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Does price disclosure in pharmaceutical advertising result in price transparency? Evidence from a randomized experiment

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ABSTRACT

Background: Policies that mandate list price disclosure in direct-to-consumer pharmaceutical advertising (DTCPA) cite price transparency among the benefits. The expectation is that price transparency will lead to changes in consumer behavior that will ultimately lower healthcare costs.
Objective: The objective of this study was to assess the impact of price transparency on perceived level of information and consumer behaviors, specifically intentions to seek treatment and intentions to comparison shop.
Methods: A nine-arm randomized experiment was conducted to expose respondents to television advertisements for prescription drugs that varied by price disclosure type (no price/control, list price only, or price plus, which disclosed the list price and typical out-of-pocket cost) and indicated condition (deep vein thrombosis/pulmonary embolism [DVT/PE], diabetes, or rheumatoid arthritis [RA]). The sample was recruited from US adult members of the nationally representative Amerispeak online panel.
Results: The sample included 2138 respondents. For ads featuring prescription drugs for DVT/PE, findings provide no evidence of an impact from price disclosure on perception of sufficient information. For ads for prescription drugs for diabetes, there was no evidence of an impact from list price only, but the price plus group was more likely than the control group to report the ad provided sufficient information (OR = 2.475). For ads for RA prescription drugs, both the list price only group (OR = 3.380) and price plus group (OR = 2.720) were more likely to report sufficient information than the control. Findings provide no evidence of an impact from price disclosure on consumer behaviors (i.e., intention to seek treatment or intention to comparison shop).
Conclusions: Mandatory DTCPA list price disclosure may not be the most effective tool for improving price transparency and affecting consumer behavior.

List of abbreviations

DTCPA	Direct-to-consumer pharmaceutical advertising
AWP	Average wholesale price
WAC	Wholesale acquisition cost
HHS	Department of Health and Human Services
CMS	Centers for Medicare & Medicaid Services
DVT/PE	Deep-vein thrombosis/pulmonary embolism
RA	Rheumatoid arthritis
IRA	Inflation Reduction Act

1. Introduction

Information asymmetry is a situation in which there is an imbalance of information between consumers and sellers regarding price and quality that leads to market failures, or conditions under which goods and services are not efficiently distributed and prices are not determined by the laws of supply and demand.[1] Information asymmetry is pervasive among transactions in the US healthcare market, which differentiates it from markets for other goods and services and is among the reasons why the US healthcare market falls short of the theoretical free market.[2–7] One salient example of unbalanced information in the US market is the cost of health products and services and whether they will be covered by insurance. In a healthcare market shifting towards consumer-focused initiatives, many look to price transparency to reduce this form of information asymmetry.[8] Furthermore, theory suggests that price transparency may reduce healthcare costs by increasing comparison shopping for the most cost-effective options.[9]

The US pharmaceutical market is particularly vulnerable to information asymmetry but also presents challenges for enacting price transparency because it is not clear what price to communicate to patients. While the average wholesale price (AWP), or list price set by manufacturers, and the wholesale acquisition cost (WAC), or market price paid by wholesalers,

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are fairly standardized, these prices rarely reflect the actual price charged to patients. The actual price depends on the amount of volume discounts and rebates negotiated by individual insurance companies and pharmacy benefits managers. Thus, a patient's out-of-pocket cost differs markedly by the patient and their insurance provider as well as where and how they are purchasing the drug. The controversy then becomes how a manufacturer can effectively disclose useful price information in the market for pharmaceuticals. Although the dilemma remains unsettled regarding the optimal drug price to publicize, there have been several attempts to mandate standard price disclosures in direct-to-consumer pharmaceutical advertising (DTCPA). In October 2018, the Department of Health and Human Services (HHS) Centers for Medicare & Medicaid Services (CMS) proposed a rule that would require the list price to be disclosed in television DTCPA for therapies that are eligible for payment under Medicare or Medicaid.[10] Consistent with the tenets of information asymmetry, the goal of the proposed rule was to curb rising drug prices by ensuring price transparency for prescription drugs and biologics.[11] This proposed rule was challenged in court in Merck & Co. v. United States Department of Health and Human Services and ultimately vacated by a district judge based on the limited regulatory authority of HHS.[12] In other words, HHS does not have the power to mandate price disclosure. In response, the Drug Transparency in Communications Act was introduced in the Senate in May 2019 to grant the HHS the necessary authority to impose the rule, but efforts to expedite the vote were derailed before other priorities took precedence.[13] Subsequently, a new Bill titled the Drug-Price Transparency for Competition Act that would amend the Social Security Act to require price disclosures on DTCPA was introduced in the Senate in June 2021 and sits with the Committee on Finance.[14]

Now that price disclosure in DTCPA has been introduced as a presumed key factor in patient-as-consumer decision-making, additional initiatives to require price disclosure are likely to resurface. However, limited research has been conducted to investigate the impact of drug price disclosure on healthcare markets. The proposed policies are grounded in the assumptions of information asymmetry and free market economics, but it is not clear how well these assumptions apply to the complex structure of the prescription drug market, if DTCPA is the best communication channel, or if the list price is the appropriate cost to communicate. Therefore, research on the impact of such price disclosures is needed to ensure proposed policies are evidence-based.[15]

Current empirical evidence on the impact of price disclosures within DTCPA is limited. At present, the one study that investigated the form of price disclosure proposed in the CMS rule was a behavioral experiment that found price transparency had little influence on consumer behavior for low-priced prescription drugs, but decreased consumer interest in high-priced prescription drugs.[16] The study evaluated one health condition in a convenience sample and used fictitious print ads as stimuli. The current study provides a more robust estimate of the effects of price disclosure by employing a large, nationally representative probability sample, examining three health conditions for greater generalizability, and using actual television ads as stimuli since television receives a substantial majority of the ad spend in DTCPA.[17] The objective of the current study was to assess the impact of price transparency on information asymmetry and behavioral intentions often associated with price transparency. In particular, the current study answered the following specific research questions: 1) Does list price transparency in DTCPA impact perceived informativeness of the ad, price information comprehension, intention to seek treatment and intention to comparison shop? 2) Does the impact of list price transparency in DTCPA vary by different levels of disclosures? 3) Does the impact of list price transparency in DTCPA vary across health conditions?

2. Methods

2.1. Data source

The survey data was obtained using the nationally representative NORC AmeriSpeak survey research panel of US adults available through the Time Sharing Experiments for the Social Sciences program funded by the National Science Foundation. This is a probability-based panel of 35,000 households that provides coverage for over 97% of US households. The survey was fielded from November 25 to December 16, 2019. A random sample of general population participants aged 18 and older were drawn. Panelists were offered the cash equivalent of $2 for completing the study. The survey was self-administered online in English. The dataset used in this study is freely available in an openly accessible repository.[18]

2.2. Experimental study design

The study was conducted using a nine-arm randomized experimental design. Each arm of the 3 (health condition) x 3 (price disclosure type) design was exposed to a stimulus that varied according to health condition and price disclosure type. The stimuli were composed of a narrative and an ad. The narrative varied across health conditions but was consistent within a health condition. The narrative asked respondents to imagine themselves with a given health condition, a method commonly used in DTCPA studies.[19–22] The narrative included a description of the health condition and a rationale for potential interest in switching to a new treatment. Respondents were then exposed to a television ad for a therapy targeting their assigned health condition that varied by price disclosure type.

The three randomly assigned chronic health conditions were chosen to represent a spectrum of impacts on survival and quality-of-life. This was based on previous DTCPA research that has recognized the importance of accounting for differences in the severity and salience of health condition symptoms and consequences.[23–26] The health conditions were deep vein thrombosis/pulmonary embolism (DVT/PE; non-symptomatic, life-threatening), type II diabetes (symptomatic, life-threatening), and rheumatoid arthritis (RA; symptomatic, nonlife-threatening). In addition, each of these conditions offer prescription-based therapies that are typically taken long-term, covered under a pharmacy benefit, and have been advertised on television. The therapies featured in the ads were Eliquis (apizaban), Invokana (canagliflozin), and Xeljanz (tofacitinib) for DVT/PE, diabetes, and RA, respectively.

Control groups for each health condition viewed an ad with no pricing information. The exposure groups were shown the same ad but with overlaid text at the end with price disclosures. The disclosures used the language proposed in the 2018 CMS proposed rule. The “list price” exposure group viewed text disclosing the list price only, and the “price plus” exposure group viewed text disclosing the list price and typical out-of-pocket cost. The list price was based on the 2016/2017 wholesale acquisition costs (WAC) for a 30-day supply rounded to the nearest ten dollars. Average out-of-pocket costs were based on estimated co-payment/coinsurance rates for Medicare beneficiaries for their respective tier level (tier 3 for the DVT/PE and diabetes therapies and tier 5 for the RA therapy). Transcripts of ad content as well as overlaid text are available as an appendix (see Appendix 1 in Supplementary Information).

The ads were edited versions of actual television ads from 2016. A previous content analysis was used to select ads that were similar in frequency it aired, severity of risks, type of benefits portrayed, inclusion of health information, creative execution style, and medication form.[27] The DVT/PE and diabetes ads were shortened to be a consistent length with the 60-second RA ad. Edits did not result in substantive content changes in the information presented or ad features.

2.3. Questionnaire

Following the stimuli, respondents answered questions measuring comprehension, recognition, intended behavior, perception, and personal characteristics. While the questionnaire was developed specifically for this study, individual items were designed based on their prior use in the literature. The full questionnaire is available in the appendix (see Appendix 1 in Supplementary Information).

2.4. Outcome variables

Outcome variables included measures of information asymmetry, intention to seek treatment, and intention to comparison shop. Information asymmetry was operationalized both subjectively and objectively. The subjective information asymmetry measure was perceived informativeness which has been utilized similarly in previous DTCA research as an opinion-based measure of ad information.[28,29] This measure asked respondents to select their level of agreement with the statement, "The ad provided enough information to decide whether I should discuss the medication with a doctor." Response categories were a 6-point Likert scale ranging from strongly disagree to strongly agree. The objective information asymmetry measure was assessed as price disclosure comprehension. Respondents were asked what they thought they would have to pay in out-of-pocket costs for a 30-day supply of the drug advertised, which was developed based on Aikin et al. 2016.[30] The intention to seek treatment measure asked respondents to select their level of likelihood to ask their doctor for a prescription for the advertised medication. A similar question has been used to assess behavioral responses in a multitude of DTCA studies.[24,31,32] The intention to comparison shop measure asked respondents their level of likelihood to look for more information about the drug advertised before deciding to use the medication. This applied an assessment measure other authors have used retrospectively in a prospective context.[33,34]

2.5. Analysis

Outcome responses were dichotomized by consolidating all disagree responses and all agree responses. The odds of agreement with each outcome statement were estimated two ways using different logistic regression models. First, aggregate models were run with all respondents combined and included control variables for the health condition. Next, separate models were run for each health condition to determine if a particular health condition was driving differences.

To better understand the impact of price disclosure on information asymmetry, respondent comprehension for the price displayed in the ad was assessed. Respondents were asked what they thought they would have to pay in out-of-pocket costs for a 30-day supply of the drug advertised. For this analysis, outliers were identified separately for each health condition and outlier responses above the 95th percentile for each health condition were removed. Respondents were asked to explain why they think it would cost that amount (if they entered a dollar amount) or why they did not know what it would cost (if they selected "I don't know"). The qualitative responses were coded using codes generated by the data. Two coders analyzed the free text responses to generate initial categories and create a codebook. Then the qualitative data were coded, the codebook was refined, and the data were recoded. The final codebook is available in the appendix (see Appendix 2 in Supplementary Information). The percentages of responses for each category were calculated and the distribution across categories of response by transparency group were compared using chi-square tests and Cramér's V.

All analyses were conducted using study-specific sampling weights derived from panel-based sampling weights and probability of selection in the study. All analyses were conducted using STATA version 15.1 (College Station, TX). The study protocol was reviewed and approved by the Institutional Review Board of Temple University (protocol number: 26197).

3. Results

3.1. Sample

The survey completion response rate was 29.1%, which resulted in an analytic sample of 2138 individuals. Overall, the sample was a large majority under 65, with half of the sample between 30 and 59 years (Table 1). The sample skewed towards a higher socioeconomic status with 61% having attended at least some college and with almost a third of the sample earning an annual household income of $100,000 or more. The sample had greater representation in metropolitan areas (80%) and the South (38%), and lower representation in the Northeast (17%). The sample was relatively healthy with 84% of the sample self-reporting their health as excellent, very good, or good. About half (54%) of the sample reported taking prescription medication regularly and about half of those participants reported taking two or fewer medications. The sample reported high access to healthcare with 89% having a usual source of care, 90% currently insured, and 91% of those with insurance having prescription drug coverage. More than half of the insured obtained coverage through an employer (52%) and 33% received public insurance. Among the uninsured, 65% cited costs as a reason and 17% were in the process of enrolling.

3.2. Information asymmetry

The first outcome variable assessed was information asymmetry. In the aggregate model that included the entire sample and controlled for health condition, the groups that were shown a price had higher odds of believing that the ad provided enough information relative to the control group (OR = 1.67; p-value(p) = 0.02 and OR = 1.73; $p = 0.01$ for list price and price plus groups, respectively). Assessing each health condition separately, findings indicated the DVT/PE group had no significant differences between transparency groups (Table 2). In the diabetes group, compared to the control, there was no significant difference in the list price only group (OR = 1.36; $p = 0.40$) but the price plus group had two times higher odds of believing the ad provided enough information relative to the control group (OR = 2.47; $p = 0.02$). For RA, compared to control, the list price only group was more than three times as likely to believe the ad provided enough information (OR = 3.38; $p = 0.00$), but the price plus group was only 2.72 times more likely to believe the add provided enough information (OR = 2.72; $p = 0.01$).

As revealed in a separate analysis, a majority of those in the list price and price plus arms did not remember seeing a price disclosure.[35] Therefore, the models were run again among the subset of the sample who correctly identified whether a price was shown. The magnitude of the odds increased for all statistically significant odds ratios from the full sample. Specifically, for RA, the odds of believing the ad provided enough information among the list price group increased (sub-sample: OR = 4.79; $p = 0.02$ vs. full sample: OR = 3.38; $p = 0.00$). The odds in the price plus group increased slightly (sub-sample: OR = 2.93; $p = 0.06$ vs. full sample: OR = 2.72; $p = 0.01$) but was no longer significant. For the diabetes subset, the odds of believing the ad provided enough information for the price plus group increased (sub-sample: OR = 3.42; $p = 0.03$ vs. full sample: OR = 2.47; $p = 0.02$). As with the full DVT/PE sample, the DVT/PE subgroup had no significant differences between transparency groups.

To assess disclosure comprehension, outliers were identified for each health condition resulting in the removal of 6% of the sample for DVT/PE and RA and 5% of the sample for diabetes. The pattern differed between the mean and median values. The control group had a much lower mean value ($84; $p < 0.000$) compared to the list price only and price plus groups ($197 and $190). The medians from the control ($50) and price plus groups ($45) were similar, and both groups had lower medians than the list price group ($75). When accounting for the actual list price of the drug, the control group had the greatest mean percent difference between respondent estimates and the list price (−85%). The list price group had the lowest percent difference (−65%), and the price plus group had a percent difference between the two other groups (−78%). All pairwise comparisons between these groups were statistically significant. When accounting for the typical out-of-pocket for the drug, the control group had the smallest mean percent difference between respondent estimates and the typical price (3.6%). The list price group had the highest percent difference (158%), and the price plus group had a percent difference between the two other groups (45%). The percent difference between respondent guesses and typical prices were positive for the DVT/PE and diabetes treatments (typical price = $40), indicating respondents on average estimated their out-of-pocket costs were higher than the typical out-of-pocket cost

Table 1
Characteristics of the sample responding to the survey.

	DVT/PE			Diabetes		RA				Total
	Control (%)	List Price (%)	Price Plus (%)	Control (%)	List Price (%)	Price Plus (%)	Control (%)	List Price (%)	Price Plus (%)	All (%)
	$n = 214$	$n = 248$	$n = 250$	$n = 216$	$n = 251$	$n = 259$	$n = 242$	$n = 233$	$n = 225$	$n = 2138$
Gender										
Male	49	46	47	41	52	54	50	50	45	48
Female	51	54	53	59	48	46	50	50	55	52
Age										
18–29	24	15	21	23	14	23	21	22	26	21
30–44	23	23	24	27	29	19	24	25	28	25
45–59	28	27	27	23	24	23	26	25	25	25
60+	25	36	28	27	33	34	29	28	22	29
Education										
No high school	13	11	15	8	12	15	6	10	4	11
High school graduate	27	25	28	31	24	26	33	31	32	28
Some college	26	31	24	28	31	29	29	23	28	28
College degree or above	34	33	32	34	33	31	32	37	36	33
Annual household income										
$0–$24,999	12	20	24	18	17	18	18	14	22	18
$25,000–$34,999	15	10	11	16	11	12	10	11	9	12
$35,000–$59,999	22	23	22	22	27	24	24	19	25	23
$60,000–$99,999	16	17	18	15	16	16	14	26	9*	16
$100,000+	34	31	25	29	29	29	35	30	35	31
Region										
Northeast	16	19	20	14	16	14	20	22	16	17
Midwest	18	21	21	22	19	22	25	18	20	21
South	38	36	43	34	39	44	40	32	35	38
West	28	24	16	31	26	21	16	28	29**	24
Geographical area										
Metropolitan area	84	77	81	78	84	76	78	84	79	80
Non-metropolitan area	16	23	19	22	16	24	22	16	21	20
General health										
Excellent / very good	47	52	54	51	43	46	52	50	45	49
Good	36	29	29	37	42	40	34	33	38	35
Fair / poor	17	19	17	12	15	14	15	18	17	16
Number of regular prescriptions										
0	49	51	47	46	46	41	50	44	48	47
1	9	11	13	17	12	17	13	12	15	13
2	11	10	13	12	13	9	12	6	14*	11
3	11	8	10	7	8	11	7	11	6	9
4	6	7	6	5	6	8	7	8	7	7
5+	14	13	10	13	15	15	10	19	11	13
Experience with indicated condition or medication featured in ad										
Ever diagnosed with condition	3	5	1	14	11	11	9	3	8*	7
Ever used medication	5	5	2	2	1	4	1	2	6	3
Access and insurance information										
Insurance source										
None	9	7	14	7	12	13	9	9	13	10
Employer-sponsored	52	45	45	50	40	42	50	51	47	47
Medicare	19	23	20	18	24	25	15	20	15	20
Medicaid	8	13	10	13	10	8	12	8	12	10
Exchange	4	5	7	6	7	5	8	4	4	6
Other	8	7	3	6	7	7	6	8	10	7
Has prescription drug coverage	92	92	94	92	93	86	89	89	89	91
Has usual source of care	89	91	88	91	88	90	83	86	91	89
Health and insurance literacy										
Assistance needed with written materials										
Always /often	6	5	2	2	5	5	4	9	4	5
Sometimes	11	6	8	8	7	6	6	3	10*	7
Rarely / never	82	90	90	91	88	89	91	88	86	89
Understanding of insurance terminology score by quartile										
Top	26	30	20	25	26	24	22	33	24	26
Second	19	27	25	30	28	28	34	23	31	27
Third	19	18	17	25	20	16	17	16	23	19
Lowest	36	25	39	20	26	32	27	27	23	28

SOURCE Authors' analysis of data from 2138 respondents sampled from a nationally representative survey research panel of US adults. NOTES Survey data was obtained using a random sample of general population participants aged 18 and older drawn from a nationally representative, probability-based research panel of US adults. The survey was fielded from November 25 to December 16, 2019. HS = high school; * = $p < 0.05$, ** = $p < 0.01$.

for those health conditions (Fig. 1). The percent difference between respondent guesses and typical prices were negative for RA (typical price = $885), indicating on average expected cost was less than the typical out-of-pocket amount. All pairwise comparisons between these groups were statistically significant.

The free text provided reasons for respondents' cost estimates or inability to provide a guess. After excluding missing and irrelevant responses 1898 free-text responses were grouped into eight categories (see Appendix 2 in Supplementary Information). A mean number of 1.2 categories were applied to each response. The number of categories applied did not differ

Table 2
Results of logistic regression models predicting three outcomes by health condition.

	DVT/PE	Diabetes	RA
	OR (p-value)	OR (p-value)	OR (p-value)
Information asymmetry			
List price	1.002 (0.10)	1.356 (0.40)	3.380 (0.00)**
Price plus	0.817 (0.58)	2.475 (0.02)*	2.720 (0.01)**
Likelihood to seek treatment			
List price	0.936 (0.80)	0.853 (0.51)	1.370 (0.23)
Price plus	0.992 (0.98)	1.266 (0.36)	1.278 (0.33)
Likelihood to comparison shop			
List price	1.105 (0.72)	0.933 (0.80)	1.751 (0.06)
Price plus	0.932 (0.81)	1.222 (0.49)	1.034 (0.91)

SOURCE Authors' analysis of data from 2138 respondents sampled from a nationally representative survey research panel of US adults. NOTES Information asymmetry refers respondents' level of agreement with the statement, "The ad provided enough information to decide whether I should discuss the medication with a doctor." Intention to seek treatment refers to respondents' likelihood to ask their doctor for a prescription for the advertised medication. Intention to comparison shop measure refers to respondent likelihood to look for more information about the drug advertised. OR = odds ratio; * = $p < 0.05$, ** = $p < 0.01$.

significantly by transparency group ($p = 0.261$). There was a statistically significant relationship ($X^2 = 195.34$;$p < 0.01$), albeit a weak association (Cramérs V = 0.22), between category distribution and transparency group. The most common theme across all groups, accounting for more than half of the responses (53%) reflected cost-sharing assumptions (Fig. 2). This was higher among the list price group (59%) compared to the control (51%) and price plus groups (50%). Beyond this category, those in the list price group and price plus group were more likely to cite ad attributes (17% and 26%, respectively) than in the control group (5%). Conversely, those in the control group were more likely to mention attributes of the drug, consumers, health condition, and industry as well as personal experience compared to the two price disclosure groups. Overall, responses from the control group were distributed more evenly across all eight categories relative to the list price and price plus groups.

3.3. Consumer behavior

With regards to consumer behavior, three outcomes were evaluated: likelihood to seek treatment, likelihood to price shop, and likelihood to comparison shop based on benefits/risks. There were no significant differences between price transparency groups in the aggregate model or the individual condition models for any of these consumer behavior outcomes (Table 2).

4. Discussion

This is the first empirical study to better understand the impact of complex price disclosures in television DTCPA and provides important evidence to inform policy making on the role of price transparency in DTCPA for prescription drugs. Respondents provided a subjective perception of the information value of the ad and price estimates and the reasons for those estimates tested how much additional information was gleaned compared to the control. Results indicated that the impact of price disclosure on

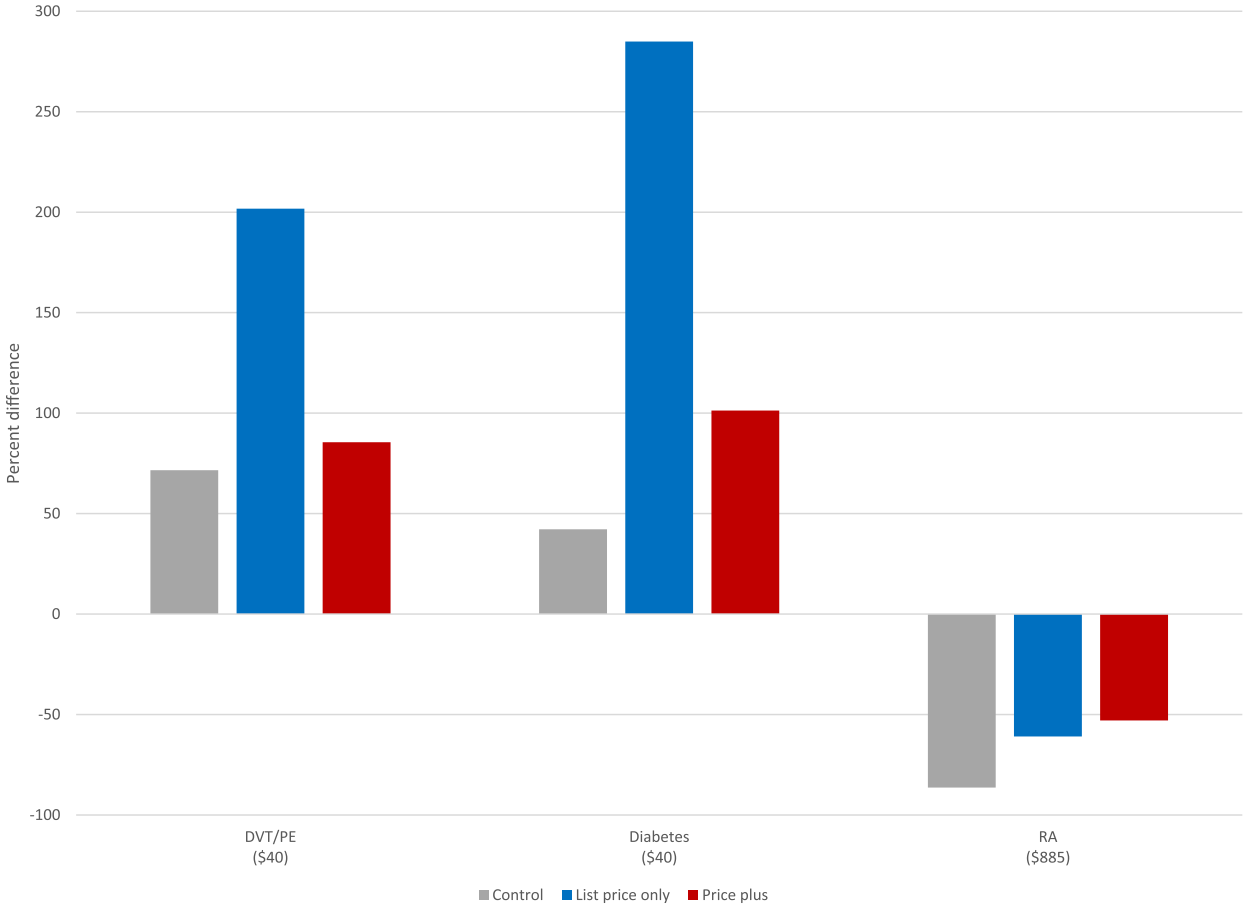

Fig. 1. Percent difference between respondent estimated out-of-pocket costs and typical out-of-pocket cost. Source/Notes: SOURCE Authors' analysis of data from 2138 respondents sampled from a nationally representative survey research panel of US adults. NOTES Average out-of-pocket costs were based on estimated co-payment or coinsurance rates for Medicare beneficiaries for the drug's respective tier level (tier 3 for the DVT/PE and diabetes therapies and tier 5 for the RA therapy). The average out-of-pocket cost disclosed to the list price only group and the price plus group were $40 for the DVT/PE and the diabetes drug and $885 for the RA drug.

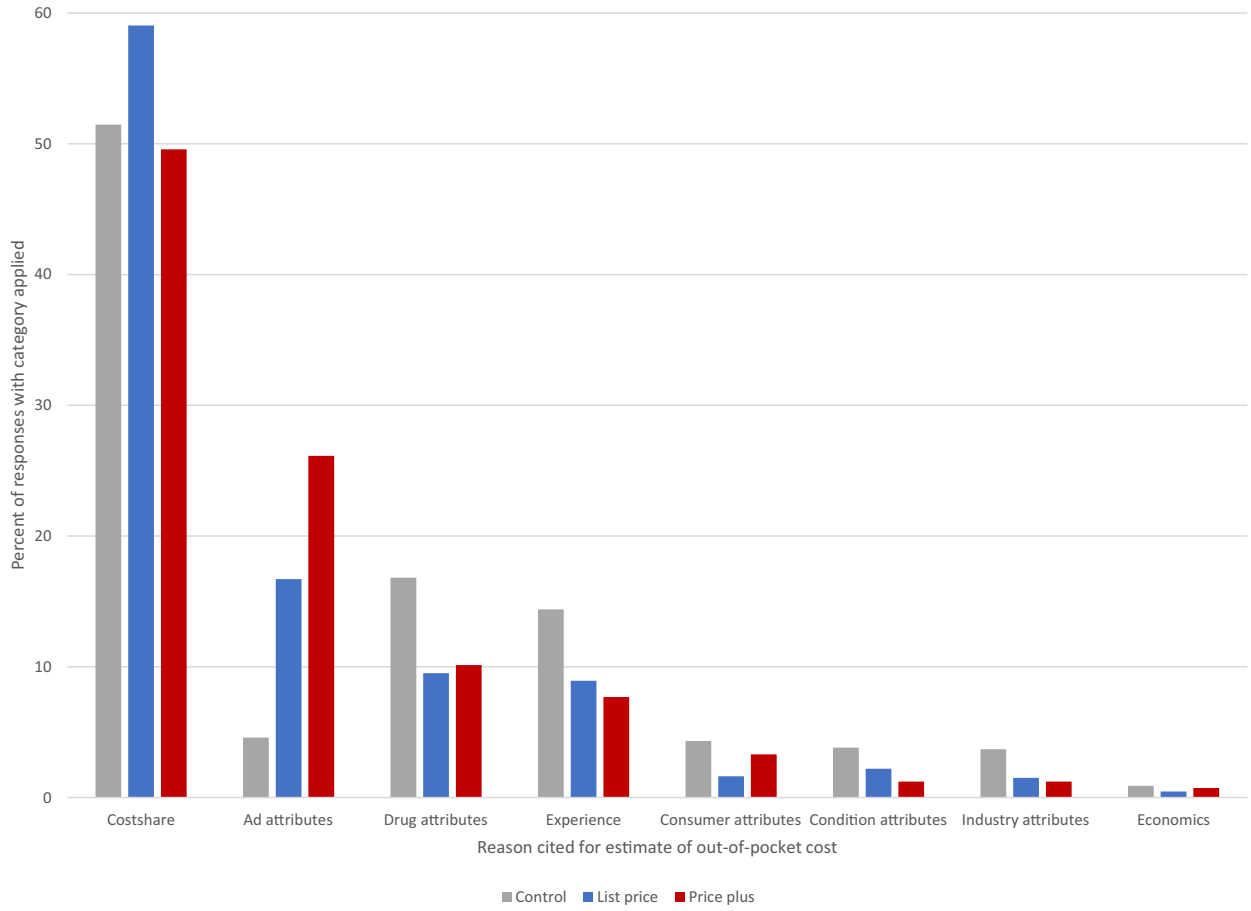

Fig. 2. Reasons cited for respondents' estimate of out-of-pocket costs across transparency groups. Source/Notes: SOURCE Authors' analysis of data from 2138 respondents sampled from a nationally representative survey research panel of US adults. NOTES Excludes responses that were missing or did not address the question. Final analysis included 1898 free-text responses that were categorized into eight categories generated by the data.

believing the ads provided enough information varied across health conditions. This is consistent with other studies on price transparency that have shown that the impact of price transparency on comparison shopping varies by the procedure or service.[36] For DVT/PE, there were no significant differences across any of the exposure groups. For diabetes, only the price plus group had greater odds of believing the information provided was sufficient. For the RA group, both price groups (list price and price plus group) had greater odds of believing the information provided enough information for the list price only group, but the effect was diminished with the inclusion of the typical price. Taken together the results of this study indicate that disclosing the list price may improve the information asymmetry problem for some products but not others. The difference may be a result of the characteristics of the health condition or drug costs. Results also indicate that while in some situations, disclosure of list price may make consumers feel more informed, inclusion of a typical price and a statement that actual costs may vary may diminish any gains in perceived transparency obtained by price disclosure. It is possible that this is because some consumers may be confused by the two different prices.

The respondents' mean cost estimate for the control group was roughly half of the mean cost estimate for groups exposed to price. Broken down by health condition, respondents estimated higher out-of-pocket prices for the more expensive RA drug regardless of transparency group. One possible reason for this is that respondents may have picked up on other signals that indicated this drug was more expensive. For DVT/PE and diabetes, the mean estimate for the list price only group is about double those of the control group, indicating that the list price disclosure may inflate respondents' estimates of their own costs. This result lends credence to the argument that to simply relay information without proper context can fall short of the goals of improving price transparency, particularly for prescription drug prices in which list prices are not reflective of what the typical patient pays out-of-pocket. The inclusion of the typical price with the list price however, seemed to have dampened the inflationary effect of the list price disclosure, because the mean estimates for that group were just slightly higher than the control groups for DVT/PE and diabetes. For the RA group however, the additional disclosure of the typical price in the price plus group did not dampen the effect. A possible reason for this difference may be the magnitude of the cost. These findings indicate that in some health conditions the inclusion of additional information, such as the typical price or a statement indicating that prices may vary, may contribute to consumer comprehension. However, for other conditions, specifically those with higher cost drugs, the additional information may not contribute to improved comprehension.

When accounting for the typical out-of-pocket cost for the drug, there were substantial differences between health conditions. For DVT/PE and diabetes for which the typical price was $40, the mean percent difference between the estimate and the typical price was positive (122% for DVT/PE and 150% for diabetes). On the other hand, for RA for which the typical price was $885, the mean percent difference between the estimate and the typical price was negative (−67%). It appears from this data that the inclusion of list price information seems to have led respondents farther astray from the typical price for prescription drugs for DVT/PE and diabetes, but not for RA. The results indicate that respondents believed prescription drugs for DVT/PE and for diabetes would cost them more than the typical price while RA respondents believed prescription drugs would cost them less than the typical price, regardless of price disclosure. In other words, the impact of price disclosure on perceived cost varies by drug. One

potential reason for that difference is that consumers notice contextual factors other than price disclosure that are contributing to their perception of the cost.

When asked why they made the guess that they did, more than half of respondents indicated their guess reflected some cost-sharing on the part of an insurance company. For example, free-text responses cited copays or made statements like "Insurance should cover most of it." Those who did not guess the out-of-pocket cost noted too little information about the portion insurance would pay; for example, "I don't know if it is covered by my insurance." The fact that this category appeared more frequently among the list price group may indicate that respondents in the list price group adjusted their cost estimate downward from the price provided in the ad because they assumed insurance would share the cost and they would not pay the list price.

It is reasonable that ad attributes were cited more often by the list price group and price plus group compared to the control group because respondents who viewed a price could use it to anchor their guess. The fact that responses for the control group were more distributed across the eight categories is a byproduct of fewer of these responses referring to the ad price, except for some responses that cited the lack of price disclosure, for example, "I don't recall a number being provided in the ad." Otherwise, in the absence of price information, participants inferred the price from a variety of other contextual factors. It is also notable that about 4% of responses in the control group were attributed to consumer attributes which were based on consumers' willingness-to-pay, affordability or what was perceived as fair or reasonable. In the list price group this was seen half as often. This pattern mimics the results of a separate analysis from this study that showed decreased affordability perceptions in the list price group compared to the control group.[35]

While minimizing information asymmetry is one goal of price disclosure, proponents of price disclosure in DTCPA also argue that it will reduce healthcare spending because it will lead to comparison shopping and consumers will choose less expensive treatment options when lower cost options are available. Results indicate no evidence of an impact of price transparency on consumer behavior outcomes, specifically likelihood to seek treatment or likelihood to comparison shop. This is similar to a previous study on price disclosure in DTCPA which found behavioral intentions were only impacted when the list price was exceedingly high ($15,500, which was the 99th percentile for drugs treating the indicated health condition).[16] More research is needed to identify the price range that acts as the tipping point to alter behavior. However, our results paired with the previous research raise questions regarding the ability of price disclosures in traditional DTCPA to prompt the behaviors that are necessary to have broad and direct impact on lowering drug prices.

This experiment was conducted across three different health conditions that ranged in characteristics such as seriousness, incidence, and symptomology, to enhance generalizability of the findings. It was not the intent to control for the inherent differences between health conditions. The differences found in results across health conditions points to the need for additional research to determine which aspects of the health condition contributed to the difference in impact of disclosure and whether the differences across health conditions were due to the characteristics of the health condition itself or to differences in prices.

4.1. Limitations

This study had several limitations. First, this study used a general population sample and asked people to consider hypothetical situations in which they have the health condition, known as the participant-as-patient perspective. This approach has been previously used in DTCPA research.[19,20,22,30] However, people with the indicated health condition may respond differently to price disclosures. That being said, such individuals may have had many nuanced experiences with the health condition and particular prescription drugs. As such, a general population is likely to be more objective and take a market-based approach to their decision making (i.e., more likely to think about minimizing costs and maximizing benefits).

Second, participants were asked to imagine a treatment switching scenario. The results could potentially differ in the context of other framings, such as one in which they are selecting an initial treatment. A treatment switching context was most suitable for testing the impact of the disclosure on likelihood to comparison shop. Both the "participant-as-patient" and the "treatment switching" context may impact the generalizability of the results, but neither of these limitations threaten internal validity of the comparison between disclosure formats.

Third, because the stimuli presented ads for real prescription drugs, some participants may have had greater awareness of the health condition or drug brand. Such topic and brand familiarity can alter the goals and availability of knowledge structures available for message processing.[37,38] However, any such effect is likely to be limited given only 3% of the sample had used the drug featured in the ad and 7% of the sample had the indicated condition. Furthermore, the percentage of the sample that had the indicated condition was not significantly different across disclosure conditions when collapsed across health conditions (8.8% in control vs. 6.2% in list price vs. 6.8% in price plus; $p = 0.35$). Sensitivity analyses were conducted to test the impact of having experience with the disease or having used the drug on the model and no differences in any of the results were found.

Fourth, this study lacks generalizability to price disclosure in advertising through other media (e.g., print) or television ads that include a voiceover price disclosure. This study focuses on television ads because television receives a substantial majority of the ad spend in DTCPA.[17] However, results may vary for print ads in which there is no limit to the length of time consumers can view the information.

Fifth, although this study examined differences in exposure within three different health conditions, and conditions were purposefully selected with varying characteristics to enhance generalizability of the findings, the study was not designed with the intention to control for the inherent differences between health conditions. It is not possible to tease out whether the differences across health conditions were due to the characteristics of the health condition itself or to differences in prices.

Sixth, some argue price transparency may reduce healthcare costs by placing downward pressure on manufactures or by increasing market competition by bringing more generic drugs to market, thereby reducing costs regardless of the impact on consumer behavior.[39] This study does not speak to this potential benefit.

5. Conclusions and implications

This study highlights the difficulty of trying to use a list price disclosure strategy in DTCPA to impact consumer spending in the United States where individuals pay different prices for the same drug. Results indicate that disclosing the list price may or may not contribute to consumer's perceived informativeness nor did it consistently improve expected cost estimates. Furthermore, the addition of a typical price and a statement that actual costs may vary has the potential to confuse consumers more that list price alone. List price disclosure in DTCPA may fail to meet the intended goals of policies that propose to mandate such disclosures. In some situations, the inclusion of confusing or misleading price disclosures in DTCPA may, at best, have no impact, and at worst, leave consumers feeling less informed.

Within the pharmaceutical sector, other policy efforts to increase transparency and reduce pharmaceutical costs and patient out-of-pocket spending may have a greater impact. In the US, the former administration was eager to pursue healthcare price transparency that focused on consumer information. The current administration was slow to demonstrate their drug pricing priorities, but in August 2022 passed The Inflation Reduction Act (IRA), a law that will eventually allow the federal government to negotiate prices with manufactures on some high-price drugs for Medicare beneficiaries.[40–42] This will not directly impact drug pricing or healthcare costs for those with private insurance or no insurance. Further study is warranted for domestic policy initiatives such as increasing transparency of

rebates, spread pricing, and mandatory notifications to HHS when drug prices are above a threshold or increase by a certain percentage. Globally, there have been coordinated efforts by the World Health Organization and United Nations to increase disclosures by manufacturers on their costs, pricing strategies and discounts.[43]

Much of the drug price transparency literature focuses on price transparency to governments responsible for regulation.[44] The current study focuses on drug price transparency for consumers. Within this category, transparency focused on the consumer may be more impactful at a more relevant time point and with a more relevant price. For example, transparency efforts to integrate actual out-of-pocket costs into electronic medical records so that prescribing physicians are aware of drug costs and discuss affordability with patients.[45] This would provide true transparency as it would disclose patient-specific costs.

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

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