Supplementary Online Content

Dusetzina SB, Huskamp HA, Winn AN, Basch E, Keating NL. Out-of-pocket and health care spending changes for patients using orally administered anticancer therapy after adoption of state parity laws. *JAMA Oncol*. Published online November 9, 2017. doi:10.1001/jamaoncol.2017.3598

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This supplementary material has been provided by the authors to give readers additional information about their work

eMethods 1. Anticancer Medication Selection

We selected infused anticancer medications using Healthcare Common Procedure Classification System codes from outpatient claims including the following: J9XXX, J8510, J8515, J8520, J8521, J8560, J8562, J8565, J8600, J8700, J8705 and J8999. We included any outpatient anticancer therapy infusion claim where there was a corresponding International Classification of Disease, Ninth Edition code for cancer included on the claim (ICD-9: 140.xx – 239.xx).

For orally administered anti-cancer medications, we included targeted, non-hormonal cancer therapies based on drugs included in the National Cancer Institute Targeted Cancer Therapies Fact Sheet (http://www.cancer.gov/about-cancer/treatment/types/targeted-therapies/targeted-therapies-fact-sheet) that had an FDA approved indication during our study period. (eTable 1 in the Supplement). In addition, we also included capecitabine as it is a commonly used orally-administered anticancer medication and the only agent with an equivalent infused substitute (5 flourouracil).

eMethods 2. Difference-in-Differences Estimation

This study utilizes a difference-in-differences approach for the analysis. Below is a brief explanation of the basic difference-in-differences (DD) model. Our basic model is: $f(Y) = \alpha + \beta 1 Parity + \beta 2 Post + \beta 3 Parity*Post + \varepsilon$ [1]

In this model, we include main effects for each of our key independent variables (Parity and Post) as well an interaction between the two. β1 represents the impact of being in a fully-insured plan that is subject to parity; β2 represents the impact of time, β3 represents the effect of parity on post-parity outcomes (Y).

A difference-in-difference design is well-suited to study the effects of a policy change by assessing outcomes of interest before and after a policy change while also incorporating a comparison group that is also experiencing time trends but is not exposed to the policy change (See Dimick et al, 2014 JAMA "Methods for Evaluating Changes in Health Care Policy: The Difference-in-Differences Approach" for further discussion). Thus, two groups are followed over time and outcomes are compared by group and time. In the current study, we compare health plans that are subject to parity (fully insured plans, the intervention group) with plans that are not subject to parity (self-funded plans, the control group), examining outcomes before and after parity was implemented during each period. This allows for clear comparisons of changes in the intervention group (fully-insured plans) while controlling for changes occurring over time in the outcome among the control group (self-funded plans). This method allows for identification and control of temporal variation in the outcome not due to treatment exposure (exposure to parity).

In addition to applying the DD framework for estimating the impact of parity, we further used propensity score weighting to better balance baseline characteristics of patients in self funded and fully insured plans. We estimated a propensity score by modeling the probability of being in a fully-insured versus self-funded plan at the time of the patient's index claim. The propensity score model included state, age, sex, cancer type, health plan type (HMO, POS, PPO, other), comorbidity (measured via the Klabunde comorbidity score and number of medications used in prior 3 months), zip code-level socioeconomic variables from the 2010 American Community Survey, and rurality of

residence. We applied the propensity score to all analyses using inverse probability of treatment weights.

Sensitivity Analyses

In sensitivity analyses we estimated changes in mean out-of-pocket spending, rather than the distribution of spending. For all spending models we used a modified Park test to determine the best fitting distribution but also tested alternative definitions of the distributional family and link functions to ensure our findings were robust. Next, for total health care spending, we restricted our sample to those with continuous health plan enrollment during the six-month treatment episode (81.2% of the sample). Finally, although our primary modeling strategy took advantage of within-state controls, we also estimated models matching five states that had not passed parity over the study period to those that had in a difference-in-difference-in-differences model. Results of all sensitivity analyses were consistent with the primary analysis and not presented.

eTable 1. High-Cost Oral Cancer Medications and FDA Approved Cancer Indications

Drug Name	FDA Approved Indications	Approval Date
capecitabine	Breast Cancer Colorectal Cancer	4/30/1998 4/30/2001
imatinib	Chronic Myeloid Leukemia (CML) Gastrointestinal Cancer Acute Lymphoblastic Leukemia	5/10/2001 2/01/2002 10/19/2006
erlotinib	Non-Small Cell Lung Cancer Pancreatic Cancer	11/18/2004 11/02/2005
sorafenib	Kidney Cancer Liver Cancer	12/20/2005 11/16/2007
sunitinib	Kidney Cancer Gastrointestinal Cancer Pancreatic Cancer	1/26/2006 1/26/2006 5/20/2011
dasatinib	Chronic Myeloid Leukemia Acute Lymphoblastic Leukemia	6/28/2006 6/28/2006
lenalidomide	Multiple Myeloma	6/29/2006
lapatinib	Breast Cancer	3/13/2007
nilotinib	Chronic Myeloid Leukemia	10/29/2007

eTable 2. Characteristics of Anticancer Medication Users by Plan Funding Status Before and After Propensity Weighting

	Before Propensity Score Weighting			After Propensity Score Weighting		
	Fully Insured	Self Funded	P-Value	Fully Insured	Self Funded	P-Value
Patient Characteristics	N = 32,792	N = 30,988				
Age Category - %			0.002			1.00
18-24	4.4	4.7		4.5	4.5	
25-45	18.2	19.2		18.7	18.7	
45-54	32.7	31.9		32.5	32.4	
55-64	44.7	44.3		44.3	44.4	
Sex, % Female	56.4	58.1	<0.001	57.2	57.2	0.97
Census-Level SES Variables						
Median Household Income	$70,837	$71,002	0.08	$70,814	$71,036	0.31
Residents Below Poverty - %	11.7	11.5	0.00	11.6	11.6	0.90
Graduating College - %	36.1	35.8	0.05	35.9	36.0	0.69
Graduating High school - %	88.3	88.6	0.00	88.4	88.4	0.86
Black - %	10.5	10.0	<0.001	10.2	10.2	0.61
White - %	75.9	76.5	0.00	76.2	76.2	0.62
Rural-Urban Classification			0.07			1.00
Urban Core - %	78.7	79.2		78.9	79.0	
Urban Other - %	11.3	11.5		11.4	11.4	
Large Rural - %	4.0	3.9		4.0	4.0	
Small Rural - %	2.4	2.2		2.3	2.3	
Isolated - %	1.6	1.5		1.6	1.6	
Unknown - %	1.9	1.8		1.9	1.9	
Medications Used in Prior 3 Months - Mean (SD)	5.7 (4.7)	5.7 (4.7)	0.39	5.7 (4.7)	5.7 (4.7)	0.54
Comorbidity Score - %			0.41			0.36
0	88.3	88.4		88.5	88.2	
1	8.1	8.2		8.0	8.3	
2+	3.7	3.5		3.5	3.6	
Health Plan Type - %			<0.001			0.81
HMO	38.0	8.8		23.9	24.1	
POS	44.7	70.2		56.9	56.9	
PPO	14.5	13.2		13.8	13.8	
Other	2.8	7.9		5.4	5.2	
Year of Index Anticancer Therapy - %			<0.001			1.00
2008	25.4	28.1		26.7	26.7	
2009	19.8	20.9		20.4	20.4	
2010	18.5	18.2		18.3	18.3	
2011	18.3	17.1		17.6	17.7	
2012	18.1	15.7		17.0	17.0	

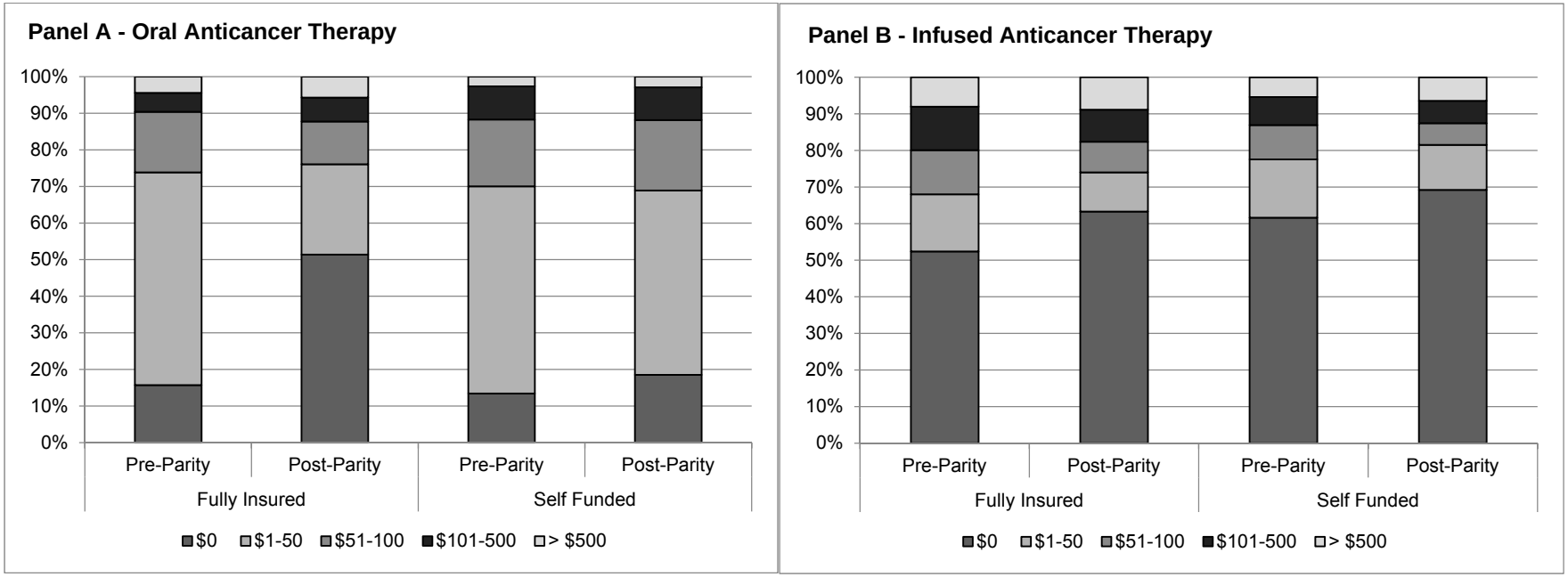
Source: Authors analysis of Health Care Cost Institute Claims, 2008-2012.
HMO = Health Maintenance Organization, POS = Point of Service, PPO = Preferred Provider Organization
SES = Socioeconomic Status

eTable 3. Changes in Out-of-Pocket Spending for Orally-Administered Anticancer Medications—Full Difference-in-Differences Model Results

Quantile Regression Results	25th Percentile		50th Percentile		75th Percentile		90th Percentile		95th Percentile	
	Estimate	P-Value	Estimate	P-Value	Estimate	P-Value	Estimate	P-Value	Estimate	P-Value
Baseline Spending	$19.11	<0.001	$31.50	<0.001	$53.50	<0.001	$105.00	<0.001	$183.60	<0.001
Time	-$1.96	<0.001	$0.00	1.00	$6.50	<0.001	$12.56	<0.001	$36.03	0.08
Fully-Insured	$2.29	<0.001	$0.63	<0.001	-$2.50	<0.001	-$24.75	<0.001	$78.90	<0.001
Time*Fully-Insured	-$19.44	<0.001	-$32.13	<0.001	-$10.83	<0.001	$37.19	<0.001	$143.25	<0.001

Source: Authors analysis of Health Care Cost Institute Claims, 2008-2012. N=85,107 observations
Quantile regression analyses in propensity-weighted cohorts to predict changes in the distribution of patient out-of-pocket spending on a single fill of orally-administered anticancer therapy. Per fill medication costs were adjusted to reflect a standardized dose of therapy and inflation adjusted to 2012 dollars using the medical component of the consumer price index. Models were estimated using PROC QUANTREG in SAS 9.4.

eFigure 1. Estimated Monthly Out-of-Pocket Spending on Anticancer Medications Before and After Parity, by Plan Funding Status



Source: Authors analysis of Health Care Cost Institute Claims, 2008-2012. After parity, the probability of paying $0 for orally-administered anticancer medications more than doubled in fully-insured plans compared with self-funded plans (aDD RR:2.36, 95%CI:2.00-2.79). There was an increase in the proportion of fills with out-of-pocket spending of >$100 in fully-insured plans relative to self-funded plans (aDD RR: 1.36, 95%CI: 1.11-1.68).). No differences were seen between fully-insured and self-funded plans when considering infused anticancer therapy out-of-pocket costs (all $p > 0.05$).

eFigure 2. Histogram of Logged Monthly Out-of-Pocket Spending by Plan Funding and Time