eAppendix A. Taxonomy of Enrollee Out-of-Pocket Spending According to Network Status

	Provider Health Care Network Status	
Is the Care by Providers Covered by Insurance Plan?	**In-Network**	**Out-of-Network**
Yes	Cost-sharing payments including copayments, coinsurance, and/or deductible. Providers cannot bill patients to collect more than the agreed reimbursements contracted with health plans.	Health care providers are out-of-network, but plans allow reimbursement. Enrollees have cost-sharing payments as specified for out-of-network care. Cost-sharing portions are often higher than for in-network care. <u>Fully covered:</u> Total reimbursements to out-of-network providers include enrollee cost-sharing as well as health plan payments. Providers do not directly bill enrollees. *Example: The out-of-network care has a $1000 bill from providers. The plan covers the care but requiring a 50% coinsurance from enrollees for out-of-network care. The enrollees will have to pay an out-of-pocket cost-sharing amount of $1000*50%=$500.* <u>Partially covered:</u> What the provider expected can be higher than enrollee's cost-sharing payments plus payments from plans. Providers may directly bill enrollees for the difference in plan allowed reimbursements and what providers charge. This is a form of balance billing. The balance-billed amount cannot be observed in claims data. *Example: The out-of-network care has a $1000 bill from providers, but the plan coverage is up to $800 for out-of-network care, with a 50% co-insurance. The enrollees will have to pay a coinsurance of $800*50%=$400. The enrollees will also have to pay the "balance billing" from providers for ($1000-$800)=$200. The total out-of-pocket is $600.*
No	Health plans do not cover the specific health care provided even when it is from in-network providers.	Health plans do not cover the specific health care provided by out-of-network providers.

	As a result, enrollees pay the entire care out-of-pocket. *Example: health plans may not cover cosmetic plastic surgeries even if the care is provided from an in-network surgeon.*	

eAppendix B.

The following represents model specifications that were used to estimate predicted values and marginal effects displayed in Table 2, eAppendix C, and Figures 1, 2 and 3.

In the analysis, unit of analysis is person-year. OON_{ijpt} indicates the occurrence of any OON care associated with cost-sharing payments. A logit model is estimated to predict the probability of having any cost-sharing spending for OON care during a year. The model is specified as:

$$\begin{aligned} Prob(OON_{ijpt} = 1 | X_{ijpt}) \\ = \Omega[\beta_0 + \beta_1 HCC_{it} + \beta_2 Plan_p + \beta_3 Year2017_t + \beta_4 Year2016_t \\ + \beta_5 Year2015_t + \beta_6 Year2014_t + \beta_7 Year2013_t + \beta_8 Rural_i + \beta_{9-j} State_j \\ + \varepsilon_{ijpt}] \end{aligned}$$

Here, i indicates individual, p indicates a Plan Type, j indicates State (a vector of dummy variables), and t indicates year.

Health status (HCC_{it}) is represented by a risk score following definitions of HHS for commercial population. The algorithm to calculate HCC_{ijt} already incorporated age and gender, thus the demographic factors were not separately controlled in the modeling. Year-fixed effects ($\beta_3 - \beta_7$) controlled for secular trends.

Similar regression models were used to estimate the respective probability of having each ED-based OON care outcomes as described in the Method.

Among those who had any OON care (that is, $OON_{ijpt} = 1$), the expected amount of total OOP cost-sharing payments for OON care covered by insurance (OOP_OON_{ijpt}) was estimated using a generalized linear regression model (GLM) with a log link and Gamma family distribution ($g(.)$).

$$\begin{aligned} g(.) = \beta_0 + \beta_1 HCC_{it} + \beta_2 Plan_p + \beta_3 Year2017_t + \beta_4 Year2016_t + \beta_5 Year2015_t \\ + \beta_6 Year2014_t + \beta_7 Year2013_t + \beta_8 Rural_i + \beta_{9-j} State_j + \varepsilon_{ijpt} \end{aligned}$$

Similar regression models were estimated for each spending outcome measure based on ED status and setting among those who had a specific type of OON care, respectively. In addition, a GLM model was estimated for total in-network OOP spending levels during the observation period.

Finally, to account for the potential changes in benefit designs even within the same plan types over time, we performed an additional robustness test allowing the effects of plan characteristics to be time-variant by adding the covariate of ($\underline{Plan_p \times Year_t}$).

eAppendix C. Factors Associated with Out-of-Pocket Spending for Out-of-Network Care in the 6-Year Continuously-Enrolled Sample[§] (Marginal Effects in dollars, Clustered Standard Errors)

	Percentage-point change in the probability of out-of-network care	**Cost-sharing payments for out-of-network care ($)[±]**	**Cost-sharing payments for in-network care ($)[‡]**
Year (Reference: 2012)			
Year 2013	-0.40** (0.03)	32.87** (2.10)	-15.61** (0.87)
Year 2014	-0.97** (0.03)	7.45** (3.36)	-53.27** (0.86)
Year 2015	-1.44** (0.03)	27.00** (3.36)	-1.67 (0.88)
Year 2016	2.42** (0.03)	38.37** (3.41)	23.57** (0.88)
Year 2017	2.12** (0.03)	8.73** (3.86)	68.53** (0.93)
Average HCC scores	4.98** (0.01)	84.44** (1.58)	356.26** (0.28)
Plan Type (Reference: HMO)			
PPO	7.25** (0.04)	461.92** (2.72)	403.51** (0.58)
POS	5.07** (0.06)	602.78** (4.90)	185.66** (0.84)
High deductible plan	6.31** (0.04)	530.30** (3.44)	762.81** (0.86)
EPO	-3.96** (0.11)	-64.97** (5.53)	122.77** (2.32)
Comprehensive	0.01 (0.01)	304.01** (6.17)	414.27** (1.51)
Rural Residency	0.63** (0.04)	-165.60** (3.73)	9.16** (0.84)
Observation numbers	20,324,595	3,432,880	71,653,505

[§]The Logistic and GLM models were estimated with a list of covariates, including HCC score, plan characteristics, rural residency, year fixed effects and state fixed effects. Age and sex were both considered in the algorithm constructing the HCC risk scores, thus, they were not separately listed as covariates in the regressions. The models were estimated considering the sampling weights to represent national ESI population.

The marginal effects of state fixed effects were not reported.

[±]The cost-sharing payments for out-of-network care were conditional on out-of-network care use, including outpatient, inpatient and pharmaceutical care that occurred out-of-network

[‡] The cost-sharing payments for in-network care were conditional on in-network care use

[**]Indicates statistical significance at 95% Confidence Interval