Research Statement

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Current Research: My research primarily focuses on health policies analyses, including: (1) drug coverage and utilization of prescription drugs; (2) Medicaid managed care programs; (3) preventive care services; and (4) health information technology. After I became a postdoctoral researcher at University of Pennsylvania, my interests diversified into the study of genetics, progression, and symptoms of Alzheimer’s Disease (AD).

(1) Drug Coverage and Utilization of Prescription Drugs: I study the impact of the adoption of Medicare Part D on physicians prescribing behavior (Hu, Decker, and Chou 2014b). We analyze the National Ambulatory Medical Care Survey using combined difference-in-differences (DD) and regression discontinuity (RD) specifications. Our results indicate a 35% increase in the number of prescription drugs prescribed per visit and a 55% increase in the number of generic drugs prescribed after the implementation of Part D. This is consistent with the change in patients actual utilization pattern. Physicians do not appear to act in the interest of pharmaceutical companies.

After I joined University of Pennsylvania as a postdoctoral researcher, I continued to explore the detailed benefit design of Part D drugs plans. I am focusing on rheumatoid arthritis (RA) biologic therapies. RA patients who are eligible for a low income subsidy (LIS) under Part D face different cost sharing structures than those who do not qualify for LIS. I ask whether LIS status affects the utilization of and adherence to biologics under Part B or D, using the 2007-2010 Medicare Chronic Condition Warehouse (CCW) Part A, B and D claim files. I find that among RA patients who used Part D or B biologics in the previous year, non-LIS beneficiaries are less likely to adhere to part D bio, and more likely to use Part B bio in pre-ICL period (Doshi et al. 2014a; Doshi et al. 2014b). This raises concerns about the Medicare program because the use of physician-administered Part B bio is not likely to be cost-effective compared to self-administered Part D bio.

(2) Medicaid Managed Care Programs: The percentage of the population covered by Medicaid managed care is likely to increase under Affordable Care Act. I study the impact of Pennsylvania’s mandatory Medicaid managed care program, HealthChoices, on pregnancy outcomes (Hu, Chou, and Deily 2014). This program was adopted in different regions over the period of 1995-2004, allowing us to use DD methods to net out the effects of contemporaneous changes. This policy results in fewer patients with preventable complications, particularly among higher-risk patients. The results also indicate significant reductions in costs for very costly cases, possibly because of better coordination of care for higher-risk patients.

Several states adopted pay for performance (P4P) programs for their Medicaid managed care plans in response to CMSs promotion of quality and value-based purchasing. The P4P program rewards/penalizes managed care plans based on performance measures. Using data from National Health Interview Survey and National Immunization Survey, I find that Medicaid beneficiaries in a P4P state, especially one with higher Medicaid managed care penetration rates, are likely to have higher rates of cancer screening procedures and childhood immunization rates (Hu, Decker, and
I also find that negative financial incentives, such as penalties or withholds, are most effective in improving outcomes.

(3) Preventive Care Services: Appropriate preventive care services help to prevent diseases and improve the quality of our lives. However, it is empirically challenging to measure the causal effect of preventive care on outcomes, given that patients health is correlated with both services and outcomes. I exploit the variation in prenatal care visits generated by the unpredicted SARS outbreak in 2002-2003 to estimate the marginal returns to medical care (Lien, Hu, and Chou 2014). Using National Health Insurance data from Taiwan, I create an instrumental variable (IV) for mothers prenatal visit with the average number of visits in a relevant social network. The results indicate that prenatal care visits, especially those in the second and third trimesters, lead to fewer incidences of pre-term delivery, low birth weight, and infant mortality.

(4) Health Information Technology: Health information technology (HIT) helps information flow better between different sites and specialists where patients receive care, resulting in more coordinated care, larger gains in terms of quality, and efficiency in health care services. Past literature focused on the impact of HIT by looking at inpatient facilities. I examine the impact of HIT at non-hospital facilities; I find that higher clinical HIT use by non-hospital facilities is associated with better quality. The beneficial impacts of HIT increase as the time following adoption increases, suggesting learning effects as physicians and staffs gain experience. Policies promoting the adoption of electronic health records (EHRs) are based on the assumption that increasing provider access to timely and accurate patient information will improve the quality of health care. We conduct surveys on data availability (as perceived by providers at primary care offices and at the hospital) before, during, and after the implementation of an integrated commercial EHR in one large health care delivery system, Lehigh Valley Hospital Network (LVHN). The results indicate that access to key clinical information on the inpatient Labor and Delivery (L&D) Triage Unit was associated with significant reductions in the incidence of obstetric trauma, preterm birth, and low birth weight (Meyerhoefer et al. 2014).

(5) Genetics, Progressions and Symptoms of AD: Despite the high prevalence and high cost associated with caretaking activities, and the loss of productivity for patients with AD, there is no clear diagnosis or effective treatment for the disease. From a statistical perspective, it is thus important to learn the mechanism and progression of AD, as well as the relationship between different cognitive and functional symptoms of AD.

Patients with AD or mild cognitive impairment (MCI), the stage that leads to AD onset, exhibit neuropsychiatric symptoms (NPSs), but the prevalence and severity of symptoms vary. I analyze baseline characteristics of AD, MCI, and normal subjects from the Integrated Neurodegenerative Disease Database (INDD), developed by the University of Pennsylvania. The results indicate significant differences in changes of NPSs across the disease spectrum. Education has the strongest effects on the development of NPSs, followed by gender and age (Leung et al. 2014).

Patients with AD also suffer serious functional difficulties in daily activities, such as preparing meals, handling bills, and driving, which lead to loss of independence and increased caregivers.
burden. I analyze subjects from INDD, and find that the association between NPS and functional disabilities is greater for patients with MCI, compared to other stages of AD (Hu, Leung, Appleby, et al. 2014). Further analyses indicate that functional difficulties increase with a higher prevalence of NPS in frontal cluster (anxiety, apathy, and disinhibition). This suggests either a common pathological mechanism or a causal relationship between NPS and functional difficulties, which merits further explorations with longitudinal data.

Depression in AD presents atypically with some features typical of major depression, including anhedonia and irritability, but not others, such as guilt and suicidality. Previous studies have shown that depression doubles the risk of transition from MCI to Alzheimers dementia, but it remains unclear how much depression is caused by AD progression itself. With the National Alzheimers Coordination Center database, I use genetic risk factors for AD, variants in the Apolipoprotein E gene (APOE), as the instrumental variable for AD (Hu, Leung, Naj, et al. 2014). My initial results indicate a causal relationship between AD and depression.

**Future Research:** As an extension to my studies related to drug coverage and utilization of prescription drugs, I was funded through the pilot grant program of LDI. The goal of my proposal is to study the effect of benefit designs of drug plans on the utilization of generic drugs. Part D plans have adopted various benefit designs and utilization management tools to reduce pharmaceutical use and steer enrollees to less-expensive generic alternatives. Estimating the effect of those designs on the utilization of generic drugs is potentially challenging because of adverse selection – that is, people choose insurance plans based on their preference for the plans specific characteristics. I hope to examine the existence of adverse selection and to estimate the unbiased effects of those designs on the utilization of generic drugs. The study will use the 2006-2010 Medicare claims data files for all 50 states plus D.C. linked with Part D plan and formulary characteristics files, the state generic substitution policy database, and the Area Resource File. When the project ends, I intend to submit an external grant proposal in order to further explore this topic.

I am also interested in other quality improving and cost saving measures in the reimbursement system. The Centers for Medicare & Medicaid Services (CMS) deny higher payment associated with specified hospital-acquired conditions (HACs) that are not present on admission (POA), as of October 1, 2008. However, those quality improvements and cost savings can only be achieved if hospitals consistently record patients conditions and their corresponding POA indicators. I plan to use inpatient data from California to study the impact of the program on quality and cost of health care services. Specifically, I would like to estimate the impact of the policy on the hospital coding practice, as well as on the intensity/quality of care, such as costs, length of stay, and mortality rate.

I also hope to continue working on projects associated with the gene and environment interaction, and its impact on AD and other health outcomes. My postdoctoral experience has allowed me to work with and learn from experts in the fields of biostatistics, computational genetics, and medicine, providing me with knowledge in this interdisciplinary field. One possible project might be a study of the impact of obesity on comorbidities (type 2 diabetes, hypertension, Alzheimers
disease, stroke, and arthritis) and on medical care expenditures, using 1992 through 2010 waves of
the Health and Retirement Study (HRS) linked to its dbGap data which stores the respondents
 genetic information. Direct estimation between the weight variable and health outcomes may yield
biased estimates because of reverse causality and because omitted third variables can cause both
obesity and the comorbidity or medical care expenditures. I can use genes associated with obesity;
the price, outlet, and advertising measures; and interactions between these variables and genes as
instruments for obesity to obtain consistent estimates of its causal effects. Another possible study
in this arena is the analysis of the impact of divorce on psychiatric outcomes, such as depression.
Past studies indicate that genetic similarities between friends are associated with the distance be-
tween them in the friendship network. Using genetic distance between couples as an instrument, I
can estimate the impact of divorce on health outcomes.

References

impact of health information technology adoption by outpatient facilities on pregnancy outcomes.,”
Health services research, 48 (1), 70–94.

Doshi, Jalpa A., Pengxiang Li, Tianyan Hu, Prasun Subedi, and Margaret Davis-Cerone, “Impact of
Specialty Tier Copayments on Adherence and Discontinuation among Medicare Beneficiaries using

, , , , and , “The Association of Specialty Tier Copayments and Biologics Use

Utilization of Preventive Care Services among Medicaid Population in United States,” 2014a. Working
Paper.

, and , “The Impact of Health Insurance Expansion on Physician Treatment Choice: Medi-

, Shin-Yi Chou, and Mary E. Deily, 2014. “Pregnancy Outcomes for Medicaid Patients in Manda-
tory Managed Care: The Pennsylvania HealthChoices Program, forthcoming in Southern Economic

, Yuk Yee Leung, Adam C. Naj, Shin-Yi Chou, and Li-San Wang, “Mendelian Randomization Analysis

, Dina Appleby, Selamawit Negash, Mitchell A. Kling, David Baker, Nikolay Manyakov, Gerald P.
Novak, Giacomo Salvadore, Dai Wang, Li-San Wang, and Steven E. Arnold, “Association between Neu-opsychiatric Symptoms and Functional Outcome Among Dementia Patients with Alzheimer’s Disease,”

Leung, Yuk Yee, Tianyan Hu, Dina Appleby, Selamawit Negash, Steven E. Arnold, David Baker, Nikolay
Manyakov, Gerald P. Novak, Giacomo Salvadore, Dai Wang, Li-San Wang, and Mitchell A. Kling,
“Prevalence and Severity of Neuropsychiatric Symptoms Among Dementia Patients with Alzheimer’s
