the british psychological society
promoting excellence in psychology

British Journal of Health Psychology (2022), 27, 50–66

www.wileyonlinelibrary.com

The influence of price and funding source disclosure on medication labels: Implications for intended adherence, perceived value and efficacy, and feelings of burden and guilt

Simon McCabe*[1], Conny Wollbrant[1] and Liam Delaney[2]

[1]University of Stirling, UK
[2]London School of Economics, UK

Objectives. To examine if informing people in free-at-the-point-of-use medical systems of the financial value of medicines, and priming them with the fact that the medication is funded by taxation, influences people's perceived value and efficacy of the medicines, feelings of burdensomeness and guilt, and intended adherence.

Design. An experiment was implemented to examine the impact of medication labelling featuring the presence (vs. absence) of the phrase 'funded by UK the taxpayer' and pricing information (absent vs. £20 vs. £200) on outcome measures.

Methods. A total of 257 UK participants (age: $M = 29.10$ years, $SD = 9.15$; 89 males, 167 females, one undisclosed) who were currently taking medication were recruited from an online participant pool (prolific academic). Participants viewed an image of a medication with the manipulated price and taxation message on the label. They then completed a number of measures to gauge perceived value and efficacy of the medicines, feelings of burdensomeness and guilt, and intended adherence.

Results. Findings point to both positive and negative consequences of such labelling of medication, with the taxpayer label increasing perceptions of value but also increasing feelings of guilt. The price labels demonstrated a positive effect on perceived value and intended adherence.

Conclusions. Discussion of results is centred on potential policy implications, applied recommendations, and future directions for study.

Statement of contribution

What is already known on this subject?

- Health care services must balance the provision of medicines and services with the task of remaining economically viable.
- Altering medication labels and packaging can produce beneficial effects on compliance, improving population health while also reducing waste.

**Correspondence should be addressed to Simon McCabe, Behavioural Science Centre, University of Stirling, 3A30 Cottrell Building, Stirling, FK9-4LA, UK (email: simon.mccabe@stir.ac.uk).*

DOI:10.1111/bjhp.12528

What does this study add?

- An examination of a previously suggested (but untested) alteration to medication labelling. Specifically, the study examines the influence of including pricing information and the phrase 'funded by the UK taxpayer' on medication labels.
- The disclosure of pricing information led to greater intentions to adhere to the medication schedule and greater perceptions of the medicine's value.
- The inclusion of the taxpayer information increased perceived value, but also increased self-reported feelings of guilt.
- Overall, we provide new insight into a potential approach that might be utilized to improve medication use, but also acknowledge potential negative emotional repercussions.

Background

Health care providers face the challenge of balancing the provision of services and medications with the need to remain economically viable. To this end, a range of approaches leveraging insights from behavioural science have been proffered to help identify and intervene where money could be saved, or service efficacy improved. One area that has shown promise is altering medication packaging. As an example, pill boxes and blister packaging featuring a reminder of what day of the week to take certain medications have been shown to benefit compliance (Conn et al., 2015). Yet, other approaches focussing on alterations to medication packaging have been suggested, but remain largely untested. In 2015, for example, the UK health minister proposed that medications costing more than £20 could feature the cost of the medication and include the words 'funded by the UK taxpayer' (Hunt, 2015). The health minister argued inclusion of such information would have several benefits, including limiting the waste of medication and improving patient care by boosting adherence to drug regimes. In response, PharmacyVoice (an association representing the views of pharmacies) suggested the move might not have the desired effects and may even backfire with unintended consequences. Such consequences included the potential for feelings of burden and guilt, misperceptions of drug efficacy based on price of the medication, and people (particularly the elderly) being deterred from taking the medication as they may feel worried about the impact on public funds. Some evidence for this was provided by a qualitative study of Welsh respondents, in which guilt emerged as a theme from a series of focus groups (Yemm, Jones, & Mitoko, 2017). While the labelling scheme was never implemented, its proposal does raise interesting and largely unexplored questions regarding whether providing price information and including the phrase 'funded by the UK taxpayer' on medicine labels might have either (or both) positive or negative repercussions.

Disclosure of information – implications for perceived value, effectiveness, and adherence to medication regime

The inclusion of pricing information and the funding phrase on medicines represents an approach often classified as 'disclosure of information'. The provision of certain information to the public (sometimes referred to as 'targeted transparency') is one tool governments can use to attempt to achieve a desired end. In 2010, for example, the US Affordable Care Act required calorie information to be posted on menus in restaurants, with an aim to mitigate the obesity crisis (Weil, Graham, & Fung, 2013). At first blush, such efforts may seem laudable. Yet, evidence from the behavioural sciences suggest reactions

to information disclosure may not be universally positive and in some cases may be ineffective, or even backfire with unintended consequences (e.g., Loewenstein, Sunstein, & Golman, 2014). As an illustrative example, the use of health warnings aimed at deterring certain harmful behaviours may employ fear appeals (e.g., disclosing the health risks of smoking with graphic images) to attempt to curb the behaviour. However, this may actually impede people from thinking about and hence become less likely to respond to, the risks involved in the behaviour (e.g., Loeber et al., 2011). Of pertinence to the current research, an independent study conducted by the Department of Health examining the impact of disclosing price information on medication found 'older people in need of effective treatment could be deterred from taking the medicines they need because they are worried about the impact on the public purse' (see, Department of Health and Social Care, 2012, pg. 32[1]). The inclusion of pricing information was also advised against by the Royal Pharmaceutical Society (RPS; Royal Pharmaceutical Society, 2016). The society highlighted concerns that inexpensive medicines could be regarded as a 'cheap option' or sub-standard, and that patients with similar conditions might compare medications and feel undervalued if found to be receiving the cheaper treatment. Indeed, research suggests consumers believe and, therefore, judge lower-priced items to be of lower quality (see, e.g., Gerstner, 1985; Huber & McCann, 1982; Rao & Monroe, 1989). Further, studies suggest this 'low price – low quality' heuristic might have negative consequences for actual efficacy – a link thought to be related to placebo effects. For example, consumers who paid a discounted price for a product (e.g., an energy drink thought to increase mental acuity) derived less actual benefit from consuming the product (e.g., they were able to solve fewer puzzles) compared to those paying the regular price (Shiv, Carmon, & Ariely, 2005). While the robustness of placebo effects, particularly in health domains where it has been tested on a diverse array of diseases with heterogeneous results, is still subject of debate (see, e.g., Hamberger, Meissner, Hinterberger, Loew, & Weimer, 2019; Price, Finniss, & Benedetti, 2008), the possibility remains for negative consequences if lower prices lead to less actual benefit from the medication.

Concern for certain groups (e.g., the elderly) to feel like a burden on the National Health Service (NHS) was also raised by the RPS. As previously mentioned, responses to the proposed scheme were probed in a qualitative study conducted in Wales via a focus group approach. The study indicated findings consistent with the criticisms raised by the professional bodies – suggesting that introducing cost to labels may make patients feel guilty or unworthy, rather than encouraging them to use their medicines appropriately, and that this effect may be more pronounced among the elderly (Yemm et al., 2017).

While certain groups, such as the elderly, may be influenced by the disclosure of information pertaining to the price of medicine in heterogeneous ways, some theories suggest disclosure of price may also have a more uniform effect – arguing cost acts as one way to communicate the value of a product. In particular, early theories and more recent research suggest that cost of a product may act as a signal of quality (e.g., Milgrom & Roberts, 1986; Spence, 1974; Veblen, 1899). Others argue higher price alone is not sufficient to signal higher quality, and instead, that higher prices should be accompanied by other signals of quality, for example word of mouth reviews (Alpert, Wilson, & Elliott, 1993). Regardless of the competing claims, the potential influence of pricing information on perceived value and efficacy may impact adherence to medical regiment. This is important as recent reports suggest patients may not adhere to their medicine regime as

[1] *Note that the details available online in terms of this study's design, participants, findings, etc., are very sparse.*

much as 50% of the time, with substantial implications for the health of the population (e.g., Brown et al., 2016). Further, this lack of adherence generates medical waste with negative environmental and financial ramifications (e.g., Castensson & Ekedahl, 2010; McKeown & Pawloski, 2013). As such, finding ways to improve adherence is imperative. Drawing on the price-quality heuristic and targeted transparency, disclosing the price of medication may be beneficial to patients in situations where price signals the medication to be valuable and effective. To this end, such a signal may have downstream effects for medication adherence, improved population health, economic sustainability, and waste reduction.

In summary, while research has broadly noted that disclosure of information has the potential to be advantageous, it also can be ineffective or even backfire for a number of reasons tethered to psychological shortcomings and biases, for example lack of attention, motivated attention, social pressure (see Loewenstein et al., 2014, for a review). Further, little has been done to specifically consider the affective and cognitive consequences of disclosing price and source of funding on medical products.

Psychological reactions to explicit reminders of socialized health care – a social exchange perspective

While the literature on the influence of actual taxation on health-related behaviours is relatively well developed (see e.g., Wright, Smith, & Hellowell, 2017, for a review), there is little to inform how explicitly stating a medical product is paid for by taxpayers influences attitudes and behaviours. While the vaguely referenced 'independent study' referred to by the Department of Health reported 'concerns' older people may have about taking from public funds, it does not inform other potential psychological reactions.

In the UK, as in many EU countries, medical service transactions are mostly offered in a free-at-point-of-use context. As such, one theory well-positioned to inform psychological reactions to this service is social exchange theory (see e.g., Cropanzano & Mitchell, 2005, for a review). The theory posits that people respond to receiving goods (broadly defined as including services, products, gifts, favours) as a social transaction. Consequently, a consideration of the literature on social exchange, gift-giving, reciprocity, and the exchange of goods from a social psychological perspective more generally is warranted. This literature is also appropriate as the UK health minister specifically suggested that the inclusion of the phrase 'funded by the UK taxpayer' on medication labelling would make salient the 'social contract' between the National Healthcare Service and the public – again, signalling the notion that the provision of medication is an exchange of sorts.

The social exchange literature often focuses on the idea of a 'social contract' and identifies several ways people can respond to receiving a good or service. One possibility is that a social exchange instils the psychological state of indebtedness – a feeling similar to gratitude, albeit entailing a sense of obligation to repay one's debts towards the benefactor. In comparison to gratitude, indebtedness is considered to have undesirable qualities that people generally try to avoid (e.g., Fredrickson, 2004). Tethered to (but distinct from) the psychological state of indebtedness are feelings of guilt at having received something, for example research finds patients receiving the 'gift' of an organ donation reported elevated feelings of guilt after surgery (Fukunishi et al., 2001). Relatedly, receiving help from others (e.g., health care providers) can lead to feelings of burdensomeness – a mental state characterized by the belief that the person is a drain on others, and that others would 'be better off if I were gone'. As such, feelings of guilt and burdensomeness have important implications for psychological well-being (e.g., Bernabé-

Valero, Moret-Tatay, & Navarro-Sancho, 2018). Among older adults, burdensomeness has been found to be associated with suicidal ideation (e.g., Van Ordern, Cukrowicz, Witte, & Joiner, 2012). Despite the negative valence of these responses to a social exchange, prior theory and research suggest such feelings may help promote healthy behaviours and attitudes. Connecting the present study to social exchange theory and the potential for feelings of guilt and indebtedness – following the receipt of a 'gifted' medication, one way to clear these feelings is to indicate increased value of the good (the medicine). This may be particularly likely when the source of the good is made salient (i.e., when a person is reminded the medication is funded by their fellow citizens). Indeed, prior research aligns with this. As just one example, Achille, Ouellette, Fournier, Vachon, and Hébert (2006) found that people who had received an organ donation reported greater indebtedness and also reported greater medication adherence, perhaps because they valued the medication more as a way to psychologically 'pay off' feelings of indebtedness. Thus, it is not only economic and efficacy concerns that may be aroused by the presence of pricing information and the presence of the 'funded by the UK taxpayer' phrase on medication labelling – there may also be important psychological consequences with implications for behaviour.

The present research

Given the need to identify potential interventions to help health care providers save money and improve services, we probe the suggestions put forward by the 2015 UK health minister to alter medication labels. Specifically, these novel suggestions recommended altering labels to include pricing information and the phrase 'funded by the UK taxpayer'. Given the literature on disclosure of information and the lack of empirical evidence concerning potential positive and negative outcomes in this context, we sought to experimentally examine the implications of viewing a medication label featuring pricing information (absent vs. £20 vs. £200) and the phrase 'funded by the UK taxpayer' (present vs. absent) on perceived value, efficacy, and intentions to adherence to medication regimen. In addition, based on prior work from social exchange theory indicating a range of responses to receiving goods, we examined how these labels might influence feelings of burdensomeness and guilt.

Hypotheses

Two broad a priori hypotheses were posited. First, based on the literature on information disclosure and extant work on the price-quality heuristic (the economic tenant that the presence of a price, and higher prices, signal greater quality), we predicted:

1. Labels featuring pricing information and higher prices (vs. the absence of price information) would lead to the medication being perceived as greater in value, more effective, and result in heightened intentions to complete the full course of medication.

Secondly, based on the literature on information disclosure and social exchange theory, we predicted:

2. A main effect such that the presence of the text 'funded by the UK taxpayer' would lead to greater feelings of burdensomeness and guilt. It was also predicted that the presence of the phrase would lead to the medicine being seen as more valuable as it

makes salient to the participant that the funders are their fellow citizens, and should be valued accordingly.

No a priori hypotheses were posited concerning the interaction of pricing information and the 'funded by the UK taxpayer' phrase.

Method

Participants

Sample size was determined via an a priori power analysis given the 2 × 3 between-subjects ANOVA we planned to pursue, using a medium effect size ($f = .25$), and power set to .80 (conducted via G*Power; Faul, Erdfelder, Buchner, & Lang, 2009). This suggested a total sample size of 213. The study aimed to exceed this amount to account for attrition, potential low-quality data, and exclusion criteria. As such, two hundred ninety-five UK participants over the age of 18 were recruited from Prolific Academic – a crowd-sourced Internet workforce – in exchange for financial compensation (£1.50). A recruitment filter was applied to recruit participants who were currently taking medication. We opted to apply this filter as previous research indicates measures of intention are more likely to translate to actual behaviour (and thus may help close the 'intention-behaviour' gap) when the question relates to the person's self-identity versus a hypothetical scenario unrelated to one's current condition (see, e.g., Sheeran & Webb, 2016). After removing participants who appeared to rush or take a long time with the study (≥ or ≤3 *SD*s from the mean completion time), and/or who did not complete the primary dependant variable, and those who failed any of the data quality check questions (these are explained in detail in the 'materials and procedure' section), there were two hundred and fifty-seven participants remaining (age: $M = 29.10$, $SD = 9.15$, range = 18–43; 89 males; 167 female, 1 undisclosed). The study was listed on the recruitment site as 'exploring personality and attitudes'. The accompanying brief description stated the study aimed to examine the relationship between personality traits and decisions. The description also requested participants only take part if they were currently taking any kind of medication. Participants were randomly assigned to conditions in a 2 ('funded by the UK taxpayer' phrase present vs. not) × 3 (price absent vs. £20 vs. £200) between-subjects experimental design.

Materials and procedure

Personality premeasure

To bolster the cover story, participants first completed a short measure of personality (ten-item personality index; Gosling, Rentfrow, & Swann, 2003). Example items include 'I see myself as extraverted, enthusiastic' and 'I see myself as conventional, uncreative'. Responses were made using a scale anchored at 1 (Disagree strongly) and 7 (Agree strongly). After completing this measure, participants were randomly assigned to view one of the medication labels.

Medicine labels manipulation

Participants were then given the instructions 'The following section is designed to assess attitudes towards prescription drugs. Please imagine the doctor has prescribed you the

medication on the next screen. Take a moment to look at the image and read over the printed label. Once you have done this please answer the questions on the following pages'. Participants then viewed an image of some medicine featuring one of the six labels.

The medication displayed were pills in a standard translucent orange cylinder. At the top of the label, it was indicated the medication was called 'Radacet'. The name was taken from a medicine name generator website (see pills.olivervogel.net/). A fabricated medicine name was used to avoid familiarity effects for extant drugs that people may be aware of and therefore have some idea of their value, what they are used to treat, and their efficacy. At the bottom of the label, information commonly seen on medications was included. Specifically, the label noted: 'Store at 10-20°C', 'KEEP OUT OF REACH OF CHILDREN', and 'STORE IN A COOL DRY PLACE'. All font was presented in Arial, black, and 15-point size. We opted to use this font as it is one of two core fonts employed by the NHS for text communications (see NHS England, 2021). The centre of the label featured the manipulated information, containing the pricing information (absent, £20, or £200), and, either the presence or absence of the phrase 'Funded by the UK taxpayer; please see Supplementary Materials for an example image). The monetary values of £20 and £200 were selected based on two lines of reasoning. First, £20 was selected based on the recommendation of the (then) health secretary's suggestion to only include the pricing information if the medication cost £20 or above. The higher value of £200 was included as it is 1,000% more than the £20 price tag. Second, at time of writing, these values map onto approximate US dollar values for some relatively common medications for example Advil (branded Ibuprofen) can cost around $20, and Ritalin (a common medication for ADHD) costs approximately $200. The following measures were then administered in a random order to mitigate potential order effects.

Medication value

Perceived value of the medication was assessed via the item 'This medicine is valuable' assessed on a 10-point Likert type scale (*1 – completely disagree, 10 – completely agree*).

Medication effectiveness

Perceived effectiveness was assessed with a single item 'This medicine is effective' on a 10-point Likert type scale *(1 – completely disagree, 10 – completely agree*).

Intended adherence to medication regime

Intentions to adhere to the medication plan were examined with the item 'If I were prescribed this medicine I would complete the full course of this medication' assessed on a 10-point Likert type scale (*1 – completely disagree, 10 – completely agree*).

Burden measure

Feelings of burden were assessed with the six-item perceived burdensomeness scale (Peak et al., 2016). Instructions read 'Think back to the medication you saw and complete the items below'. Example items include 'I think I am a burden on society' and 'I make things worse for the people in my life' assessed on a seven-point Likert type scale (*1 – not at all true for me, 7 – very true for me*).

Guilt measure

Feelings of guilt were assessed via the question 'To what extent would you feel guilty if you received the medication that you saw?' with responses measured on a 10-point Likert type scale (*1 – not at all guilty, 10 – very guilty*).

Demographics measures

These measures appeared after the above dependent variables and included sex, age, ethnicity, nationality, religion/philosophy, political orientation, importance of political orientation, political party affiliation, country of birth, country of residence, and employment status.

Current medication use question

After demographic measures, participants indicated if they were currently taking any kind of medication (*Yes/No*). This question was used in conjunction with the recruitment filter to check for participants whose medication regimen might have changed since they initially indicated their medication use for screening purposes.

Data quality measures

In an effort to attain quality responses, we included three approaches aimed at bolstering data integrity. First, as part of the burden measure, an additional 'catch' question was included 'I am paying attention to this study, to indicate that I am paying attention I will select the number 6'. The second approach was to include probe questions as part of the demographics section. The following three questions were included – First, an open-ended question 'In your own words, what was the purpose of the study?' Second, 'Have you been in any other studies that were similar to this one? (*Yes/No*)', then 'If you answered yes, please explain in the space below'. Finally, we also asked 'Have you heard about the proposed scheme to include price of mediation and the phrase 'funded by the UK taxpayer' on medications?' (*Yes/No/Not sure*). The final approach was another question at the end of the study, but before the debriefing – 'It is important that the data we receive from you represent a genuine quality response. We want to try to remove data that is of low quality for example if the participant rushed, did not read instructions / questions, or responded randomly to questions. Do you feel that you have read and responded to every section of this study such that we can use your data? You will receive payment regardless of whether you select yes or no.' (*Yes/No*).

Analyses

Primary analyses

We submitted all measures to a 2 (funded by the UK taxpayer phrase: present vs. absent) × 3 (price: absent vs. £20 vs. £200) between-subjects analysis of variance (ANOVA).[2] While we had no a priori hypotheses for interactions, we report the presence or absence of them below in the interests of completeness (as exploratory analyses).

[2] *To account for the inflated experiment-wise type I error rate given the number of multiple comparisons, all pairwise t-test reported are Bonferroni-corrected. We also ran these analyses as two one-way ANOVAs; this did not significantly alter patterns of results.*

Results

Medication value

There was a main effect of the 'funded by the UK taxpayer' phrase, $F(1, 251) = 5.66$, $p = .018$, $\eta_p^2 = .02$, such that when the phrase was present (vs. absent) the medication was seen are more valuable. A main effect of pricing information was also revealed, $F(2, 251) = 8.83$, $p < .001$, $\eta_p^2 = .07$, such that there was no difference in valuation of the medicine when comparing the £20 label to the no pricing label, $t(173) = 1.48$, $p = .139$, $d = .225$, greater valuation when comparing the £200 to the £20 label, $t(168) = 2.70$, $p = .007$, $d = 4.16$, and greater valuation when comparing the £200 to the no pricing label, $t(167) = 4.15$, $p < .001$, $d = .642$. No interaction effect emerged, $F(2, 251) = .594$, $p = .553$, $\eta_p^2 < .01$ (see Figure 1).

Medication effectiveness

There was no main effect of the 'funded by the UK taxpayer' phrase, $F(1, 251) = 007$, $p = .935$, $\eta_p^2 < .01$. There was no main effect of pricing information, $F(2, 251) = .342$, $p = .711$, $\eta_p^2 < .01$. The analysis produced an interaction between the 'funded by the UK taxpayer' phrase and pricing information, $F(2, 251) = 4.72$, $p = .01$, $\eta_p^2 = .04$ (see Figure 2; also, see Supplementary Materials for an unpacking of this interaction).

Adherence to medication regime

There was no main effect of the 'funded by the UK taxpayer' phrase, $F(1, 251) = .275$, $p = .600$, $\eta_p^2 < .01$. There was a main effect of pricing information, $F(2, 251) = 3.98$, $p = .020$, $\eta_p^2 = .03$ such that there was no difference in intentions to follow the medication regime when comparing the £20 label to the no pricing label, $t(173) = .339$, $p = .734$, $d = .051$, greater intention to follow the medication regime when comparing the £200 label to the £20 label, $t(168) = 2.27$, $p = .023$, $d = .350$, and greater intention to follow the medication regime when comparing the £200 label to the no pricing label, *t*

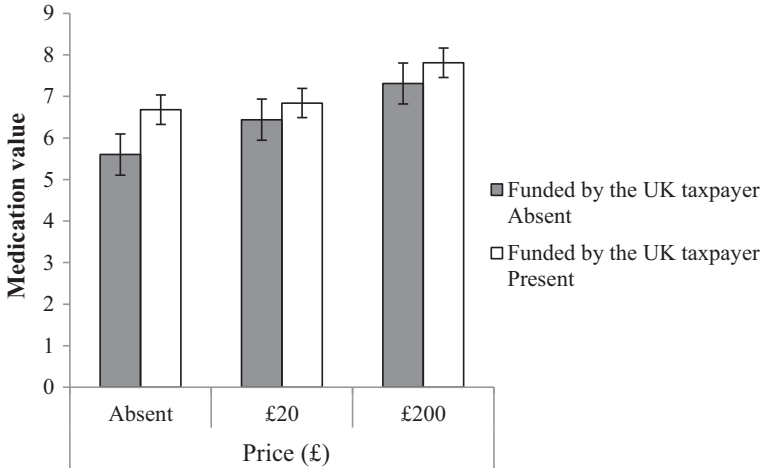

Figure 1. Influence of pricing information and 'Funded by the UK taxpayer' on medication value.

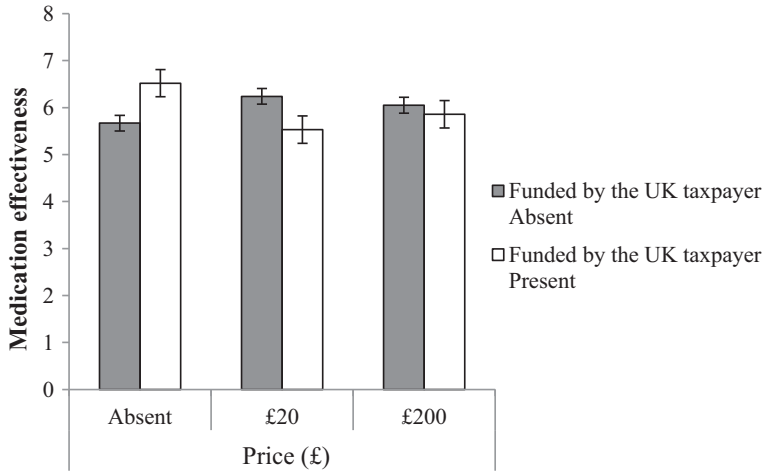

Figure 2. Influence of pricing information and 'Funded by the UK taxpayer' on medication effectiveness.

(167) = 2.60, $p = .009$, $d = .402$. No interaction effect emerged, $F(2, 251) = 1.01$, $p = .367$, $\eta_p^2 < .01$ (see Figure 3).

Burden measure

There was no main effect of the 'funded by the UK taxpayer' phrase, $F(1, 251) = .197$, $p = .657$, $\eta_p^2 < .01$. There was also no effect of pricing information, $F(2, 251) = 2.86$, $p = .059$, $\eta_p^2 = .02$, and no interaction effect emerged, $F(2, 251) = .580$, $p = .560$, $\eta_p^2 < .01$ (see Figure 4).

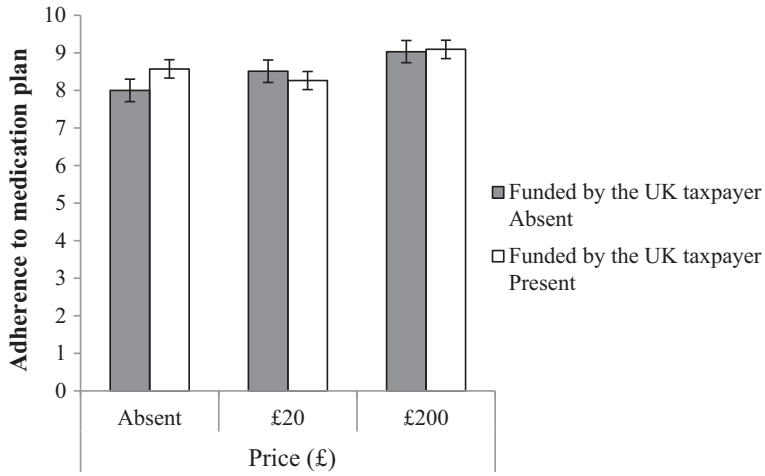

Figure 3. Influence of pricing information and 'Funded by the UK taxpayer' on adherence to medication plan.

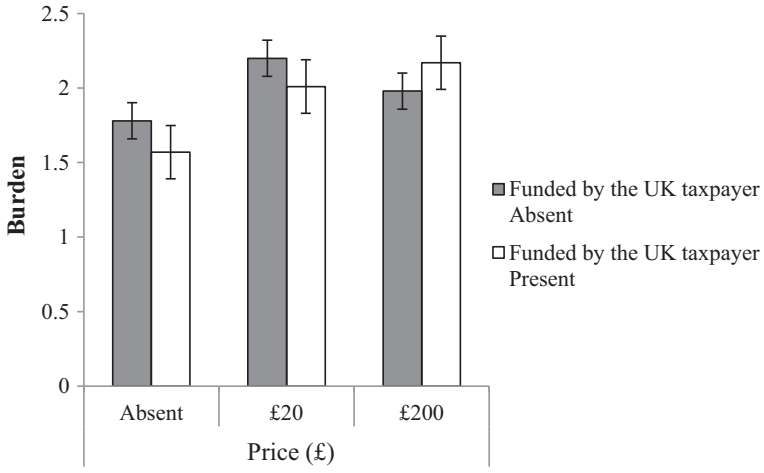

Figure 4. Influence of pricing information and 'Funded by the UK taxpayer' on burden.

Guilt measure

There was a main effect of the 'funded by the UK taxpayer' phrase, $F(1, 251) = 9.74$, $p = .002$, $\eta_p^2 = .04$, such that when the phrase was present (vs. absent) people indicated they would feel more guilty for taking the medicine. There was no main effect of pricing information, $F(2, 251) = 2.21$, $p = .112$, $\eta_p^2 = .02$. No interaction effect emerged, $F(2, 251) = 1.39$, $p = .251$, $\eta_p^2 = .01$ (see Figure 5).

Summary

Results indicated that hypothesis 1 was partially supported – the inclusion of pricing information led to the medicine being perceived as more valuable and led participants to report greater intentions to complete the course of medication, with no effects emerging on perceived efficacy of the medication. In terms of the UK taxpayer funded phrase, hypothesis 2 was also partially supported – inclusion of the phrase resulted in the medication being viewed as more valuable, but also increased feelings of guilt, with no effects emerging on feelings of burden. See Table S1 for an overview of all means and SDs for all dependent measures.[3] See Table S2 for a correlation matrix of key measures (across conditions).

General discussion

The present research provides preliminary evidence that medication labelling disclosing (vs. not) pricing information and including the phrase (vs. not) 'funded by the UK taxpayer' impacts perceptions of medication value and intended adherence to medication regime. Effects also emerged on psychological reactions, namely on feelings of guilt.

[3] *Because of variations in prescription fees in the UK, we conducted an additional set of analyses included country of residence as a control variable, following the same approach as outlined here. This did not meaningfully alter the pattern of results reported or effect sizes.*

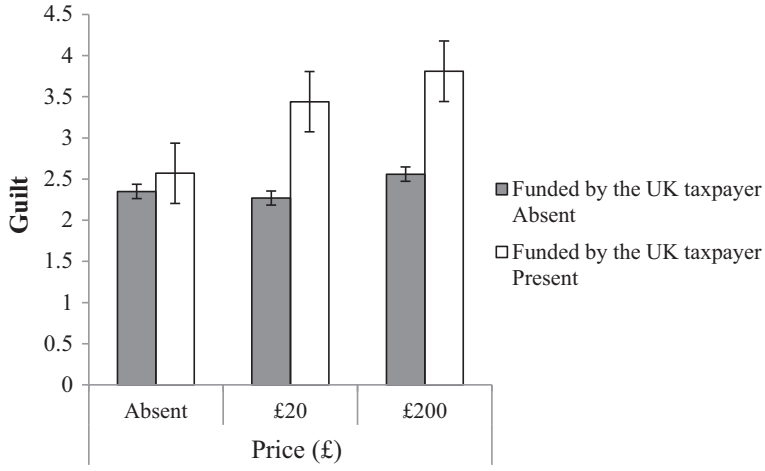

Figure 5. Influence of pricing information and 'Funded by the UK taxpayer' on guilt.

In terms of the pricing information, hypotheses were partially supported with effects emerging on perceptions of the medications value. Specifically, the medication was seen to be more valuable when comparing the £200 price tag to the £20 label and when pricing information was absent. Intentions to complete the course of medication were greater when comparing the £200 price tag to the £20 label and the no pricing information condition. Counter to our hypotheses, no effect of pricing information emerged on perceived efficacy of the medication.

The inclusion of the phrase 'funded by the UK taxpayer' led participants to view the medication as more valuable, as predicted. Similarly, feelings of guilt were greater when the phrase was included on the medication; however, counter to our predictions, the inclusion of the phrase did not produce greater levels of self-reported burdensomeness.

Implications for adherence for medical regimen

Taken together, the effects reported here constitute a 'mixed bag' with both potentially positive and negative outcomes related to the UK's former health minister's proposal to include pricing information and the 'funded by the UK taxpayer' phrase on medicines. Such labelling alterations were originally put forward with the specific suggestion that it would bolster adherence to medical regimens – boosting health while also reducing medical waste and saving money. The data reported here provide partial support for this claim. Of note, these data suggest such an effect on adherence is not likely to be driven by the presence of the taxpayer funded phrase; rather, pricing information appears to be the influential factor. More specifically, greater intentions to adhere to the medication schedule only emerged when comparing the higher value (£200) against the lower price (£20) and price absent conditions. This raises interesting questions concerning the 'tipping point' at which the cost of a medication leads to greater intentions to complete the course of medication. If such a 'sweet spot' can be identified, this may suggest a calibration of the recommendation for when pricing information would appear on medicine labels such that it would only appear once it breaches a certain pricing threshold shown to be effective in promoting adherence.

Continuing consideration of the intentions to adhere to the medication scheme driven by the pricing information – it is interesting to note that there was no main effect of pricing information on the perceived efficacy of the medication. This might suggest that greater intentions to adhere to the medical regimen is not the result of greater perceptions of efficacy engendered by a higher price (as might be suggested by 'price-value' approach). However, it is possible the higher price label used in this study (£200) was not high enough to instil perceptions that the medicine was a premium product. Future research might attempt to replicate this study using greater price values to examine if the price-efficacy link emerges when cost of the medicine exceeds the £200 upper level set in the present research.

We also note that in these data, intentions to complete the course were high across conditions. Such high responses might be driven by social desirability factors which may be especially prevalent in health contexts (see, e.g., Sheeran & Orbell, 1996). There is also a considerable literature illustrating the 'intention-behaviour gap', whereby intentions do not always translate to behaviour (e.g., see Rhodes & Bruijn, 2013, for a meta-analysis in a health context). Future research might attempt to examine whether the greater self-reported intentions reported here, elicited by the pricing information, can make the leap to impacting adherence to actual medication regimes in a more ecologically valid setting.

Potential unintended consequences – feelings of burdensomeness and guilt

PharmacyVoice's suggestion that the labelling might backfire or have unintended consequences also seems to have some support. Two broad objections to the label changes were raised by the group. First, that people (especially the elderly) may feel a sense of burdensomeness as a result of such labels, and second, misperceptions of drug efficacy potentially being signalled by higher or lower prices. Concerning the latter, there were no main effects for either the pricing information or taxpayer funded phrases on perceived efficacy (however, as previously noted, this may emerge with higher price tags. Further, we did not examine price signals below the £20 threshold).

Concerning psychological reactions, there were no effects on self-reported burdensomeness in response to the pricing information or the funded by the UK taxpayer manipulation. However, the inclusion of the 'funded by the UK taxpayer' phrase did elicit greater levels of guilt, consistent with social exchange theory. Specifically, guilt is thought to emerge when agents perceive an unequal exchange and feel they have received more from the transaction than they have given (e.g., Baumeister, Stillwell, & Heatherton, 1994; Blau, 1968).

While feelings of guilt no doubt have a negative valence and potential implications for well-being (e.g., Greenberg, 1980), some research suggests guilt can bolster medication compliance (Achille et al., 2006). This raises difficult questions concerning the appropriate routes government and policymakers can take to facilitate a desired behaviour. While this debate is important, it is also outside of the focus of the current research. However, we would like to highlight that this is the first study we are aware of that examines the impact of this particular labelling approach on psychological reactions. As such, we advise further study and better understanding of the boundary conditions, moderators, and replicability of effects before putting such measures out 'in the wild'.

Recommendations, limitations, and future directions

Overall, when considering the inclusion of pricing information and the phrase 'funded by the UK taxpayer', in the current data, there is no immediate evidence that including pricing information leads to negative consequences on the measures included (feelings of guilt and burdensomeness). However, the inclusion of taxpayer phrase yielded greater valuation of the medication, but also greater feelings of guilt. Given these results, one might be tempted to make a recommendation to include pricing information – given no negative effects emerged in the current study. However, we believe a more cautious approach is warranted before such recommendations can be made. While greater valuation may appear a useful consequence of the inclusion of pricing information, there may be down sides too. That is, if medicine with a higher price point results in greater perceived value, this might have implications for negative attitudes and behaviours beyond the measures we included in the present study. For example, it is possible that medications seen as more valuable due to higher prices are not used properly for example keeping/using them past the use-by date, inappropriately passing medications on to someone with a similar health condition, or even reselling the medicine. Future studies should probe the potential for these kinds of behaviours as a result of the inclusion of pricing information and the subsequent greater valuation observed in our data. We also believe future research examining how these interventions may produce heterogeneous effects contingent on variations in, for example, personality, SES, nationality, and political orientation are warranted. Despite the plethora of future directions to be explored and our suggestion for more thorough testing before potential implementation, the present research represents a promising direction. Specifically, it demonstrates a low-cost means by which we can pursue the improvement of health behaviours by simply changing the messaging and information found on medication packaging.

Regarding other limitations, concerns were explicitly raised (e.g., by PharmacyVoice) that negative consequences of such labelling may be particularly pronounced for older people. However, in these data, greater levels of guilt emerged in a relatively young sample. Despite this, the possibility remains that this effect may be more marked for older people. We originally aimed to examine this possibility; however, we opted not to pursue such analyses given the age range of our participants (18–43 years old). One reason for not recruiting older people might relate to the 'digital divide', with significantly fewer older people engaging with computers and the Internet (e.g., Fox, 2004), and consequently the method we used to collect data, that is an online survey. Future research might pursue alternative recruitment techniques that yield greater participation by older populations, thus allowing a test of whether those of advanced age respond differently to the medication labelling.

Conclusion

The present research examined the influence of including pricing information and the phrase 'funded by the UK taxpayer' on medication. We examined perceptions of value and efficacy alongside intentions to complete the course of medication. In addition, we probed the impact on feelings of burden and guilt. Findings point to both positive and negative outcomes of such labelling, with data suggesting it may, for example, improve adherence to medication, but also foster feelings of guilt. Ambiguities of the data were discussed, and potential policy recommendations were considered. In sum, it is important to consider novel means that enable health care providers to offer their services more

effectively while also saving money. This particular approach may offer one tentative route to achieve that end, albeit with some critical caveats.

Conflicts of interest

All authors declare no conflict of interest.

Author contribution

Simon McCabe, Ph.D (Conceptualization; Data curation; Formal analysis; Investigation; Methodology; Project administration; Writing – original draft; Writing – review & editing) Conny Wollbrant (Writing – review & editing) Liam Delaney (Conceptualization; Methodology; Writing – review & editing).

Data availability statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

References

Achille, M. A., Ouellette, A., Fournier, S., Vachon, M., & Hébert, M. J. (2006). Impact of stress, distress and feelings of indebtedness on adherence to immunosuppressants following kidney transplantation. *Clinical Transplantation*, *20*, 301–306. https://doi.org/10.1111/j.1399-0012.2005.00478.x

Alpert, F., Wilson, B., & Elliott, M. T. (1993). Price signaling: Does it ever work? *Journal of Product & Brand Management*, *2*, 29–41. https://doi.org/10.1108/10610429310027437

Baumeister, R. F., Stillwell, A. M., & Heatherton, T. F. (1994). Guilt: An interpersonal approach. *Psychological Bulletin*, *115*, 243–267. https://doi.org/10.1037/0033-2909.115.2.243

Bernabé-Valero, G., Moret-Tatay, C., & Navarro-Sancho, T. (2018). Does being a grateful person increase one's level of well-being? The mediating role of indebtedness. *BioRxiv*, 344440. https://doi.org/10.1101/344440

Blau, P. M. (1968). Social exchange. *International Encyclopedia of the Social Sciences*, 7, 452–457.

Brown, M. T., Bussell, J., Dutta, S., Davis, K., Strong, S., & Mathew, S. (2016). Medication adherence: Truth and consequences. *The American Journal of the Medical Sciences*, *351*, 387–399. https://doi.org/10.1016/j.amjms.2016.01.010

Castensson, S., & Ekedahl, A. (2010). Pharmaceutical waste: The patient role. In K. Kummerer, & M. Hempel (Eds.), *Green and sustainable pharmacy* (pp. 179–300). Berlin, Heidelberg: Springer.

Conn, V. S., Ruppar, T. M., Chan, K. C., Dunbar-Jacob, J., Pepper, G. A., & De Geest, S. (2015). Packaging interventions to increase medication adherence: Systematic review and meta-analysis. *Current Medical Research and Opinion*, *31*(1), 145–160. https://doi.org/10.1185/03007995.2014.978939

Cropanzano, R., & Mitchell, M. S. (2005). Social exchange theory: An interdisciplinary review. *Journal of Management*, *31*, 874–900. https://doi.org/10.1177/0149206305279602

Department of Health and Social Care. (2012). *Improving the use of medicines for better outcomes and reduced waste: An action plan*. Retrieved from https://www.gov.uk/government/publications/action-plan-for-improving-the-use-of-medicines-and-reducing-waste

Faul, F., Erdfelder, E., Buchner, A., & Lang, A. G. (2009). Statistical power analyses using G* Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods*, *41*, 1149–1160. https://doi.org/10.3758/BRM.41.4.1149

Fox, S. (2004). *Older Americans and the Internet*. Washington, DC: Pew Internet and American Life Project.

Fredrickson, B. L. (2004). Gratitude (like other positive emotions) broadens and builds. In R. A. Emmons, & M. E. McCullough (Eds.), *The psychology of gratitude* (pp. 145–166). New York, NY: Oxford University Press.

Fukunishi, I., Sugawara, Y., Takayama, T., Makuuchi, M., Kawarasaki, H., & Surman, O. S. (2001). Psychiatric disorders before and after living-related transplantation. *Psychosomatics*, *42*, 337–343. https://doi.org/10.1176/appi.psy.42.4.337

Gerstner, E. (1985). Do higher prices signal higher quality? *Journal of Marketing Research*, *22*, 209–215. https://doi.org/10.1177/002224378502200210

Gosling, S. D., Rentfrow, P. J., & Swann, Jr., W. B. (2003). A very brief measure of the Big-Five personality domains. *Journal of Research in Personality*, *37*, 504–528. https://doi.org/10.1016/S0092-6566(03)00046-1

Greenberg, M. S. (1980). A theory of indebtedness. In K. J. Gergen, M. S. Greenberg, & R. H. Willis (Eds.), *Social exchange: Advances in theory and research* (pp. 190 –210). New York, NY: Plenum Press. https://doi.org/10.1007/978-1-4613-3087-5_1

Hamberger, J., Meissner, K., Hinterberger, T., Loew, T., & Weimer, K. (2019). Placebo Economics: A Systematic Review About the Economic Potential of Utilizing the Placebo Effect. *Frontiers in Psychiatry*, *10*, 653. http://dx.doi.org/10.3389/fpsyt.2019.00653.

Huber, J., & McCann, J. (1982). The impact of inferential beliefs on product evaluations. *Journal of Marketing Research*, *19*, 324–333. https://doi.org/10.1177/002224378201900305

Hunt. (2015). *"Personal Responsibility" Health Secretary Jeremy Hunt's speech to the Local Government Association annual conference*. https://www.gov.uk/government/speeches/personal-responsibility

Loeber, S., Vollstädt-Klein, S., Wilden, S., Schneider, S., Rockenbach, C., Dinter, C., … Kiefer, F. (2011). The effect of pictorial warnings on cigarette packages on attentional bias of smokers. *Pharmacology Biochemistry and Behavior*, *98*, 292–298. https://doi.org/10.1016/j.pbb.2011.01.010

Loewenstein, G., Sunstein, C. R., & Golman, R. (2014). Disclosure: Psychology changes everything. *Annual Review of Economics*, *6*(1), 391–419. https://doi.org/10.1146/annurev-economics-080213-041341

McKeown, E., & Pawloski, J. (2013). Think before you flush! A sustainable aquatic eco-system's relation to human health. *Online Journal of Issues in Nursing*, *18*. https://doi.org/10.3912/OJIN.Vol18No01PPT03

Milgrom, P., & Roberts, J. (1986). Price and advertising signals of product quality. *Journal of Political Economy*, *94*, 796–821. https://doi.org/10.1086/261408

NHS England. (2021). Guidelines: Fonts. https://www.england.nhs.uk/nhsidentity/identity-guidelines/fonts/

Peak, N. J., Overholser, J. C., Ridley, J., Braden, A., Fisher, L., Bixler, J., & Chandler, M. (2016). Too much to bear: Psychometric evidence supporting the Perceived Burdensomeness Scale. *Crisis*, *37*, 59–67. https://doi.org/10.1027/0227-5910/a000355

Price, D. D., Finniss, D. G., & Benedetti, F. (2008). A comprehensive review of the placebo effect: Recent advances and current thought. *Annual Review of Psychology*, *59*, 565–590. https://doi.org/10.1146/annurev.psych.59.113006.095941

Rao, A. R., & Monroe, K. B. (1989). The effect of price, brand name, and store name on buyers' perceptions of product quality: An integrative review. *Journal of Marketing Research*, *26*, 351–357. https://doi.org/10.1177/002224378902600309

Rhodes, R. E., & de Bruijn, G. J. (2013). How big is the physical activity intention–behaviour gap? A meta-analysis using the action control framework. *British Journal of Health Psychology*, *18*, 296–309. https://doi.org/10.1111/bjhp.12032

Royal Pharmaceutical Society. (2016). *Royal Pharmaceutical Society Amendments to the Human Medicines Regulations 2012: 'Hub and Spoke' Dispensing, Prices of Medicines on Dispensing*

Labels, Labelling Requirements and Pharmacists' Exemption. Available from: https://www.rpharms.com/Portals/0/Documents/Old%20consultations/consdoc160520.pdf. Accessed May 5, 2020

Sheeran, P., & Orbell, S. (1996). How confidently can we infer health beliefs from questionnaire responses? *Psychology and Health*, *11*, 273–290. https://doi.org/10.1080/08870449608400257

Sheeran, P., & Webb, T. L. (2016). The intention–behavior gap. *Social and Personality Psychology Compass*, *10*, 503–518. https://doi.org/10.1080/08870449608400257

Shiv, B., Carmon, Z., & Ariely, D. (2005). Placebo effects of marketing actions: Consumers may get what they pay for. *Journal of Marketing Research*, *42*, 383–393. https://doi.org/10.1509/jmkr.2005.42.4.383

Spence, M. (1974). Competitive and optimal response to signals: An analysis of efficiency and distribution. *Journal of Economic Theory*, *7*, 296–332. https://doi.org/10.1016/0022-0531(74)90098-2

Van Orden, K. A., Cukrowicz, K. C., Witte, T. K., & Joiner, Jr., T. E. (2012). Thwarted belongingness and perceived burdensomeness: Construct validity and psychometric properties of the Interpersonal Needs Questionnaire. *Psychological Assessment*, *24*, 197–215. https://doi.org/10.1037/a0025358

Veblen, T. (1899). *The theory of the leisure class*. New York, NY: McMillan Co.

Weil, D., Graham, M., & Fung, A. (2013). Targeting transparency. *Science*, *340*, 1410–1411. https://doi.org/10.1126/science.1233480

Wright, A., Smith, K. E., & Hellowell, M. (2017). Policy lessons from health taxes: A systematic review of empirical studies. *BMC Public Health*, *17*, 583. https://doi.org/10.1186/s12889-017-4497-z

Yemm, R., Jones, C., & Mitoko, T. (2017). Displaying medication costs on dispensing labels as a strategy to reduce wastage: Views of the Welsh general public. *Integrated Pharmacy Research & Practice*, *6*, 173–180. https://doi.org/10.2147/IPRP.S145567

Received 19 October 2020; revised version received 31 March 2021

Supporting Information

The following supporting information may be found in the online edition of the article:

Supinfo S1. Example image of medication label used in manipulation
Supinfo S2. Interaction effect – medication effectiveness
Table S2. Dependent measures as a function of Price and Taxpayer funded information
Table S2. Means, standard deviations, and correlations with confidence intervals