThursday Seminar Series, Macalester College
2019: Midwest Economic Association
2018: Guest lecture on predictive analytics to undergraduates, Department of Economics, University of St. Thomas
2017: Midwest Economic Association

REFERENCES

Jay S. Coggins	Paul Glewwe	Pinar Karaca-Mandic
Professor	Distinguished McKnight University Professor	Professor
Department of Applied Economics	Department of Applied Economics	Department of Finance
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PERSONAL

Born December 19, 1981
US Citizen

PEER-REVIEWED PUBLICATIONS

"Effectiveness of Air Pollution Standards in Reducing Mortality in India"
Published in *Resources and Energy Economics* (with Jay S. Coggins and Andrew L. Goodkind) **JOB MARKET PAPER**

The Global Burden of Disease Study 2016 estimated that one million deaths in India could be attributed to ambient air pollution, with over 95 percent of the people of the ages of five and above being affected by this dirty air. This impact is notwithstanding the fleet of environmental regulations that have been in place for the last three decades in India, and have been effective in stemming emissions. The paper focuses on the impact of two major regulations, the Supreme Court Action Plan and the catalytic converter policy, on mortality that includes all ages (i.e., all-cause mortality), the

first such analysis for India. Even as we show that these policies lead to a significant reduction in total suspended particles (TSP), we are unable to show that the policies significantly impact mortality. Following several studies that show that PM2.5 is the more dangerous component of ambient air pollution than TSP, we go on to show that policy might have failed to have an effect on mortality because of its focus on TSP rather than the more deadly PM2.5, or fine particulate matter.

"Experimental Evidence on Activity-based Instruction in India" (with Andreas de Barros, Johanna Fajardo-Gonzalez and Paul Glewwe) *Conditionally Accepted*

The accumulation of human capital can increase economic growth and reduce poverty along multiple dimensions. There are now many rigorous studies on "what works" to increase student learning in developing countries, but there is surprisingly little evidence on how to increase learning by changing instructional practice. We study the causal effect of an innovative program in Karnataka, India, that promotes activity-based learning through teacher training, community engagement, and additional inputs. This document concludes Stage 1 for a Registered Report of the study. We have randomly assigned 98 administrative units (Gram Panchayats) and 292 schools to either receiving the program or a control group. Our primary outcome of interest is child learning, in mathematics, for students in grade four (at baseline). Sub-group analyses will focus on differential effects by students' initial skill level, gender, and geographic location (i.e., district). The study's secondary analyses investigate changes in observed instructional behaviors and the program's implementation fidelity.

"Post-Extrasystolic Potentiation as a Predictor of Recovery of Left Ventricular Dysfunction After Radiofrequency Catheter Ablation" (with Balaji Krishnan, Inder Anand, Selcuk Adabag, Jian-Ming Li, Edward O. McFalls, David G. Benditt, Kalyanam Shivkumar and Venkatakrishna N. Tholakanahalli)

The paper discusses the determinants of the recovery of left ventricular dysfunction after the ablation procedure. The paper uses data for patients with normal function, reversible and irreversible left ventricular dysfunction pre-procedure, the normal function patients being the control group. Using logistic regression, we then find that post-extrasystolic potentiation significantly impacts subsequent recovery of left ventricular function after ablation. This result is helpful to understand when and why patients need intervention when they present with numbers reflecting left ventricular dysfunction.

"Impact of pre-operative statin use on risk of mortality and early atrial fibrillation after heart transplantation" (with Balaji Krishnan, Kairav P. Vakil, Daniel Duprez and David G. Benditt)

Heart transplantation is currently the treatment of choice for patients with end-stage heart failure. Using a data with patients that have undergone heart transplantation, we show that pre-operative statin use does not lead to a significant reduction in mortality. We use Cox proportional hazards regression analysis to survival in patients with and without pre-transplant statin therapy. This statin use is also unable to show significant influence on post-operative atrial fibrillation. We recommend further large scale analyses to validate these results.

OTHER WORKING PAPERS

"Changing Recycling Behavior through Social Norms: Evidence from Minnesota"

As human population and consumption have risen, environmental degradation has steadily increased too. Much of this degradation of the environment is rooted in human behavior. In this context, the goal in my paper is to study how we can bring about more pro-environment behavior through social norms, i.e. rules of behavior that are considered appropriate within one's social group. In my paper, I build a theoretical model where the households optimize the amount it recycles given that the utility of the household members consists of incentive-based components as well as non-monetary motives. Since a lot of pro-environment behavior is expensive, requires active participation from individuals in the household, and has very little return to the person involved; factors like altruism and social norms can play a big role in the decision making. Based on these components of the model, I show that when the social norm of recycling rate increases, the recycling rate of the household rises and waste per capita declines. The empirical framework emerges from this result where I test if social norms leads to higher recycling rate in the counties of Minnesota, while controlling for socio-economic factors and the fact that Minnesota has a strong history of solid waste recycling policy. Using instrumental variable regression, and data for 87 counties of Minnesota spanning 11 years, I show that while waste per capita decreases significantly as social norm rises following the theoretical model, recycling per capita falls with an increase in social norm contrary to theory. I also find that recycling rate is not significantly affected by social capital.

"Pollution Attributed Mortality in India"

Chronic exposure to ambient air pollution is proven to increase the risk of mortality due to various nonaccidental causes. Most epidemiological studies in this area have described this association for the U.S. and European settings, where they have established that the quality of air is significant to human health even with pollution levels lesser than $30\mu g/m^3$. Few papers have, however, studied this relationship for developing countries where pollution levels are much higher than that of the developed nations. Fewer still have focused on the shape of the concentration response curve, which characterizes the relationship between pollution and health in emerging nations like India. This shape will determine if the air in India, which is much worse than that of the developed nations, affects the health of its population at a higher, lower or at the same rate as the U.S. centric impact. My paper improves upon previous research by estimating this impact by identifying this causal relationship, following a rigorous identification strategy, between air quality and human health by using a panel dataset that includes PM2.5 and mortality rates for 119 districts in India spanning 17 years.

"Robust Early Life Determinants of Neurocognitive Development in Children: Evidence from the Pune Maternal Nutrition Study (PMNS)" (with Chittaranjan Yajnik, Chih Ming Tan, Vidya Bhate, Souvik Bandyopadhyay and Rishikesh Behere)

The Lancet series on child development in developing countries have highlighted important links between early childhood development, human capital accumulation, and adult outcomes. Our study is novel in that we have information on nutritional status (e.g., B12 levels) and anthropometric factors for both the mother during pregnancy and importantly, the child from birth to 12 years of age. This data allows us to control for not only initial shocks, but changes in nutritional status across the life course of the child (until age 12 when she takes the neurocognitive tests). In this paper, therefore, we advocate an approach that moves the focus of analysis away from findings based upon any single a priori chosen model to estimates that do not depend on a particular model specification but that are instead conditional on the space of models

generated from the set of plausible explanatory variables for the outcome of interest. Specifically, we employ Bayesian model averaging (BMA) methods to produce robust estimates for the treatment effect by assigning evidentiary weights based on the data (i.e., posterior model probabilities) to each model in the model space, and then taking an average of model-specific estimates using these weights. Our findings suggest that a range of early factors – such as pregnant mother's B12 levels, fasting glucose levels, triglycerides, and HDL, as well as the child's head circumference and height at birth – remain important determinants of some dimensions of child's neurocognitive development at age 12 even after controlling for subsequent changes in health and nutritional status after birth.

"The changing effectiveness of financial incentives: theory and evidence from residential solar rebate programs in California" (with Bixuan Sun) *Under Review* Energy Economics

Financial incentives are widely used to promote the adoption of residential solar photovoltaic systems. This paper studies the changing effectiveness of rebate programs as the solar market evolves. We develop a theoretical model to first characterize individual treatment effects then aggregate them to regional effect, and hypothesize that the aggregate treatment effect of a rebate program first increases and then decreases with declining costs and increasing net metering rate. We empirically test our hypotheses by estimating the treatment effect of rebate programs in California from 2006 to 2017 and its interaction terms with installation cost and residential electricity rate. Results confirm our hypotheses and suggest that front-loaded rebate rate design can be an effective and efficient tool at promoting residential solar adoption.

"Robust Early Life Determinants of Neurocognitive Development in Children: Evidence from the Pune Maternal Nutrition Study (PMNS)" (with Chittaranjan Yajnik, Chih Ming Tan, Vidya Bhate , Souvik Bandyopadhyay and Rishikesh Behere)

Cognitive development over the life course of an individual is a dynamic process and is influenced by intrauterine factors as well as later life environment including socio-economic factors. Using data from the Pune Maternal Nutrition Study (PMNS) from 1994 to 2008, we investigate the association of in-utero, birth, and childhood conditions on offspring neurocognitive development at age 12. We used the novel Bayesian Model Averaging (BMA) approach to analyze these data. Our study employs 8 standard neurocognitive tests that measure intelligence, working memory, visuo-conceptual and verbal learning, and decision-making/attention, and we control for metabolic information based on bloodwork from both the pregnant mothers as well as from the children at various points of their lifecycle up to 12 years of age. Our findings highlight the critical role of family's socioeconomic background in determining child neurocognitive development. While there is some evidence that a range of early factors – such as pregnant mother's B12 levels, fasting glucose levels, triglycerides, and HDL, as well as the child's head circumference and height at birth – remain important determinants of some dimensions of child's neurocognitive development at age 12, their impacts are generally not statistically significant or robust once we account for model uncertainty. Using the results from our sample, we can infer that initial insults appear to be potentially reversible by post-birth (remedial) changes that stem from favorable socio-economic factors.

"De-Adoption of Fluoroquinolone: Evaluation of Prescribing Trends after FDA Warns of Permanent Nerve Damage Risk to Patients" (with Kristi Swanson, Jiani Zhou, Anupam Jena, Joseph S. Ross, Nilay Shah, Pinar Karaca-

Mandic: First author)

Fluoroquinolones are associated with serious adverse events affecting the musculoskeletal, peripheral nervous, and central nervous system. In August 2013 and July 2016, the U.S. Food and Drug Administration (FDA) issued warnings and recommended limited use of Fluoroquinolones for acute sinusitis, acute exacerbation of chronic bronchitis, and uncomplicated urinary tract infection illnesses, contending that the risks of serious side effects generally outweigh the benefits for patients with these conditions. Our objectives are to understand the change in the use of Fluoroquinolone in association with safety labeling changes required by the U.S. FDA warnings in 2013 and 2016, and also the physician characteristics that are associated with a change in response to these warnings. Using de-identified claims data from a 20% sample of Medicare fee-for-service (FFS) beneficiaries for the years 2011 to 2017, we identified outpatient acute care evaluation and management visits with a primary diagnosis of sinusitis, bronchitis, or urinary tract infection. We used an interrupted time series approach to analyze this data. Using data for 2.8 million patients, we found that the prescribing levels of Fluoroquinolone in the post period declined significantly by 0.77 percentage points (p.p.) after 2016 (although the prescribing trend went up significantly by 0.06 p.p.), even after controlling for patient age, sex, race, provider characteristics and region fixed effects. Post-2016 warning, PCPs were associated with a 1.15 p.p. decline in prescription levels, the most among the types of physician affiliations. However, the post warning trend for PCPs went up significantly by 0.08 p.p.. Although de-adoption of a drug is generally known to be slower than adoption, we do find that there is a decline in prescribing levels after the FDA warning in 2016.

"Changes in Fluoroquinolone Prescribing after FDA Warns of Potentially Disabling Side Effects: An Evaluation of the Effects of the 2016 FDA Warning" (with Kristi Swanson, Jiani Zhou, Anupam Jena, Joseph S. Ross, Nilay Shah, Pinar Karaca-Mandic: second author)

Fluoroquinolones are commonly used broad-spectrum antibiotics that have associated risks of severe adverse effects, including peripheral neuropathy and nerve damage. The U.S. Food and Drug Administration has issued multiple warnings over the past decade warning of these toxic side effects and recommending limited use for specific conditions, including sinusitis, bronchitis, and uncomplicated urinary tract infections. This study aims to evaluate whether the 2013 and 2016 FDA warnings have had an impact on the rates of Fluoroquinolone prescribing in the outpatient setting. Used claims data from the OptumLabs Data Warehouse (OLDW), we conducted an interrupted time series (ITS) analysis to examine both the immediate and long-term impact of the FDA warnings on Fluoroquinolone prescribing among two patient populations: a group of privately insured enrollees and a group of Medicare Advantage enrollees. We studied outpatient acute care evaluation and management (E&M) visits from January 1, 2008 through December 31, 2019 with a primary diagnosis of sinusitis, bronchitis, or urinary tract infection. The outcome of interest was receipt of a prescription for a Fluoroquinolone antibiotic (Cirpro, Factive, Levaquin, Avelox, Noroxin and/or Floxin). There were 15,805,135 eligible visits were identified from 2008 through 2019, with 74% being for privately insured individuals 26% being for those covered under Medicare Advantage. We found significant changes in the rates of Fluoroquinolone prescribing across time periods. During the baseline period, prescriptions decreased at a rate of 0.20% (commercial) and 0.14% (MA) per month. After the 2013 warning, prescribing rates continued to decrease, but at a slightly lower rate of 0.04% (commercial) and 0.07% (MA) per month. After the 2016 warning, prescribing decreased at rates of 0.05% (commercial) and 0.03% (MA) per month.

Trends in prescribing rates varied across provider types with higher rates of decrease notes among internists, hospital/ED providers, and family practice providers. Rates also varied between the two insured populations within different provider types seen. We found that prescriptions for Fluoroquinolones have been decreasing over the past decade, with variation notes across type of insurance coverage across type of provider seen, representing opportunity areas for targeted intervention. These results could be used to inform important policies and encourage targeted antimicrobial stewardship efforts in the outpatient setting.

"Longitudinal Patterns in Testosterone Prescribing After FDA Warnings" (with Alexander Everhart, Anupam Jena, Nancy Morden, Molly Jeffery, Joseph Ross, Nilay Shah, Pinar Karaca-Mandic) *First author*

Testosterone as a therapy is given to patients with low levels of this hormone, although the U.S. Food and Drug Administration (FDA) approves of its usage only in conjunction with other medical conditions. After observational studies pointed out that men in all age groups treated with testosterone therapy are at a higher risk of stroke, heart attack, and death, the FDA issued a safety communication about these testosterone therapies. In our study, we follow physicians prescribing testosterone from before the FDA warnings to analyze if they have reduced their prescriptions, especially off-label and for patients with Coronary Artery Disease (CAD) after the warning in 2014 in response to these warnings. Using de-identified claims data in a 20% random sample of Medicare patients for the years 2011 to 2013, before the FDA warning went into effect, we identified physicians who prescribed testosterone. We then used the Medicare sample for the years 2011 to 2017 to see if the physician cohort identified above saw male patients who were over 65 years old in an outpatient evaluation and management setting. For each patient visit quarter, we then identified if these patients were treated with Testosterone, and if they had CAD or testosterone indications using ICD-9/ICD-10 codes. We used an interrupted time series approach to analyze this data. The main outcome is the variable to indicate whether Testosterone was prescribed or not, with key variables being the FDA warning in 2014, and its interactions with a linear time trend and various physician characteristics. Using a patient cohort of 1.3 million unique patients, off-label Testosterone prescriptions were given to 0.3% of the patients with CAD. After 2014, when the changed label came about, 0.2% of the patient-visits were prescribed off-label Testosterone. After adjusting for patient age, race, physician specialty, teaching, IDN, for-profit hospital, and CMI percentile indicators, and region fixed effects, prescribing Testosterone to CAD patients in the post period sees a significant decline in off-label prescription trend by 0.055 [95% CI: -0.063, -0.047] p.p.. In our analyses that includes interactions of the FDA warning with physician characteristics, PCPs and physicians working in top 10th percentile CMI levels hospitals see a bigger decline in prescription levels as compared to other type of providers. Off-label prescriptions to patients with CAD have declined in trend but not in level terms for the study period, showing that safety communications have been partially effective in reducing off-label prescriptions.

"FDA Safety Warnings and Trends in Testosterone Marketing to Physicians" (with Adeniyi Togun and Pinar Karaca-Mandic)

We examine testosterone marketing practices around the period of the testosterone label warning in 2015 by physician specialty and rural versus urban primary care service area (PCSA). We found that testosterone marketing efforts increased significantly for four quarters following an FDA boxed warning in 2015 on testosterone prescriptions among non-PCP physicians and urban physicians. After the black box warning, off-label testosterone advertisements stopped, which could have made it

more attractive for pharmaceutical companies to increase their marketing spending, targeting non-PCP physicians and physicians in urban areas.

"Trends in Testosterone Receipt Among Older Men Enrolled in Commercial Insurance and Medicare Advantage" (with Alexander Everhart, Katrina Harper, Molly Moore Jeffery, Zachary Levin, Nancy E. Morden, Pinar Karaca-Mandic) *Under Review* JAMA

We examined trends in testosterone receipt among older men enrolled in commercial insurance or Medicare Advantage (MA) with and without several cardiovascular conditions. We found that older men with MA or commercial insurance received testosterone therapy less often immediately following FDA actions. This reduction persisted in later years.