

BMJ Open 'At-risk' individuals' responses to direct to consumer advertising of prescription drugs: a nationally representative cross-sectional study

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ABSTRACT

Objectives The factors determining individuals' self-reported behavioural responses to direct to consumer advertising of prescription drugs were explored with an emphasis on 'at-risk' individuals' responses.

Design Nationally representative cross-sectional survey.

Setting Community living adults in New Zealand.

Participants 2057 adults (51% women).

Primary outcome measures Self-reported behavioural responses to drug advertising (asking a physician for a prescription, asking a physician for more information about an illness, searching the internet for more information regarding an illness and asking a pharmacist for more information about a drug).

Methods Multivariate logistic regressions determined whether participants' self-reported behavioural responses to drug advertising were predicted by attitudes towards advertising and drug advertising, judgements about safety and effectiveness of advertised drugs, self-reported health status, materialism, online search behaviour as well as demographic variables.

Results Identifying as Indian and to a less extent Chinese, Māori and 'other' ethnicities were the strongest predictors of one or more self-reported responses (ORs 1.76–5.00, $P < 0.05$). Poorer self-reported health status (ORs 0.90–0.94, all $P < 0.05$), favourable attitude towards drug advertising (ORs 1.34–1.61, all $P < 0.001$) and searching for medical information online (ORs 1.32–2.35, all $P < 0.01$) predicted all self-reported behavioural outcomes. Older age (ORs 1.01–1.02, $P < 0.01$), less education (OR 0.89, $P < 0.01$), lower income (ORs 0.89–0.91, $P < 0.05$) and higher materialism (ORs 1.02–1.03, $P < 0.01$) also predicted one or more self-reported responses.

Conclusions Taken together, the findings suggest individuals, especially those who are 'at-risk' (ie, with poorer self-reported health status, older, less educated, lower income and ethnic minorities), may be more vulnerable to drug advertising and may make uninformed decisions accordingly. The outcomes raise significant concerns relating to the ethicality of drug advertising and suggest a need for stricter guidelines to ensure that drug advertisements provided by pharmaceutical companies are ethical.

INTRODUCTION

Direct to consumer advertising (DTCA) of prescription drugs is a controversial

Strengths and limitations of this study

- A strength of this study is the use of the large and representative sample so that the findings can be generalised to the national population of New Zealand.
- This is the first study to explore the factors determining individuals' self-reported behavioural responses to direct to consumer advertising of prescription drugs in New Zealand and at a population level.
- This study shows, for the first time, the responses of ethnic minorities to drug advertising outside of North America.
- The cross-sectional study does not explore the causal relationships between dependent and independent variables.
- The findings of this study were based on self-reported behavioural responses to drug advertising and might not reflect individuals' actual behavioural responses.

pharmaceutical marketing strategy.¹ Currently, it is only legal in New Zealand and the USA,^{2–6} although advertising on the internet can cross geographical boundaries, and the European Commission has considered a proposal for drug advertising.⁷ A health communication tool such as DTCA can have positive or negative consequences.⁸ The outcomes of DTCA depend on the types of advertised drugs and the nature of the illnesses to be treated.

DTCA is most likely to deliver public health benefits when the condition to be treated is serious and when the treatment is safe, effective, and underused. However, DTCA will tend to deliver net harms when the condition is mild or trivial and when the treatment is potentially dangerous, marginally effective, or overused (p0286).⁸

Furthermore, the effect of DTCA varies depending on how individuals interpret and respond to the information. Of concern, the vast and disparate information in drug advertising reaches individuals directly and poses challenges to individuals to make informed choices on whether the advertised drugs will be beneficial or deleterious.⁹ Supporters of drug advertising claim that it improves individuals' autonomy by increasing awareness of medical problems, symptoms and existing treatments; accordingly, it can assist patients to make superior medical decisions.^{4 10–13} However, exposure to health information through DTCA does not necessarily lead to knowledge¹² and can result in individuals requesting a drug that they do not actually need.¹⁴ Studies show that individuals typically understand the benefits far better than the risks.¹⁵ Furthermore, new drugs presented in DTCA may have unknown side effects or safety issues.¹⁶ Opponents of DTCA argue that the primary motive of the pharmaceutical industry is to increase profit rather than to help individuals make informed health-related decisions.^{17–20}

The pharmaceutical industry spends billions of dollars annually on promotion²¹ to push consumers to buy the advertised medications, spending more on promotion than research and development.²² Such advertising has been blamed for changing the pattern of use of health-care services,²³ including medicalising normal human conditions,²³ driving overconsumption of new prescription drugs and motivating requests for more expensive medications.^{5 24} For instance, in countries with a socialised health system, such as New Zealand, where the government subsidises generic drugs, advertising can convince patients to request a non-subsidised branded medication over a subsidised generic one. The prescription charge for each subsidised medication is \$NZ5, whereas there may be an additional (sometimes substantial) cost if the drug is not fully subsidised.²⁵ Prescription drugs must be prescribed by physicians, and medical professionals act as gatekeepers between DTCA and individuals. However, as a result of drug advertising, patients may pressure physicians to prescribe the advertised branded drugs, and patients' requests for specific drugs significantly increase the likelihood that requested drugs are prescribed.^{8 26 27} Physicians also report that DTCA negatively influences the physician–patient relationship because patients challenge their knowledge based on information they have received through drug advertising.^{28 29} The interference in the physician–patient relationship can result in ill-informed patients and treatments that are not fully tailored to the patients' conditions.³⁰ Consequently, the question arises as to whether individuals are able to make informed decisions in response to drug advertising.

There is a lack of research examining possible communication disparities in response to drug advertising,³¹ and researchers have suggested the need for detailed examinations of responses of various social groups.⁹ Models of drug advertising commonly assume identical attention, processing and behaviour among individuals. However, if the information is not suitably fitted to individuals' needs

and knowledge, it can limit their ability to make informed decisions instead of strengthening it.³² The structural influence model (SIM) of health communication suggests that social determinants are linked to health communication outcomes and theorises that health communication disparities can be seen in terms of inequalities in how people act on health information.³³ Similarly, there might be disparities in individuals' responses to drug advertising. Assuming that there might be differences between social groups in their ability to process and respond to drug advertising, it is important to understand the outcomes of exposure to DTCA between different social groups.⁹ The current study, therefore, explored whether there were communication disparities in self-reported behavioural responses to DTCA, focusing in particular on 'at-risk' individuals' responses.

In healthcare, the terms 'vulnerable' or potentially 'at-risk' are used to refer to individuals who are ethnic minorities, children, elderly, those with certain medical conditions as well as socioeconomically disadvantaged individuals, such as those with a lower level of education and/or a lower level of income.^{34–36} 'At-risk' individuals are more likely to experience a medical information gap. For instance, older individuals are more vulnerable to DTCA than are younger individuals because they tend to obtain less information from the advertisements³⁰ and are more likely to misinterpret information on the effectiveness of advertised drugs.³⁷ The misinterpretation of a drug's effectiveness can complicate the physician–patient relationship if the patient requests the advertised drug.³⁷ While younger adults might also misinterpret information in DTCA, older adults are more likely to have several medical conditions requiring more prescription drugs and are therefore more likely to be affected by communication gaps in drug advertisements.³⁰ Less educated and lower income individuals may obtain less information from drug advertisement and may be more vulnerable than others to the medication information gap.³⁰ People with poorer health may similarly be more vulnerable to drug advertising as they have also been defined as vulnerable populations in the medical domain,^{34 35} and they may need to use more prescription drugs. Furthermore, research typically shows that health outcomes for ethnic minorities are poorer compared with the majority populations.^{35 36 38–40} For example, earlier research has reported dissimilarities in health outcomes of different ethnicities in the USA and New Zealand. In both countries, poorer health outcomes were found among the minority populations. Ethnic minorities can, therefore, be considered as vulnerable or 'at-risk' people.³⁹ Given the growing concern about the role of health literacy and social imbalance in health-related outcomes, more studies have to be conducted to map the paths between social determinants and health-related consequences.^{41 42} Drawing on the SIM of health communication, the present study explored whether there was any social imbalance as a function of individual characteristics with regard to responding to drug advertising. Using a representative sample within

New Zealand, this study examined whether 'at-risk' individuals (with poorer self-reported health status, older, less educated, lower income, lower occupational status and ethnic minorities) were more likely to be influenced by drug advertising.

Research has also focused on the role of attitudes and personal characteristics in determining responses to advertising. Positive attitudes towards drug advertising predict behavioural intentions and responses to such advertising.^{43–45} Thus, the present study examined the influence of attitudes towards advertising and DTCA on perceived behavioural responses to drug advertising. In addition, this study explored the personal trait of materialism to examine whether there was a relationship between materialistic traits and responding to drug advertising. Materialism emphasises the importance placed on goods and their purchase to help achieve desired goals or situations.⁴⁶ Drug advertising uses emotional appeals, for instance, showing a character in a fearful state, followed by a happy state after using the product, to communicate that purchasing the product is a way to overcome insecurity.⁴⁷ The association between feelings of insecurity and materialistic behaviour was discussed as early as the 1950s.⁴⁸ Materialism is also linked with poorer health status including physical symptoms, drug use^{49–50} and lower subjective well-being.^{51–57} Considering the nature of advertising, coupled with materialistic individuals' greater attention to advertising,⁵⁸ proneness to compulsive consumption^{52–59–62} and susceptibility to advertising,⁵⁴ it is reasonable to speculate that materialistic individuals might be more likely to respond to DTCA, especially given that DTCA markets drugs to individuals in the same fashion as other fast-moving consumer goods. However, no previous research has explored the relationships between materialism and responses to drug advertising. Therefore, the current study examined the effects of materialism on self-reported behavioural responses to drug advertising. In addition, people are increasingly searching for medical information on the internet,⁶³ but this may differ by education, income and ethnicity. These inequalities in internet usage may intensify health inequalities among different groups.^{64–66} Therefore, this study also examined the influence of the use of the internet to search for medical information on self-reported behavioural responses to drug advertising.

METHODS

Source of data

This study analysed a subset of pharmaceutical-related and health-related questions from a large online survey covering a range of attitudes, behaviour, consumption and lifestyle questions. Data collection was performed in late 2013 by Research Now, a leading market research company operating in more than 40 countries with over 11 million panellists. Quota sampling was used for selecting the survey participants. The instructions were that the respondents were to be demographically

representative of the New Zealand population in terms of age, sex, education, ethnicity and income. The full-survey instrument took approximately 40 min to complete. A total of 2057 usable responses were retained for analysis. Since an independent panel survey was used, it was not possible to calculate a response rate (participants were signed up to complete the surveys that they were sent). All participants answered all of the questions used in this study since the questions were not based on a response logic of any earlier item in the questionnaire. This study had ethics approval from the University of Otago, and all participants gave their written consent.

Variables

Dependent variables

Perceived effects of DTCA on individuals were measured by asking participants to report their behavioural responses after exposure to a drug advertisement through four yes/no questions drawn from previous studies: (1) As a result of seeing an advertisement for a drug, have you asked your physician for a prescription?⁶⁷ (2) As a result of seeing an advertisement for a drug, have you asked your physician for more information about an illness?⁶⁷ (3) As a result of seeing an advertisement for a drug, have you searched the internet for more information regarding an illness?⁶⁸ (4) As a result of seeing an advertisement for a drug, have you asked your pharmacist for more information about a drug?⁶⁷

Independent variables (predictors)

Measures of attitudes and knowledge were made on a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). Participants were asked about their general attitude towards advertising,⁶⁹ attitude towards DTCA,^{45–70} knowledge about the safety of advertised drugs^{71–72} and knowledge about the effectiveness of drugs.⁷² Self-reported/subjective health status, a valid and widely used indicator of health conditions,^{73–76} was measured by asking respondents' self-rated satisfaction with their health on a 10-point Likert scale from 1 (completely dissatisfied) to 10 (completely satisfied).⁷¹ Materialism was measured by using Richins and Dawson's Materialism Value Scale, including 18 statements on a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree).⁴⁶ Richins and Dawson's Scale has been widely used in consumer research^{47–77–80} and shown robust psychometric properties in international research.^{47–81} This scale was originally argued to have three subscales (centrality, happiness and success), but this dimensional structure is not consistently found in the data.^{82–83} In this study, the exploratory factor analysis/confirmatory factor analysis found evidence for a 2-factor model, but with all the negatively worded items loading on the second factor, suggesting that this factor is an artefactual factor, based on the positive or negative wording of items, rather than a real latent dimension.^{84–85} Moreover, previous research has revealed that although there are three dimensions in the original scale, items can be summed to reflect an overall

materialism score.⁸⁶ Accordingly, in line with common practice, a total materialism score was computed.⁸⁶⁻⁹⁰ Based on omega and alpha estimates, the internal consistency (reliability) of the scale was good ($\omega=0.81$ (95% CI 0.80 to 0.82), $\alpha=0.81$ (0.80 to 0.82)). Use of the internet to search for medical information was measured by the sum of two yes/no items; ie, searching for medical advice online and visiting a health-related blog ($\omega=0.72$ (0.70 to 0.74), $\alpha=0.70$ (0.67 to 0.72)). Demographic information on age (as a continuous variable), gender, ethnicity (as multiple dummy variables, with New Zealand European as the reference level), education, income and occupation (as multiple dummy variables, with unemployed as the reference level) were also used.

Data analysis

Data were analysed with IBM SPSS Statistics for Windows, V.22.0, IBM. Descriptive statistics were used to calculate frequencies, mean and SD of items. Omega and alpha estimates of reliability were calculated using the 'MBESS' package in R. Multivariate binary logistic regression models were used to show independent variables predicting self-reported behavioural responses to DTCA and subsequently to reveal the factors determining self-reported behavioural outcomes. The outcomes of the logistic regression analyses were presented as ORs with 95% CIs. Predictive accuracy and overall appropriateness of the models were examined by non-significant ($P>0.05$) Hosmer-Lemeshow tests⁹¹ and significant ($P<0.01$) Omnibus test of model coefficients.

RESULTS

Sample characteristics

The demographics of the sample are presented in table 1.

Table 2 shows the means and SD for non-demographic independent variables.

About 60% of respondents considered themselves in good health, 5.2% were completely satisfied with their overall health, 25% were dissatisfied and only 3.4% were completely dissatisfied with their overall health. 48% had looked for medical information online. Almost a third of the sample (30.7%) believed that DTCA was helpful for consumers, 43.7% thought that only drugs that are completely safe could be advertised and 35.3% believed that only drugs that are extremely effective could be advertised. Moreover, as a result of seeing DTCA, 11.4% of participants asked their physicians for a prescription, 15.9% asked their physicians for more information, 34.4% searched the internet for more information and 16.2% asked their pharmacists for more information.

Predictors of self-reported behavioural outcomes

Results of the logistic regression analyses predicting each self-reported behavioural outcomes are shown in table 3.

Having asked a physician for a prescription after seeing a drug advertisement was most strongly

predicted by identifying as Indian (OR 5.00; 95% CI 2.81 to 8.91, $P<0.001$) or Chinese (OR 2.23; 95% CI 1.14 to 4.39, $P<0.05$), followed by more positive attitudes towards DTCA (OR 1.61; 95% CI 1.35 to 1.91, $P<0.001$). Searching for health information online (OR 1.32; 95% CI 1.11 to 1.57, $P<0.01$) was a moderate strength predictor. Weaker predictors were higher materialism (OR 1.03; 95% CI 1.01 to 1.05, $P<0.001$), poorer self-reported health status (OR 0.94; 95% CI 0.89 to 0.99, $P<0.05$), lower income (OR 0.89; 95% CI 0.81 to 0.97, $P<0.05$) and less education (OR 0.89; 95% CI 0.82 to 0.96, $P<0.01$). Students (OR 0.48; 95% CI 0.24 to 0.96, $P<0.05$) were strongly less likely to report asking a physician for a prescription than were unemployed respondents. This model correctly classified the outcome for 89% of the cases and explained 14.3% (Nagelkerke R^2) of the variation in asking a physician for a prescription. The non-significant result of Hosmer-Lemeshow test ($\chi^2=4.78$, $df=8$, $P=0.78$) and the significant result of Omnibus Tests of Model Coefficients ($P<0.001$) demonstrated that the model had a good fit to the data.

Having asked a physician about an illness after seeing a drug advertisement was most strongly predicted by identifying as Indian (OR 3.88; 95% CI 2.21 to 6.81, $P<0.001$), Chinese (OR 1.99; 95% CI 1.04 to 3.80, $P<0.05$) or Māori (OR 1.76; 95% CI 1.19 to 2.60, $P<0.01$), followed by searching for health information online (OR 1.67; 95% CI 1.44 to 1.93, $P<0.001$) and more positive attitudes towards DTCA (OR 1.53; 95% CI 1.31 to 1.77, $P<0.001$). It was weakly predicted by older age (OR 1.02; 95% CI 1.01 to 1.03, $P<0.001$), poorer self-reported health status (OR 0.93; 95% CI 0.89 to 0.98, $P<0.01$) and lower income (OR 0.89; 95% CI 0.82 to 0.96, $P<0.01$). This model correctly classified the outcome for 84.2% of the cases and explained 14.5% (Nagelkerke R^2) of the variation in asking a physician about an illness. The non-significant result of Hosmer-Lemeshow test ($\chi^2=10.22$, $df=8$, $P=0.25$) and the significant result of Omnibus Tests of Model Coefficients ($P<0.001$) again showed a good model fit.

Having searched the internet for more information regarding an illness after seeing a drug advertisement was strongly predicted by searching for health information online (OR 2.35; 95% CI 2.08 to 2.65, $P<0.001$), moderately predicted by more positive attitude towards DTCA (OR 1.34; 95% CI 1.19 to 1.51, $P<0.001$) and weakly predicted by higher materialism (OR 1.02; 95% CI 1.01 to 1.03, $P<0.01$), in addition to poorer self-reported health status (OR 0.90; 95% CI 0.86 to 0.93, $P<0.001$). Women were somewhat (OR 1.36; 95% CI 1.09 to 1.70, $P<0.01$) more likely than men to report searching the internet for more information regarding an illness after exposure to DTCA. This model correctly classified the outcome for 71.3% of the cases and explained 20.7% (Nagelkerke R^2) of the variation in searching the internet for more information regarding an illness. The non-significant result of Hosmer-Lemeshow test ($\chi^2=20.03$, $df=8$,

Table 1 Demographics of the sample (n=2057)

Variable	Frequency (%)	Mean	SD
Age (year) (continuous variable)		44.21	17.6
Education			
No secondary schooling	61 (3.0)		
School examinations only	165 (8.0)		
School certificate examination only	355 (17.3)		
University entrance/matriculation only	277 (13.5)		
Technical or trade certificates	329 (16.0)		
Professional training	215 (10.5)		
University qualifications	655 (31.8)		
Ethnicity			
European New Zealanders	1290 (62.7)		
Māori	218 (10.6)		
Chinese	74 (3.6)		
Indian	79 (3.8)		
Pacific Islands	68 (3.3)		
'Other' ethnicities	328 (15.9)		
Gender			
Male	1001 (48.7)		
Female	1056 (51.3)		
Income			
Less than \$NZ20 000	199 (9.7)		
\$NZ20 000 to \$NZ39 999	460 (22.4)		
\$NZ40 000 to \$NZ59 999	413 (20.1)		
\$NZ60 000 to \$NZ79 999	338 (16.4)		
\$NZ80 000 to \$NZ99 999	212 (10.3)		
\$NZ100 000 to \$NZ119 999	202 (9.8)		
Over \$NZ120 000	232 (11.3)		
Occupation			
Working for someone else full-time	684 (33.3)		
Working for someone else part-time	275 (13.4)		
Self-employed	166 (8.1)		
Temporarily unemployed	144 (7.0)		
Retired	337 (16.4)		
Student	273 (13.3)		
Full-time home maker	178 (8.7)		

P=0.01) and the significant result of Omnibus Tests of Model Coefficients (P<0.001) showed a good fit.

Having asked a pharmacist for more information about an advertised drug after seeing a drug advertisement was most strongly predicted by identifying as Chinese (OR 2.55; 95% CI 1.40 to 4.63, P<0.01), Māori (OR 2.06; 95% CI 1.41 to 3.01, P<0.001) or 'other' ethnicities (OR 1.78; 95% CI 1.27 to 2.50, P<0.01). More positive attitudes towards DTCA (OR 1.39; 95% CI 1.21 to 1.61, P<0.001) and searching for health information online (OR 1.32; 95% CI 1.14

to 1.53, P<0.001) were moderate strength predictors. Weaker predictors were older age (OR 1.01; 95% CI 1.004 to 1.03, P<0.01), poorer self-reported health status (OR 0.94; 95% CI 0.90 to 0.99, P<0.05) and lower income (OR 0.91; 95% CI 0.84 to 0.98, P<0.05). This model correctly classified the outcome for 83.9% of the cases and explained 10.2% (Nagelkerke R²) of the variation in asking a pharmacist for more information about an advertised drug. Model fit was again good with a non-significant result of Hosmer-Lemeshow test ($\chi^2=7.01$, df=8, P=0.53) and

Table 2 Non-demographic independent variables

Items	Mean (SD)
Only drugs that are completely safe can be advertised in New Zealand	3.28 (1.18)
Only drugs that are extremely effective can be advertised in New Zealand	3.11 (1.12)
Overall, I believe that advertising of medicine is good for consumers	3.00 (1.02)
Overall, I consider advertising a good thing	3.07 (0.92)
Self-reported health status	5.98 (2.47)
Materialism	48.89 (9.32)
Searching online health information	0.71 (0.82)

significant result of Omnibus Tests of Model Coefficients ($P < 0.001$).

DISCUSSION

Individuals lacked knowledge regarding the regulation and safety of drug advertising with nearly half of all participants believing that only drugs that are completely safe could be advertised. Similarly, a substantial proportion thought that only drugs that are extremely effective could be advertised. Individuals are often vulnerable to misinformation⁹² and do not try to process the rest of the provided information if a drug advertisement presents a drug as effective.²⁹ Inaccurate positive belief regarding the safety and efficacy of advertised drugs is concerning given that advertising may induce unwarranted inferences and change individuals' beliefs over time,⁹³ the main goal of drug advertising is to persuade rather than to inform,^{94 95} and research shows that drug advertising is usually effective at persuasion.^{96 97} Furthermore, some drugs that are advertised directly to consumers have serious side effects. For instance, Vioxx (rofecoxib) was heavily advertised for 5 years in more than 80 countries, including New Zealand. It was subsequently withdrawn from the worldwide market in 2004 over safety concerns about increased risk of heart attack and stroke.^{98–100}

Participants reported responding to drug advertising by seeking the medication or further information as a result of seeing a drug advertisement, indicating a general effect of DTCA. Such reported behaviour can have varied outcomes; requesting a prescription drug may lead to either appropriate treatment or inappropriate and excessive prescribing.⁸ Moreover, searching or asking for more information can increase individuals' awareness of medical conditions and potential treatments, but it can also lead to seeking medications for irrelevant, non-medical or minor medical problems.¹⁰¹ Discussions about inappropriate drugs or unrelated medical conditions can take time away from necessary medical examinations or prevent communications regarding healthy lifestyle changes or mental health issues, which can consequently influence patients' well-being.^{94 102} Furthermore, finding

reliable information on the internet is challenging ' (like finding a needle in a haystack), and the noise of DTCA just makes the haystack larger' (p0286).⁸

Of importance, this study found disparities in self-reported behavioural responses to drug advertising with 'vulnerable' or 'at-risk' individuals (ie, poorer subjective health status, older, less educated, lower income and ethnic minorities) being more likely to report responses to drug advertising. In particular, respondents' ethnicity influenced self-reported behavioural responses, so that some ethnic minorities were strongly more likely to report behavioural responses, relative to New Zealand Europeans. This study extends the handful of studies, which have examined responses of ethnic minorities to DTCA,¹⁰³ and shows the disparate effects of drug advertising on vulnerable populations outside of North America. Respondents who had lower levels of satisfaction with their health status were more likely than other individuals to report engaging in all four behavioural responses. Older individuals were also more likely than others to seek more information from a physician or pharmacist as a result of seeing a drug advertisement. While health issues and associated needs for prescriptions might explain self-reported behavioural responses of older individuals and those who were less satisfied with their health status, other individuals classed as 'vulnerable' due to social determinants were also more likely to respond to drug advertising. Respondents with lower levels of education were more likely to ask a physician for a prescription. Those with lower levels of income were more likely to report all behavioural responses except for searching the internet, and unemployed respondents were more likely than students to ask a physician for a prescription. Taken together, the current findings showed communication inequalities in response to drug advertising with 'vulnerable' or 'at-risk' individuals being more likely to respond to such advertising. These findings are consistent with the SIM of health communication, which suggests that differences in health behaviours among different social groups can be explained by focusing on how social determinants are linked to health communication outcomes.^{9 104} The imbalance in self-reported behavioural responses of 'at-risk' individuals raises concerns regarding the ethicality of drug advertising in its present form. Although physicians play the role of gatekeepers and moderate the effects of drug advertising on individuals, patients' requests can drive physicians' medication choices.²⁶ Many physicians have reported that assuring patients that a requested medication is not suitable is challenging and onerous.¹⁰⁵

In the current study, a favourable attitude towards drug advertising predicted all self-reported behavioural outcomes. The fact that individuals might respond to drug advertising based on their favourable attitudes, coupled with the fact that participants had inaccurate knowledge regarding the safety and effectiveness of advertised drugs, suggests that individuals are at risk of being influenced by the promotional nature of the advertisements. This is a

Table 3 Summary of multivariate binary logistic regression models predicting self-reported DTCA-triggered behaviours

Variable	Asking a physician for a prescription: OR (95% CI)	Asking a physician for more information about an illness: OR (95% CI)	Searching the internet for more information regarding an illness: OR (95% CI)	Asking a pharmacist for more information about a drug: OR (95% CI)
Age	1.00 (0.99 to 1.01)	1.02 (1.01 to 1.03)***	1.01 (0.99 to 1.02)	1.01 (1.004 to 1.03)**
Annual income	0.89 (0.81 to 0.97)*	0.89 (0.82 to 0.96)**	0.99 (0.93 to 1.05)	0.91 (0.84 to 0.98)*
Ethnicity				
New Zealand European (reference)	1.00	1.00	1.00	1.00
Māori	1.33 (0.84 to 2.10)	1.76 (1.19 to 2.60)**	1.08 (0.77 to 1.52)	2.06 (1.41 to 3.01)***
Chinese	2.23 (1.14 to 4.39)*	1.99 (1.04 to 3.80)*	1.22 (0.71 to 2.08)	2.55 (1.40 to 4.63)**
Indian	5.00 (2.81 to 8.91)***	3.88 (2.21 to 6.81)***	1.58 (0.93 to 2.67)	1.77 (0.96 to 3.25)
Pacific Island	0.87 (0.39 to 1.96)	1.29 (0.64 to 2.58)	1.08 (0.62 to 1.87)	1.64 (0.86 to 3.15)
'Other' ethnicities	1.24 (0.80 to 1.91)	1.35 (0.94 to 1.95)	1.28 (0.96 to 1.70)	1.78 (1.27 to 2.50)**
Gender	0.74 (0.53 to 1.02)	0.81 (0.61 to 1.07)	1.36 (1.09 to 1.70)**	1.08 (0.82 to 1.42)
Self-reported health status	0.94 (0.89 to 0.99)*	0.93 (0.89 to 0.98)**	0.90 (0.86 to 0.93)***	0.94 (0.90 to 0.99)*
Occupation				
Unemployed (reference)	1.00	1.00	1.00	1.00
Working full-time	0.89 (0.52 to 1.55)	0.94 (0.57 to 1.54)	1.46 (0.94 to 2.26)	1.18 (0.71 to 1.95)
Working part-time	0.68 (0.37 to 1.26)	0.78 (0.45 to 1.34)	1.13 (0.71 to 1.82)	0.74 (0.42 to 1.29)
Self-employed	1.05 (0.53 to 2.06)	0.52 (0.27 to 1.002)	1.07 (0.63 to 1.82)	0.99 (0.53 to 1.84)
Retired	0.67 (0.34 to 1.34)	0.57 (0.32 to 1.03)	1.10 (0.66 to 1.84)	0.77 (0.43 to 1.39)
Student	0.48 (0.24 to 0.96)*	1.10 (0.61 to 2.00)	1.52 (0.92 to 2.52)	0.77 (0.41 to 1.44)
Full-time home maker	0.81 (0.41 to 1.59)	0.57 (0.30 to 1.09)	0.93 (0.55 to 1.56)	0.95 (0.52 to 1.74)
Level of education	0.89 (0.82 to 0.96)**	0.96 (0.89 to 1.03)	0.99 (0.93 to 1.05)	1.03 (0.96 to 1.10)
Attitude towards advertising (in general)	1.01 (0.85 to 1.19)	1.09 (0.94 to 1.26)	1.09 (0.97 to 1.23)	1.15 (0.99 to 1.33)
Attitude towards DTCA	1.61 (1.35 to 1.91)***	1.53 (1.31 to 1.77)***	1.34 (1.19 to 1.51)***	1.39 (1.21 to 1.61)***
Materialism	1.03 (1.01 to 1.05)***	1.01 (0.99 to 1.03)	1.02 (1.01 to 1.03)**	1.005 (0.99 to 1.02)
Searching online health info	1.32 (1.11 to 1.57)**	1.67 (1.44 to 1.93)***	2.35 (2.08 to 2.65)***	1.32 (1.14 to 1.53)***
View on effectiveness of advertised drugs	1.19 (0.96 to 1.48)	1.06 (0.88 to 1.28)	1.02 (0.88 to 1.18)	1.04 (0.87 to 1.24)
View on safety of advertised drugs	0.87 (0.71 to 1.07)	0.90 (0.75 to 1.07)	0.94 (0.81 to 1.08)	1.02 (0.86 to 1.21)

*P<0.05, **P<0.01, ***P<0.001.

DTCA, direct to consumer advertising.

significant concern since drug advertising is self-regulated in New Zealand,^{4 106} and medicine advertisements often present patient success stories, which can mislead the public.¹⁰⁷ This risk is further evident by the finding that materialism positively predicted self-reported behavioural responses to DTCA, including asking a physician for a prescription and searching the internet for more information. Previous studies have revealed that materialism is associated with lower psychological well-being, more physical symptoms, more drug use, more attention to advertising as well as purchasing behaviour.^{48 50–62} The current

findings linking materialism to responding to drug advertising align with earlier research showing that materialism is closely related to excessive and uncontrollable shopping and compulsive consumption.^{52 60–62} These outcomes add to this body of research by suggesting that materialistic individuals might be more likely than others to treat prescription drugs similarly to other consumer goods. Of note, reliance on the internet for medical information also predicted all self-reported behavioural responses to DTCA. Thus, pharmaceutical companies could improve the ethicality of their advertising by using the internet

to develop patient support and offer informative online DTCA, which can help people to have more effective discussions with health professionals.

Limitations and strengths

The current findings were based on cross-sectional data, thus causal inferences could not be made. Future longitudinal studies could further explore the effects of social determinants, personal characteristics and exposure to drug advertisements on health communication outcomes, including prescription drug purchasing. Moreover, the findings were based on self-reported behavioural responses and might not reflect individuals' actual behavioural responses. Experimental studies should be conducted to extend the outcomes and contributions of this study. Since this study focused on perceived behavioural responses, perceptions of the informativeness of DTCA and motivations for responding to DTCA were not explored and could be examined in future research.

The outcomes from our large representative sample can be generalised to national population in New Zealand and have important implications for both health-care policy-makers and pharmaceutical companies. This research suggests that regulations on drug advertising should be tightened. Moreover, health policy-makers should increase knowledge regarding drug advertising and let individuals know that advertised medications are not necessarily safe and effective. Health policy-makers can also concentrate on people's attitudes towards advertising of prescription drugs and let them know that it is a paid promotion conveyed by pharmaceutical companies. Health professionals need to be well informed of all medications prior to them being advertised to help individuals make safe choices. Furthermore, pharmaceutical companies should advertise their medications responsibly and educate individuals about treatments constructively since people, especially those who are more vulnerable, may ask for a medication that they do not need. Drug advertisements can discuss lifestyle alternatives to taking drugs and state that there are other medications available, which may have the identical effects.

CONCLUSIONS

While much attention has been paid to perceived behavioural responses to drug advertising, to the best of our knowledge, no study has documented 'at-risk' individuals' perceived behavioural responses to drug advertising. This study, therefore, grounded in communication inequality and the SIM, presented the factors predicting individuals' self-reported behavioural responses to drug advertising. This research found that 'at-risk' individuals were more vulnerable to drug advertising as supported by the representative empirical findings. Furthermore, the outcomes revealed the importance of attitudes towards DTCA over and above knowledge of regulation and safety of advertised drugs, which can leave individuals vulnerable to drug advertising and at risk of making

uninformed decisions accordingly. The current research also addressed the important question of whether materialism has effects on self-reported behavioural responses to drug advertising and revealed that respondents higher in materialism were more likely to be affected by drug advertising, suggesting that they might pay more attention to advertisements, or DTCA might be appealing to their consumerism, a trait that is associated with lower psychological well-being.⁵⁹

Taken together, the outcomes suggest that drug advertising affects the most 'at-risk' individuals, who base their decisions on their attitudes, who are motivated to consume and who rely on the internet for medical information. The findings raise significant concerns regarding ethicality of DTCA and suggest a need for policy developments to ensure medicine advertisements are ethical and do not cause misuse or overuse of medications.

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