Consumer preferences for different nutrition front-of-pack labels in India

Arvind Sahay, Rahul Sanghvi and Ranjan K. Ghosh
Indian Institute of Management Ahmedabad
Vastrapur, Ahmedabad – 380015
asahay@iima.ac.in; ranjang@iima.ac.in;

February 15, 2022

About the Authors

Arvind Sahay is Professor of Marketing and International Business and member of the Public Systems Group; Chairperson, NSE Center for Behavioral Science and Chairperson, India Gold Policy Center at IIM, Ahmedabad. His research and teaching interests lie in the applications of psychology and neuroscience to assessing and influencing consumer behavior with pricing and branding as major areas of application across industries. He has published more than 30 international peer reviewed articles in top journals and 60 cases many of which are widely cited in their field. He is a consultant and trainer to government, corporations and NGOs and is coordinator of executive education programs on pricing, neuroscience in marketing and enhancing sales force performance. He has more than 35 years of cumulative board room experience across 6 firms; he is currently on the board of two listed and two unlisted firms. Prior to joining IIM, Ahmedabad, Arvind Sahay was teaching at the London Business School, UK. He obtained his Ph.D. from the University of Texas at Austin and has a B.Tech and MBA from IIT, Kanpur and IIM Ahmedabad respectively. He has earlier been Dean(AER), Chairperson, Executive Education, Chairperson, Marketing Area, and Chairperson PGPX at IIM-Ahmedabad.

Rahul Sanghvi is a PGP2007 from IIM, Ahmedabad and is currently pursuing PhD from IIMA. Subsequent to IIMA, he has had a 15 year career in consultancy, research and analytics, including brief stints as DDG, DMEO, NITI Aayog (lateral) as well as Head, Research & Insights, British High Commission. He founded Dexter in 2007 as a field research and tech support organisation. Dexter has extensive experience in research operations, with more than 400 projects across sectors across 27 states of India, and more than 1.2 million interviews under its belt. Dexter specialises in strong tech-driven QC systems, with the live video spot check technology for field interview and data collection that makes for robust and quick data collection.

Ranjan K. Ghosh is an Associate Professor at IIM Ahmedabad's Center for Management in Agriculture. He is the country head for FABLE Consortium, which is a part of the Global Food and Land-use (FOLU) coalition. His research and teaching interests lie in the areas of sustainable and healthy food system transformations, agricultural and institutional economics. He is in the Executive Committee for IIM Ahmedabad's Food and Agribusiness Management Program, and teaches courses on food and agribusiness value chains and entrepreneurship. He has published in globally reputed journals, has been an advisor and consultant to the UN-SDSN, The Nature Conservancy, Food Systems Economics Commission, WHO, Environmental Defense Fund, TERI, World Resources Institute, the EU, CGIAR and various government agencies in India, Germany and Sweden. He has been a past and present board member of a national level Farmer Producer Company Consortium, a large public sector enterprise, and the Wheels Global Foundation Water Council. Prior to joining IIMA, Ranjan Ghosh worked and taught at the Department of Economics and Business Studies, Swedish University of Agricultural Sciences (SLU) Uppsala, Sweden. He holds a PhD in Resource Economics from Humboldt University Berlin, Germany and is an affiliated researcher with the Elinor Ostrom Workshop, Indiana University Bloomington, WINS Berlin and a fellow of the Ronald Coase Institute, Washington DC.

Summary

It is now well established that front-of-pack-labels (FOPLs) have the ability to nudge healthy consumption behavior with respect to packaged foods. However, many developing countries are reluctant to introduce such systems owing either to paucity of reliable research, resistance from vested interests or lack of clarity about which kind of FOPL is most comprehensible, acceptable and yet effective. In this context, we conduct a first ever large scale randomized controlled trial within the complex socio-economic-demographic setting of the Indian consumers to determine which among the five popular formats of nutrient specific labels and summary ratings – Multiple Traffic Lights (MTL), Monochrome GDA, Nutri-Score, Warning Labels and Health Star Ratings (HSR) – is the easiest to understand and influences purchase intention alike. A no-health prime, a healthy and an unhealthy prime were given to a total of 20,564 face–to–face survey respondents covering all major states of India. The respondents were randomly allocated to 15 treatment groups and asked their purchase intention for packaged biscuits and chips. They were then asked to rate important aspects of FOPLs.

Our results indicate that on an average the summary ratings of HSR and Warning Labels are in the highest pecking order from the perspective of ease of identification, understanding, reliability and influence. Among the two, HSR appears most acceptable, outdoing the nutrient specific formats on ease of understanding. HSR finds greater support among the Southern, Central and Western regions of the country. MTL was most preferred when it came to reflecting necessary health information and presence of an unwanted nutrient. In terms of change in customer behavior as reflected in purchase intention, all five FOPL's lead to a significant change in purchase intention at the 99% confidence level with MTL having a marginal advantage.

We also ran additional tests for ease of identification, understanding and reliability on sub-populations that bear a higher consequence to influencing purchases, that is, females, individuals primarily responsible for grocery shopping, urban individuals, individuals that read labels presently, individuals who don’t read labels because they are not aware of labels, and individuals who do not want information about good nutrients on the FOPL. In all of these sub-populations, HSR performed the best. We, therefore, conclude that if the objective of introducing an FOPL in India is a careful combination of both, ease of identification and understanding as well as influence on purchase intentions, then we recommend HSR as the preferred format.

Keywords: Healthy diets; Food warning labels; Nutrition; Randomized controlled trials

JEL Codes: Q18, I18, C93

1. Introduction

The three commonly acknowledged components of nutrition awareness are knowledge of the relationship between diet and disease, familiarity with the nutrient content of foods and acquaintance with dietary guidelines. Attention to the nutrient content of foods can be enhanced through appropriate labelling on packaging, which is gaining importance as an increasing proportion of food that is purchased comes packaged. In India, packaged food has had back-of-package (BOP) nutrient information in detail but no front-of-package-labels (hereafter FOPLs), which as global experience suggests, have the ability to nudge healthy consumption behavior with respect to packaged foods (Temple, 2020).

For an FOPL to be effective, however, it has to be comprehensible, credible, likeable and should have the ability to influence purchase decisions. Globally, FOPLs have evolved as an important complement to the BOP Nutrition Facts Table as the latter are difficult for consumers to interpret. They contain numerous forms of information on nutrients that include both mandatory and voluntary measures adding to the confusion of consumers. Moreover, while consumers have the abilities to interpret simple information in differentiating between product characteristics, they find the tables difficult to use for health choice decisions. On the other hand, studies have shown that placing nutrition facts on front of the packages are more effective than when they are placed at the back and that FOPLs help guide healthier product choices (Watson et al. 2014; Mhurchu, 2017; Jones et al. 2019; Temple, 2020; Shahrabani, 2021). There are numerous studies that have analysed the effectiveness of different FOPL formats in different countries that have implemented these systems either on a voluntary or mandatory basis (Pettigrew, et al. 2020; Crosetto, 2020). These formats include Health star rating (HSR), Nutriscore, Warning label, Multiple traffic lights (MTL), and Monochrome GDA.

In India, non-communicable diseases (NCDs) contribute to around 5.87 million (60%) of all deaths (Nethan et al., 2017). Easy availability of energy-dense foods high in saturated fat, sugar and salt is one of the leading factors contributing to the rise in obesity and NCDs[i]. Since a large section of the consumers in the Indian sub-continent is constituted of the urban and rural poor who have very low literacy and income levels, their disposable incomes would be reduced further if any medical expenses are incurred due to consumption of unhealthy or unsafe food. Even educated consumers do not pay attention to existing nutritional labels because looking them up and comprehending takes time and abilities to process the information. Moreover, India has a plethora of regional languages and majority of consumers can read only one or two vernacular languages which make text heavy nutritional labels further pointless. In this context, India's food regulator, Food Safety and Standards Authority of India (FSSAI), recognizing the need to inform consumers about the nutrition profile of foods, especially the nutrients of concern, plans to introduce an FOPL system that would be simple and effective in informing consumers about healthy food choices. It is our objective in this study to understand which FOPL is most suited for Indian consumers in helping to choose healthier packaged food products.

There are primarily two types of FOP labels in use or consideration, globally: evaluative/interpretive and reductive/informative. A completely evaluative/interpretive one offers only an opinion to the consumer such as a 'Nordic Keyhole' or HSR or Single Traffic Light, whereas a completely reductive/informative one offers only information, without any opinion, such as Facts Up Front or MTL (Hamlin and McNeill, 2018). There are also a range of hybrid types that provide both opinion and information such as the Australasian hybrid HSR. However, we have not tested for hybrid formats or for colour variations since Pettigrew et al. (2020) review evidence on colour and summary indicators across seven countries China, India, UK, USA, Canada, Australia and New Zealand to suggest a simplified FOPL version has been more effective than hybrid versions. Moreover, in line with an important editorial of a special issue on FOPLs in Public Health Nutrition (PHN) (Kanter et al., 2018) which states that, "the foundational concept of FOP nutrition labelling is the ability of these schemes to communicate information in a simple, understandable format to individuals with low literacy levels who face greater challenges understanding complex, numeric information often on the back of food packages", we keep our focus on understanding the differential aspects of FOP nutrition labelling "along socio-demographic and literacy lines". Hence, complexity within the FOPL formats and exposure to too many of them for our respondents, was avoided.

The *PHN* editorial further states that while global evidence is titled to suggest that evaluative/interpretive formats "are more likely to have an impact on consumer understanding and behaviour than reductive systems alone", more consumer research is needed to judge the relative strengths and acceptability. Even within evaluative systems, more attention has been given to logos and traffic light symbols and less to HSR. The editorial stresses that different FOPL systems support different policy objectives, implying that research on acceptability and impacts for both the industry and consumers, have to be context specific. Additionally, the editorial emphasizes that there is dearth of 'real world setting' research on FOPLs which have been conducted mostly in online environments. We have addressed some of these existing limitations in terms of doing a large-scale consumer research in the specific context of India with a pan-national representative data collected using a rigorous design with respondents from the field.

It is in this context that we conduct a randomized controlled trial (RCT) on a nationally representative sample of 20,564 face–to–face survey respondents covering all major states of India who were randomized to one of the six groups: No FOPL, Health Star Rating (HSR), Nutriscore, Warning label, Multiple Traffic Lights (MTL) and Monochrome GDA. Randomization was done using a computerized system making an equal probability of assignment of subjects per treatment. The sampling frame was weighted by the relative consumption of an item in a particular geography. The respondents were randomly allocated to 15 treatment groups and asked their purchase intention for packaged biscuits and chips. The control group did not have an FOPL whereas the treatment groups had one of the five FOPL. In addition, each category had two primes: a healthy and an unhealthy. The purpose was to judge the relative effectiveness of the different FOPLs as a signage for "healthy" and "unhealthy" foods.

After the choices are made, participants were asked to self-report on socio-demographic variables that included gender, age, occupation/profession, city/village, income, education, body height and weight, etc. Additional questions were asked on health awareness (knowledge of obesity, under nutrition, non-communicable diseases), awareness about conventional nutritional contents in a package, general views on packaged food and noticeability of regulatory logos. All the FOPL's were be tested for their Comprehension, Credibility and Liking using a Likert Scale post survey questionnaire where respondents were asked to rate important aspects of FOPLs. We did not include familiarity tests as they have generally been shown to have minimal impacts (Talati et al., 2017), however, we did test for colour blindness, preference for positive nutrients, label-reading behaviour and awareness of NCDs. We also checked for the effects of the manipulation through the primes through multiple tests on their willingness to buy chips and biscuits. The reported importance of various criteria such as – price, flavour, brand, warning of health risk, manufacturing date, the best before and expiry date as well as information about saturated fat, total sugar, salt/sodium, energy content and other nutrients – for deciding which products to buy were tested across primes.

The bottom-line of our results is that on an average the summary ratings of HSR and Warning Labels turns out to be the most preferred from the perspective of ease of identification, understanding, reliability and influence. Among the two, HSR appears more acceptable, clearly outdoing the nutrient specific formats. The rest of the paper elaborates the conceptualization, design, methodology for data collection and analysis that helps us arrive at the conclusions.

2. Literature Review: FOPL Choice and International Experiences

For a suitable front-of-pack nutrition label (FOPL) to encourage healthy food choice, it is essential that consumers can understand and use the label format (Jones et al., 2019). Suitability is indicated by the comprehensibility, credibility and likeability of the FOPL and its ability to influence purchase decisions. Globally, FOPLs have evolved as an important complement to the Nutrition Facts Table as the latter are difficult for consumers to interpret (Ahmed et al., 2020, Hodgkins et al., 2012). They contain numerous forms of information on nutrients that include both mandatory and voluntary measures adding to the confusion of consumers. Moreover, while consumers have abilities to interpret simple information in differentiating between product characteristics, they find the tables difficult to use for health choice decisions. On the other hand, some studies have shown that FOPLs help guide healthier product choices (Watson et al., 2014).

There are numerous studies that have analyzed the effectiveness of different FOPL formats in different countries that have implemented these systems either on a voluntary or mandatory basis. For example, Egnell et al. (2020) found that compared with the Reference Intakes, the Nutri-Score followed by the Multiple Traffic Lights was the most effective FOPL in helping consumers identify the foods' nutritional quality overall in the 12 countries[ii] where the study was conducted with a total sample size across countries of 12391. A study in the UK with 4504 respondents found that all FOPLs were effective at improving participants' ability to correctly rank products according to healthiness in this large representative British sample, with the largest effects seen for Nutriscore, followed by MTL (Packer et al., 2021). A somewhat similar study in Mexico suggested that Nutri-Score and MTL performed best, followed by Warning Symbol, HSR and RIs (Hernández-Nava et al., 2019). Detailed systematic reviews are available in Campos et al. (2011), Temple (2020) and Jones et al. (2019).

A majority studies conclude that placing nutrition facts on front of the packages are more effective than when they are placed at the back. It has also been found that labels that that have symbols, less numeric content or familiar systems such as traffic lights are more adaptive and draw consumer attention. This is also consistent with findings in neuroscience and human cognition that suggest that the default mode for consumer brains is wired to focus on summary evaluations rather than look at detailed facts (Ramachandran, 2011, Simon, 1957).

It is important, in addition, to look at some international experiences – both research and policy driven – to gain a better perspective. Mexico introduced the Guideline Daily Amount (GDA) as the official, mandatory FOPL for all "pre-packaged food products and non-alcoholic beverages" under the NOM-051-SCFI/SSA1-2010 (NOM 51) effective from January 1, 2011[iii]. However, it was considered a hurried decision and several studies were undertaken to assess how comprehensible or effective the GDA labels were in reality. Stern et al. (2011) conducted a survey to find that only 12.5% of the sample respondents could correctly identify the GDA information, taking three minutes an average for them. According to White and Barquera (2020) and Arrúa et al. (2017), GDA labels were not very straightforward, pre-required knowing how many calories one should consume per day and discernible calculative capabilities. GDA labels were also not found to effectively discourage consumption of unhealthy foods due to lack of interpretability. Moreover, studies found that people with chronic diseases such as diabetes were the 'least likely to utilize nutrition labels' such as a GDA, making it 'least accessible to the people who most needed it, considering their low education and income levels' (Nieto et al., 2020). Vargas-Meza et al. (2019) studied the variability of FOPL understanding among low- and middle income residents of Mexico City. Although 80% of the participants were aware of GDA FOPL, only 33% among them actually understood or used them. The 5-color Nutrition Label was the least favored, whereas directive labels such as warning label, health star rating and multiple traffic lights fared better than non-directive labels such as GDA or Nutriscore. In light of these and very encouraging results from implementation of Warning Label FOPL in fellow Latin American country Chile, the Mexican Congress voted to approve Warning Label FOPL as the mandatory label under an updated NOM-51 from March, 2020.

Chile had passed the Law 20.606 [on the nutritional composition of foods and their advertising], in 2016 which mandated packaged brands to put warning labels on the front-of-pack that mention foods high in sodium, saturated fats, sugars and calories. The law also prohibited the sale of such foods in institutes of education and limited their advertising to children below the age of fourteen. This prompted The New York Times to laud it as "the world's most ambitious attempt to remake a country's food culture"[iv]. Taillie et al. (2020) conducted an observational study that recorded monthly data of 2383 households from January, 2015 to December, 2017 on their purchases of packaged beverages, to include periods both before and after the regulation was implemented. The results showed astonishing levels of decline in purchases by 22.8 mL per capita per day or 23.7% as a result of the warning label FOPLs. In similar vein, Peru made warning label FOPLs mandatory from June 2018 under the decree 012-2018-SA[v]; Uruguay in 2018 as per decree 272/18[vi] and Colombia in June 2021 as Resolution 810/2021[vii]. While implementation is underway in some of these contexts, early evidence from Uruguay suggests 'high awareness and self-reported use of nutritional warnings during the first month after the date of full compliance' and 'increased citizens' ability to use nutritional information to compare products and to identify products with excessive content of sugar, fat, saturated fat and sodium' (Ares et al., 2021).

In Europe, countries such as Finland, Israel, Hungary and five other countries have made FOPLs mandatory to be used by food manufacturers. In other major European countries such as the UK, France, Sweden, Belgium and a few others, the use of FOPLs are encouraged but not mandatory[viii]. In a wider European study Feunekes et al. (2008) found minor differences in consumer usage intentions and friendliness for simpler FOPLs such as Healthier Choice Ticks, Smileys and Stars and more complex formats such as Multiple Traffic Light, Wheel of Health and GDA scores. The authors recommended the simpler formats in shopping environments that require quick decision making. Crosetto et al. (2020) analyzed the impacts of voluntary use of five types of FOPLs in France to find that aggregate, color-coded labels such as Nutri-Score brought in significant nutritional effects. Aggregating scores on ratings across various FOPLs on its features, functions and effects, the study concluded that simple and aggregate labels would perform better than detailed and analytical ones. Ogundijo et al. (2021) studied 500 products in the UK market across the major categories of cereals, dairy, beverages, packages meats and packaged fruits and vegetables. MTL and GDA were the most used where MTL (and reference intakes) comprised 43.8% of the total labels whereas the share of GDA (and reference intakes labels) were 19.6%. UK consumers found use of color in MTL and tables or grids in GDA as easy to understand and providing all the necessary information.

The Israeli government under Regulation 5778-2017 of the Ministry of Health, mandated the use of a Red Warning FOPL wherever saturated fat (>5g), sodium (500mg) or sugar levels (13.5g) were higher than the recommended levels (in brackets per 100g)[ix]. It also allowed for voluntary green FOPLs to indicate presence of healthy ingredients. As per some very early indications (Shahrabani, 2021), 58.5% of surveyed respondents used the FOPLs whereas 41.5% did not notice or heed value to the Warning FOPLs. However, nearly 70% said they were willing to change their food consumption habits in the forthcoming year, pointing out to the need for awareness programs creating a larger impact of the reforms.

New Zealand and Australia endorsed HSR system as the voluntary FOPL scheme in a meeting of the Australia and New Zealand Ministerial Forum on Food Regulation in June, 2014. The purpose of introducing HSR was to 'provide convenient, relevant and readily understood nutrition information and/or guidance on food packs to assist consumers to make informed food purchases and healthier eating choices'[x]. Mhurchu et al. (2017) surveyed the status of HSR FOPL in New Zealand two years after its roll out to discover that 5.3% of the total packaged products they surveyed had adopted the use of FOPL. Most of the products that were displaying HSR FOPLs were high in energy density and fiber; but low in saturated fat, sodium and sugars. There were small improvements observed in the use of heathy and unhealthy ingredients in the products as compared to compositions before adopting the HSR label. It was also observed that product reformulations were higher for HSR labelled products than for non labelled products. In Australia, Jones et al. (2018) found that after four years of roll-out of HSR, roughly 27.6% of packaged products had adopted the FOPL system with a mean HSR of 3.4 stars. Nearly, 75% of the FOPL products displayed an HSR of greater than 3 stars. Highest uptake was observed in convenience foods, followed by cereals and fruits and vegetable products. However, the uptake, while has brought in changes, the authors conclude that they are too slow and HSR should be made mandatory by the Australian government in the interest of consumers' good health.

Clearly, the use of FOPL is now widespread and does have an impact on the behavior of consumers with potentially positive public health outcomes. It is in this context that this study compares for India the potential efficacy of five different FOPL formats that have been tried in different geographies across the world - Nutriscore, Warning label, Multiple Traffic Lights (MTL), Health Star Rating (HSR) and Monochrome GDA. We measure the relative efficacy of each of the FOPL formats compared to a control group in terms of ease of identification and understanding of label on pack, whether the label gives all health information needed, and helps detect excess of unwanted nutrient and the reliability and complexity of information provided. And whether a package with FOPL leads to a noticeable difference in the intent to buy compared to a package with no FOPL.

3. Methodology

3.1.Randomized Control Trials

We used a randomized controlled trial (RCT) as the mechanism to elicit the effect of the "stimuli" (nature of FOPL, whether HSR, Nutriscore, GDA, Warning Label or MTL) on the respondent as compared to no stimuli (i.e. no FOPL). RCT is based on the premise that the sample of interest is randomly divided into groups with one group being the "control group" that does not have the stimuli (treatment) and the others groups have a particular treatment. Any difference in choices that respondents make in a treatment group versus choices that respondents make in the control group can only be ascribed to the treatment (stimuli) since random allocation of subjects into different groups ensures, on average, that all other possible influences are same for both the treatment and control groups (Kendall, 2003). As a result, RCTs are largely considered to be one of the most rigorous methods of determining whether a cause-effect relation exists between the intervention and the outcome (Sibbald and Roland, 1998).

As compared to other experimental methods, an RCT design can help minimize several important biases such as selection, observer, participant, response or attentional. More importantly, in an RCT design, where group assignment is blinded, response to one stimuli is not impacted due to presence of another stimuli as a single participant receives only one of them. It also minimizes confounding factors and chance errors that amplify effects of the stimuli of interest (Kendall, 2003). Moreover, since RCT is based on prospective design, it minimizes recall errors (Satija et al., 2015) and helps focus the analysis on the original research question rather than data 'trawling' (Michels and Rosner, 1996) to find statistical differences.

RCTs have been used, apart from clinical studies, for assessing a wide range of development interventions including, among many others, in the fields of education, health, technology adoption and food choices (Banerjee and Duflo, 2009, Banerjee et al., 2016, Duflo et al., 2007). It has evolved as one of the most important toolkit for policy makers and researchers globally, leading to a recognition with a Nobel Prize in Economics for pioneering this technique to Abhijit Banerjee, Esther Duflo and Michael Kremer in 2019[1]. For instance, Banerjee et al. (2010) use a clustered RCT evaluation of immunization campaigns of 1640 children aged between 1-3 in India, who were split into a control group of no intervention, a treatment group A where once a month reliable

---

[1] 'Randomistas' who used controlled trials to fight poverty win economics Nobel, Nature, 14th October, 2019.

immunization camps were held; and treatment group B, where once a month reliable immunization camps were held with an additional incentive of providing raw lentils and metal plates. The children participants were allocated to one of these groups based on computerized random number generation. The result was that the treatment group B, which received incentives, witnessed 38% full immunization rates, whereas treatment group A, saw 18% immunization and control group with no intervention saw a rate of 6%. For another case, Miguel and Kremer (2004) randomly allocated Kenyan schools into treatment and control groups where deworming drugs were administered as interventions to the treatment groups. They found that this improved health and school participation in the treatment groups.

RCTs have been made use of for several important food policy questions. To refer to just a few, for instance, Nguyen et al. (2021) conducted clustered random trials in Vietnam's peri-urban schools to assess whether lessons about food before school lunch, sharing of those lessons with parents and provision of healthy snacks had any impact on healthy food consumption patterns of school children. They found that while nutrition lessons raised the knowledge of children in the short run, the effects vanished after a few months. Also feeding fruits in school increased their fruit consumption but not at the cost of home fruit consumption at home. Seah et al. (2022) studied the effects of Singapore's Healthier Dining Program (HDP) on dietary habits outside the home by randomly allocating participants across a treatment group where participants were exposed to the HDP and a control group, where they were not. The results showed that participants in the treatment group tended to consume at least one healthier dish as compared to control group, whenever eating outside. (Riis et al., 2021) perform a single blind, clustered RCT on 89 Danish families to find positive effects of lowering salt intake on salt taste sensitivity. Vadiveloo et al. (2019) analyze the effects of sensory differences such as control, color and shape and priming to notice differences in foods through a random assignment across twelve groups with different types sensory variations, in Boston. They found, among other things, that participants priming to notice differences influenced significantly the purchase intentions towards fruits and vegetables. There have been several studies that have used RCTs to understand the impacts and interplays of the front-of-pack labels (Finkelstein et al., 2021, Ang et al., 2019, Ducrot et al., 2016, Egnell et al., 2021, Dubois et al., 2021, van Herpen et al., 2012). For a detailed discussion of those one can refer to Croker et al. (2020).

3.2.Sampling Design

The sampling in our study is based on a 16 (15 treatments + 1 control) X 3 (2 primes + 1 no prime) between-subjects design, with each of the 45 treatment cells having 400 samples,[xi] and each of the 3 control cells having 800 samples, thus adding up to a total of 18000 treatment samples and 2400 control samples. The 15 treatments included 3 treatments each using as stimuli a variant of one of the 5 FOPL types under study, that is Warning Label, Multi-level Traffic Light (MTL), Global Daily Allowance (GDA), Health Star Rating (HSR) and Nutri-score (NS). Thus 3600 samples each would be using each of the 5 label types as stimuli. The primes that were used for the study were a healthy prime and an unhealthy prime. Thus a third of the samples across treatment and control samples were primed using the healthy prime, another third using an unhealthy prime and the rest of the third were not primed.

Table 1: Number of samples by design and actually achieved in each cell

Label Type	Variant	Group Code	Prime						Total	
			Healthy		Unhealthy		None			
			Target	Actual	Target	Actual	Target	Actual	Target	Actual
Control		C	800	809	800	805	800	811	2400	2425
Warning Label	1	T1	400	403	400	403	400	404	1200	1210
	2	T2	400	403	400	404	400	404	1200	1211
	3	T3	400	403	400	403	400	403	1200	1209
MLT	1	T4	400	403	400	403	400	403	1200	1209
	2	T5	400	403	400	403	400	403	1200	1209
	3	T6	400	403	400	404	400	403	1200	1210
Nutriscore (renamed as "Health Rating" in the labels)	A	T7	400	403	400	405	400	404	1200	1212
	C	T9	400	404	400	403	400	403	1200	1210
	E	T11	400	403	400	403	400	402	1200	1208
GDA	1	T12	400	403	400	403	400	404	1200	1210
	2	T13	400	403	400	403	400	403	1200	1209
	3	T14	400	405	400	402	400	403	1200	1210
Health Star Rating (renamed as "Health Rating" on the label)	1 Star	T15	400	402	400	402	400	403	1200	1207
	3 Star	T17	400	402	400	402	400	403	1200	1207
	5 Star	T19	400	402	400	404	400	402	1200	1208
Grand Total			**6800**	**6854**	**6800**	**6852**	**6800**	**6858**	**20400**	**20564**

Source: Survey by IIMA and Dexter Consultancy

The primes used for both chips as well as biscuits can be seen in Appendix A. The Table 1 shows the sampling design and corresponding number of data points in each cell in the final dataset.

3.3. Distribution of samples across geographies

We used chips and biscuits as two representative food categories as these had the highest consumption amongst packaged food across various categories on a countrywide basis. To calculate the samples to be taken across rural and urban areas, and then across each of the states, the basis used was projected value share in consumption of chips and biscuits. The steps followed are illustrated in the Figure 1 below. First of all, the per capita consumption in INR per annum of chips and of biscuits, reported by NSSO (2010-11) was taken as the starting point. These estimates have been reported separately for rural and urban households for each state. Based on each state's rural and urban populations respectively, as per Census 2011, then an estimated value of consumption of chips and biscuits for the rural and urban populations in each state was calculated. The value of consumption of chips was found to have a very high positive correlation ($r=.768$, $p<0.001$) with consumption of biscuits, and so we added the two consumption values to arrive at the total estimated consumption value of biscuits and chips for rural and urban areas in each state in 2010-11 separately. Next, using the GSDP growth rates for each state from 2010-11 to 2016-17 as proxies for growth of consumption of biscuits and chips, we calculated the estimated total consumption value of biscuits and chips for rural and urban areas in each state in 2016-17 separately. The total treatment samples (18,000) were then distributed between rural and urban based on the proportion of the total estimated consumption of chips and biscuits in 2016-17, leading to an allocation of 8,645 treatment samples to rural and 9,355 treatment samples to urban geographies. Similarly, the total control samples (2,400) were then distributed between rural and urban based on the proportion of the total estimated consumption of chips and biscuits in 2016-17, leading to an allocation of 1,153 control samples to rural and 1,247 control samples to urban geographies. Further, the total samples in each of the 4 categories – rural treatment, urban treatment, rural control as well as urban control – were distributed among the states in proportion of the shares in consumption of biscuits and chips based on the estimated total consumption value of biscuits and chips in 2016-17 estimated earlier. For this purpose, the six north-eastern states of Arunachal Pradesh, Meghalaya, Mizoram, Manipur, Tripura and Nagaland were combined into a North-East group. Figure 1 below shows the steps in the allocation of samples across geographies.

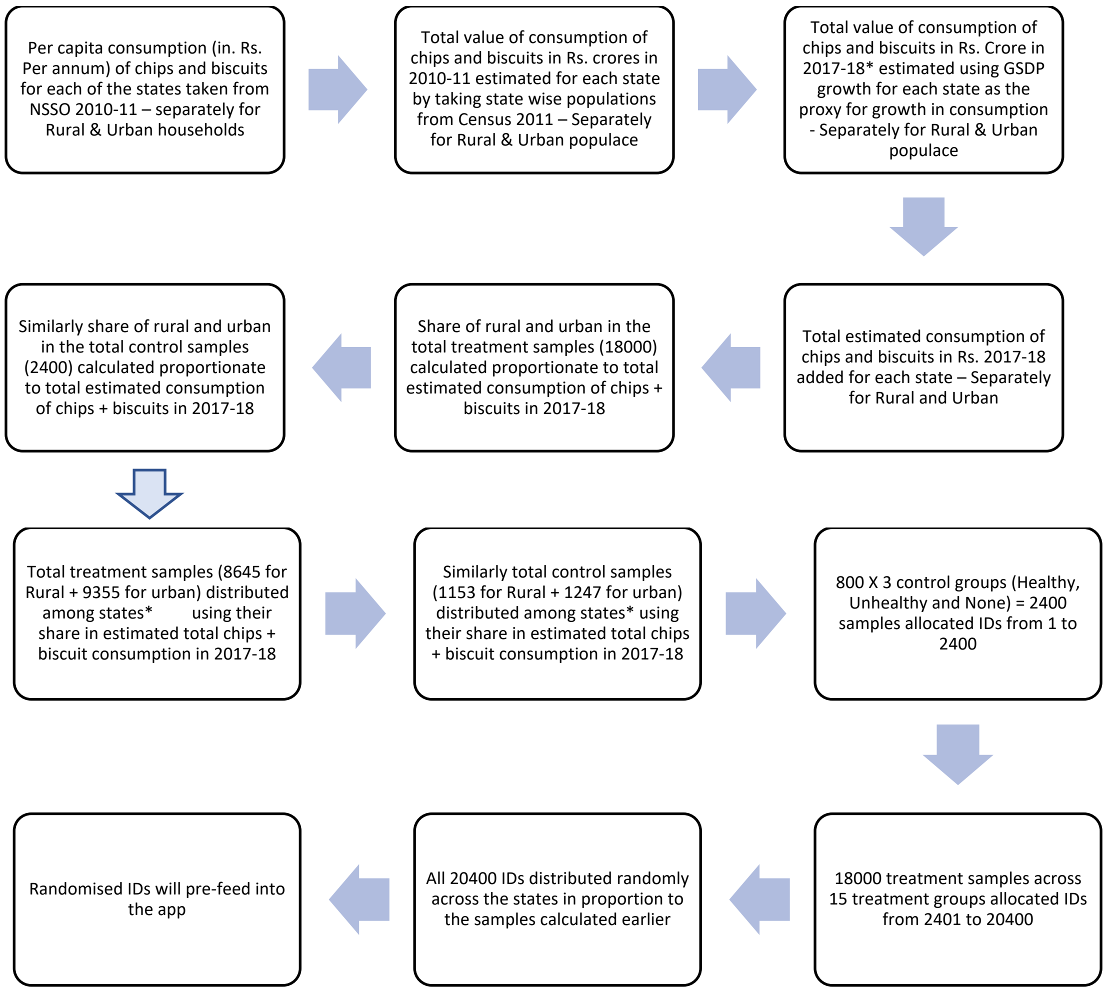


Figure 1: Steps followed in allocation of samples across geographies

3.4. Data collection

The questionnaires were pre-tested during a field pilot exercise with 77 individuals across states, with representation across gender, age groups, education levels, distributed across each of the 5 label types and control. The entire data collection was carried out using a customized mobile application, which had the feature of displaying the allocated stimulus with label based on the random allocation of each ID number. The interviewer or the respondent had no say in selecting the stimulus for a particular interview, thus maintaining the randomness fully in implementation. Due to the prevailing COVID-19 pandemic situation, all respondents were telephonically called prior to an interview, and their willingness to participate was sought. During the same call, if the respondent expressed willingness, then the appointment was fixed, and the respondent's convenience in terms of the mode of interaction was sought. Interviews were conducted either face-to-face in physical presence or face-to-face over a video call based on the convenience and willingness of the respondent indicated at the time of fixing the appointment for the interview. Finally, out of 20,564 interviews in the dataset, 12,751 (about 62%) interviews were conducted in physical presence and 7,811 interviews were conducted over video calls (about 38%). In case the interview was conducted in physical presence, the interviewer conducted the interview while showing the respondent his/her mobile phone screen throughout the interview. Similarly, in case the interview was conducted over a video call, the interviewer would share his/her screen over the call, so that the respondent could see the phone screen throughout the interview. Upon checking for a difference based on mode (physical vs. video-call), it was found that 12751 respondents interviewed through physical face-to-face interviews reported no difference in their willingness to buy chips (t(17079)= -1.583, p=0.1134) as well as willingness to buy biscuits (t(17302)=1.3129, p=0.1892) compared to 7811 respondents interviewed through video call based face-to-face interviews. There was no significant difference in the respondent scores on ease of identification and understanding of label on pack, whether the label gives all health information needed, and helps detect excess of unwanted nutrient and the reliability of information provided between the set of people that were physically interviewed vs those that were interviewed online. Thus, for the purpose of all further analyses, the entire dataset was used regardless of the mode of interview.

3. Data description

The data was collected through one-to-one interviews using a structured questionnaire. The number of interviews to be conducted across the rural and urban areas in each of the 20 states included in the study was predefined. While 24,731 individuals were interacted with, 4,167 interviews were either not completed or discarded due to overshooting the state or rural/urban or treatment/control target number as per the sampling design. Thus, finally, the data from 20,564 interviews forms the dataset used for analysis.

3.4.State wise and Rural / Urban sample coverage

The coverage of samples for each of the states and the distribution in rural and urban samples is shown in the table 2 below.

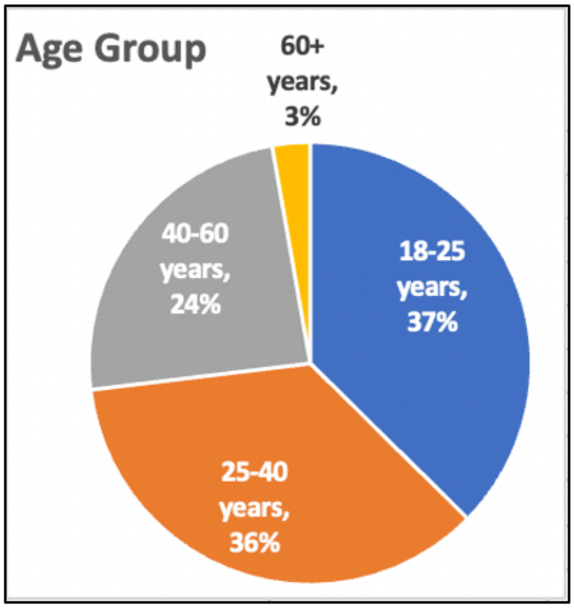
State	Rural		Urban		Total	
	Target	Actual	Target	Actual	Target	Actual
Andhra Pradesh	649	654	726	729	1,375	1,383
Assam	453	453	162	166	615	619
Bihar	994	1,000	204	206	1,198	1,206
Chhattisgarh	172	173	109	109	280	282
Delhi	11	11	560	569	570	580
Gujarat	480	483	821	829	1,301	1,312
Haryana	310	312	357	358	667	670
Himachal Pradesh	103	105	23	33	126	138
Jharkhand	195	196	140	141	335	337
Karnataka	395	400	791	794	1,186	1,194
Kerala	331	340	496	497	827	837
Madhya Pradesh	497	498	420	431	917	929
Maharashtra	806	811	1,771	1,772	2,577	2,583
NE Group*	169	178	118	126	287	304
Odisha	275	277	134	135	409	412
Punjab	263	266	266	271	529	537
Rajasthan	594	602	433	438	1,027	1,040
Tamil Nadu	616	617	1,124	1,127	1,741	1,744
Uttar Pradesh	1,730	1,736	1,121	1,137	2,852	2,873
West Bengal	755	756	827	828	1,582	1,584
Total	**9,798**	**9,868**	**10,602**	**10,696**	**20,400**	**20,564**

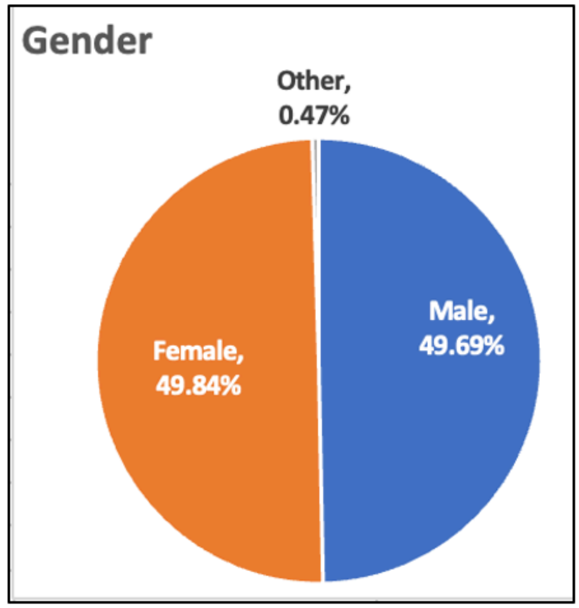
Source: Survey by IIMA and Dexter Consultancy

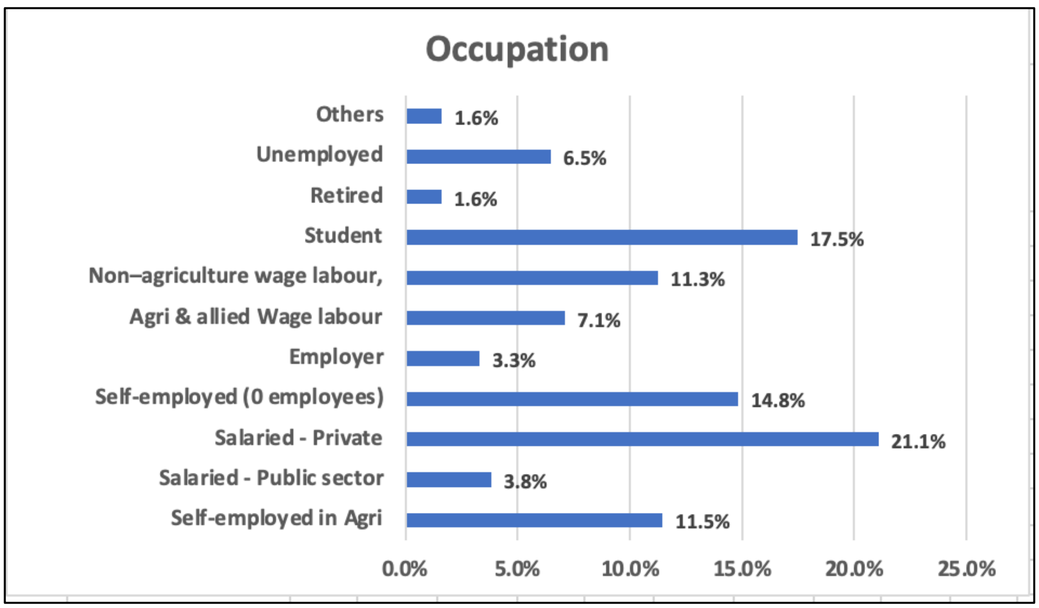
Table 2: Distribution of samples across geographies

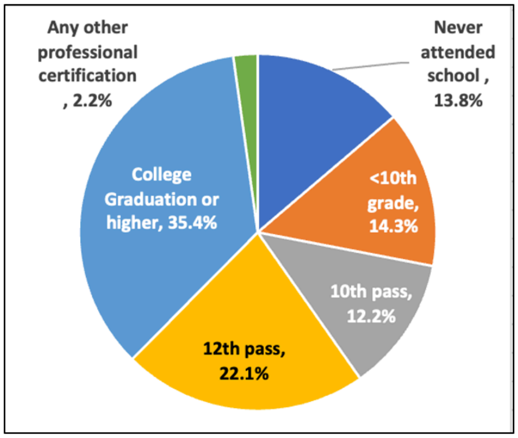
3.5.Coverage across demographic variables

The breakup of the respondents on key demographic and profile variables are shown in Figure 2 below. As can be seen, the breakup represents a fair distribution across categories on each of the demographic variables, thus provided face validity to the representativeness of the sample.

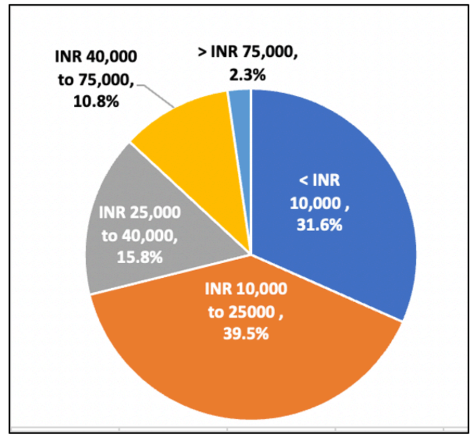

Age Group
60+ years, 3%
18-25 years, 37%
40-60 years, 24%
25-40 years, 36%


Gender
Other, 0.47%
Female, 49.84%
Male, 49.69%


Occupation
Others 1.6%
Unemployed 6.5%
Retired 1.6%
Student 17.5%
Non–agriculture wage labour, 11.3%
Agri & allied Wage labour 7.1%
Employer 3.3%
Self-employed (0 employees) 14.8%
Salaried - Private 21.1%
Salaried - Public sector 3.8%
Self-employed in Agri 11.5%
0.0% 5.0% 10.0% 15.0% 20.0% 25.0%



Education level



Reported monthly household income

Figure 2: Breakup of respondents on key demographic variables
Source: Survey by IIMA and Dexter Consultancy

3.6.Manipulation checks for the primes

As discussed earlier, a healthy and an unhealthy prime were used in the study, and the effects of the manipulation through the primes were checked through multiple tests. Firstly, the responses on the outcome variables – willingness to buy chips and willingness to buy biscuits were tested across primes. 6854 respondents who were manipulated with a healthy prime reported a higher willingness to buy chips ($t(11152) = -41.02$, $p<0.001$, $d=0.70$ (medium)) as well as higher willingness to buy biscuits ($t(13681)= -5.83$, $p<0.001$, $d=0.35$ (small)) compared to 6858 respondents who were not manipulated with any prime. Additionally, 6854 respondents who were manipulated with a healthy prime reported a stronger perception of chips being healthy ($t(13677)= 24.82$, $p<0.001$, $d= 0.42$ (small)) as well as a stronger perception of biscuits being healthy ($t(13708)= 29.62$, $p<0.001$, $d= 0.51$ (medium)) compared to 6858 respondents who were not manipulated with any prime. On the other hand, 6852 respondents who were manipulated with an unhealthy prime reported a lower willingness to buy chips ($t(13696)= 4.75$, $p<0.001$, $d=0.51$ (medium)) as well as lower willingness to buy biscuits ($t(13676)= 3.20$, $p<0.001$, $d=0.21$ (small)) compared to 6858 respondents who were not manipulated with any prime. Also, 6852 respondents who were manipulated with an unhealthy prime reported a stronger perception of chips being unhealthy ($t(13226)= -12.14$, $p<0.001$, $d= 0.21$ (small)) as well as stronger perception of biscuits being unhealthy ($t(12625)= -6.13$, $p<0.001$, $d= 0.10$ (negligible)) compared to 6858 respondents who were not manipulated with any prime. Thus, the manipulations intended by the primes seem to have worked based on the responses to the outcome variables.

Next, the reported importance of various criteria for deciding which chips/biscuits to buy were tested across primes. This was captured through a set of 12 questions, six each for chips and biscuits, which asked the respondents to rate each of the criteria – "Price", "Flavour", "Brand", "Warning/Instruction of health risk", "Manufacturing date, the best before and expiry date" as well as "Information about saturated fat, total sugar, salt/sodium, energy content and other nutrients". While most of the pairs resulted in non-significant difference in means (p>0.05), the pairs where the t-tests resulted in a significant difference in means (p<0.05) are shown in Table 3.

Table 3: Criteria for buying chips/biscuits – comparison across primes

Product	Criteria	Comparison between	Mean comparison (on a 7 point scale)	p-value	Effect Size (Cohen's d)
Chips	Warning on the pack	Healthy prime Vs No Prime	M(Healthy)=4.10 < M(No Prime)=4.73	<0.001	0.29 (small)
		Unhealthy prime Vs No Prime	M(Unhealthy)=6.06 > M(No Prime)=4.73	<0.001	0.82 (large)
	Information about nutrients on the pack	Healthy prime Vs No Prime	M(Healthy)=3.94 < M(No Prime)=5.14	<0.001	0.58 (medium)
		Unhealthy prime Vs No Prime	M(Unhealthy)=5.81 > M(No Prime)=5.14	<0.001	0.400 (small)
Biscuits	Warning on the pack	Healthy prime Vs No Prime	M(Healthy)=4.16 < M(No Prime)=4.88	<0.001	0.34 (small)
		Unhealthy prime Vs No Prime	M(Unhealthy)=5.96 > M(No Prime)=4.88	<0.001	0.64 (medium)
	Information about nutrients on the pack	Healthy prime Vs No Prime	M(Healthy)=3.97 < M(No Prime)=5.21	<0.001	0.60 (medium)
		Unhealthy prime Vs No Prime	M(Unhealthy)=5.86 > M(No Prime)=5.21	<0.001	0.40 (small)

For Brand, Price, Flavor and Manufacturing & Expiry date as criteria, no significant difference in means was observed across primes. Only for chips, brand has been marginally reported as a more important criterion by those manipulated by a healthy prime as compared to no prime. Thus the strongest priming effect was observed in respondents manipulated with the unhealthy prime on the reported significance of "Warning on the pack" as a criterion, both for chips as well as biscuits. Overall, the results of these comparisons provide further support to the manipulations with primes having worked as intended.

4. Analysis and Results

4.4.Analysis Approach

We have used Student’s t test and ANCOVA on the premise that for very large samples, the normality condition is not required as per the Central Limit Theorem, and hence should not affect the interpretations from Student's t-tests in the present dataset. Therefore using Student’s t-tests should be perfectly fine (Lumley et al., 2002, Bartlett, 2013). As a matter of precaution, we have also done two-sample Wilcoxon tests as well, and all the results from the Student’s t-tests hold. For arriving at the which FOPL is the best candidate on the dimension of comprehension and ease of understanding, we have looked at the mean scores of each FOPL on the six dimensions of interest (ease of identification and understanding of label on pack, whether the label gives all health information needed, and helps detect excess of unwanted nutrient and the reliability and complexity of information provided) across the two product categories for a total of 12 mean scores. We have then ranked the mean scores and then the FOPL with the largest number of highest ranks is taken as the recommended one. Note that we have given equal weights to the different dimensions. For the purpose of understanding which FOPL changes customer behavior the most in terms of purchase, we conducted a difference-of-difference test between the different FOPL’s delta against the control groups. An ANOVA and the Tukey’s HSD test was done to do a pairwise comparison of means for purchase of chips and biscuits. For the group with a healthy prime, Warning Labels and HSR produce the same effect on purchase of chips and biscuits, with Warning Label being very marginally ahead in terms of reducing purchase intention. For the group with an unhealthy prime and with those with no prime, Warning Labels are ahead of HSR, followed by GDA in terms of reducing purchase intention.

4.5. Comparisons of reported label features across treatments

Feedback on the FOPL labels was captured on 6 items, enlisted below, on a 7-point scale:

1. Ease of identification of label on pack
2. Ease of understanding of label
3. Label gives all the health information needed
4. Label helps detect presence of excess of an unwanted nutrient
5. Reliability of information provided
6. Complexity

The mean scores and standard deviations of all the labels on 6 items are shown in Table 4 below both for chips as well as biscuits. So if we look at each aspect as having equal weightage, one of the simple ways of comparing the performance of the labels is to look at ranks on each item, which are shown in Table 5 below.

Table 4: Mean scores and standard deviations for each item across all 5 label types

Aspect of label	**Product**	**Mean Score (SD)**				
		Warning Label	**MTL**	**GDA**	**HSR**	**NS**
Ease of identification of label on pack	Chips	5.48 (1.66)	5.10 (1.87)	4.10 (2.12)	5.70 (1.71)	5.67 (1.68)
	Biscuits	5.59 (1.62)	5.26 (1.84)	4.18 (2.19)	5.81 (1.71)	5.78 (1.65)
Ease of understand of label	Chips	5.04 (1.54)	4.14 (2.08)	3.95 (2.12)	5.49 (1.81)	4.85 (1.53)
	Biscuits	5.06 (1.53)	4.18 (2.07)	3.99 (2.12)	5.49 (1.80)	4.88 (1.52)
Label gives all the health information needed	Chips	5.03 (1.74)	5.51 (1.71)	5.22 (1.64)	5.29 (1.94)	4.73 (1.58)
	Biscuits	5.07 (1.67)	5.54 (1.66)	5.31 (1.57)	5.34 (1.88)	4.79 (1.53)
Label helps detect presence of excess of an unwanted nutrient	Chips	5.32 (1.92)	5.37 (1.64)	4.76 (1.50)	3.78 (1.72)	3.79 (1.94)
	Biscuits	5.36 (1.89)	5.38 (1.60)	4.81 (1.47)	3.81 (1.70)	3.83 (1.91)
Reliability of information provided	Chips	5.33 (1.88)	5.17 (1.61)	4.31 (1.59)	5.32 (1.94)	4.09 (1.83)
	Biscuits	5.40 (1.84)	5.21 (1.56)	4.42 (1.57)	5.33 (1.91)	4.20 (1.83)
Complexity	Chips	3.46 (1.78)	4.52 (2.02)	4.62 (2.02)	2.96 (2.12)	3.73 (1.73)
	Biscuits	3.45 (1.78)	4.50 (1.74)	4.65 (2.02)	3.01 (2.14)	3.72 (1.74)

Source: Survey by IIMA and Dexter Consultancy

Table 5: Ranks for each label type across all 6 items for chips as well as biscuits

Aspect of label	Product	Rank				
		Warning Label	MTL	GDA	HSR	NS
Ease of identification of label on pack	Chips	3	4	5	1	2
	Biscuits	3	4	5	1	2
Ease of understand of label	Chips	2	4	5	1	3
	Biscuits	2	4	5	1	3
Label gives all the health information needed	Chips	4	1	3	2	5
	Biscuits	4	1	3	2	5
Label helps detect presence of excess of an unwanted nutrient	Chips	2	1	3	5	4
	Biscuits	2	1	3	5	4
Reliability of information provided	Chips	1	3	4	2	5
	Biscuits	1	3	4	2	5
Complexity	Chips	2	4	5	1	3
	Biscuits	2	4	5	1	3

Source: Survey by IIMA and Dexter Consultancy

Now, as shown in Table 6 below, counts of ranks from Table 5 shows that while the mean score of Warning label is very marginally higher than HSR, it is HSR that has 6 instances of rank 1 and 4 instances of rank 2, thereby qualifying to be called the best performing label type overall, on the premise that all the criteria have equal weight.

Table 6: Summary of reported performance of all 5 label types

	Rank	Warning Label	MTL	GDA	HSR	NS
Occurrences of each rank in the 12 label X product combos	1	2	4	0	6	0
	2	6	0	0	4	2
	3	2	2	4	0	4
	4	2	6	2	0	2
	5	0	0	6	2	4
Total rank score		28	34	50	24	48
Average Rank score		2.33	2.83	4.17	2.00	4.00

Source: Survey by IIMA and Dexter Consultancy

The difference of means of HSR with Warning labels as well as MTL are all statistically significant at a confidence level of 95%, except on the item of reliability, thus providing further support to the superiority of HSR's feedback.

Further, the relative performance of labels in sub-populations of the dataset was checked, which resulted in the following findings:

- HSR's higher performance than other labels are much more in females, where the overall performance of HSR is clearly the best followed by Warning Label and then by MTL. In males, the difference with MTL and Warning labels goes down. Among males, MTL is seen as having either very good (Rank 1) positions on 3 items or very poor (Rank 4) positions on 3 items, whereas Warning labels have a somewhat more consistent good performance (Rank 2) on 4 items along with a Rank 3(Ease of Identification) and a Rank 4 (Giving all health information needed).
- Next, across age groups, HSR performs the best clearly among the older age groups (40-60 years and 60+ years), followed by Warning labels and then by MTL. The difference becomes smaller in the 25-40 years' age group, and even smaller among the 18-25 years' age group. Specifically, in the 18-25 years' age group, MTL is seen as having either very good (Rank 1) positions on 3 items or very poor (Rank 4) positions on 3 items, whereas Warning labels have a somewhat more consistent good performance (Rank 2) on 4 items along with a Rank 3 (Ease of Identification) and a Rank 4(Giving all health information needed).
- The performance of MTL among 18-25 years' age group is interestingly similar to all males, and might be indicative of some similarity in driving factors. On the other hand, the performance of HSR is similar among females and the older age groups. Perhaps this can be explained by a common higher sensitivity towards healthy food among females and older age groups. There is some support for this line of thinking in terms of 10218 males reporting a higher willingness to buy chips ($t(20451) = -2.9759$, $p=0.003$) as well as higher willingness to buy biscuits ($t(20437) = -4.0674$, $p<0.001$) compared to 10250 females. Similarly, the age group of 60+ years has a lower willingness to buy chips than the other age groups.
- Next, comparing the rural subpopulation of the sample with the urban one, it is interesting that HSR is a clear winner in urban, followed by Warning label and MTL. However, in rural, the comparison is quite close between Warning label, HSR and MTL, with Warning label being very marginally ahead of HSR followed by MTL. Perhaps this could be explained by

the relative differences in consumption basket or higher urban exposure (and familiarity) with star ratings on other product categories.

- Household income does not appear to impact the influence of an FOPL on ease of understanding or detecting the presence of an unwanted nutrient.
- Comparing across occupations results in some interesting observations:
    - HSR finds very strong support among those in salaried (private sector) jobs, self-employed, non-agricultural wage labour, as well as those that reported being unemployed.
    - HSR also was a close second among those that are self-employed in agriculture, those in agriculture and allied wage labour and those that are employers. Interestingly, HSR's performance among students was very poor.
    - On the other hand, Warning Labels find very strong support among those that are self-employed in agriculture as well as in agriculture and allied wage labour, as well as those that are employers.
    - Warning labels were also a close second among those in public sector salaried jobs as well as those that are unemployed. Warning labels were also a distinct second among those that are self-employed, students and well as those in non-agricultural wage labour.
    - MTL found strong support among students, while being marginally ahead of Warning labels among those in public sector salaried jobs.
    - Thus, overall HSR and Warning labels found the most broad-based support across occupations. Between the two, HSR's support was more intensive while Warning label's support was more extensive across occupations.

4.5. Label-reading behaviour

A question was asked about whether the respondent reads the labels at the back of the pack currently when buying a product, with the following options:

- Yes
- No
- Depends on the product
- Not aware of labels

65% of respondent report reading labels with another 7% reading labels depending on product. Thus, the first 3 subgroups are aware of labels, whereas the 4^{th} subgroup is not aware of labels on products at all. It is seen that HSR remains the top performer across all these sub-groups. HSR is a clear winner among the sub-group that is not aware of labels as well as the sub-group that reads labels. Further, Warning Labels are close to HSR among the sub-group which has reported reading labels depending on the product, and those that do not read labels. Interestingly, the performance of MTL is the worst among the sub-group not aware of labels as compared to the other sub-groups – that is to say that those who are not aware of labels have given the least support to MTL.

MTL's performance on its ability to *help detect the presence of excess of an unwanted nutrient* is the higher among those that read labels as compared to those that don't OR those that are not aware of labels. However, HSR, Warning Labels and MTL – all three types' performance on their ability to *provide all the needed health information* is the higher among those that read labels depending on product OR those that read labels as compared to those that don't OR those that are not aware of labels. But importantly, the difference in means between the two groups is the higher in MTL and lower in HSR and Warning labels. This indicates that HSR is doing better across label-reading behaviour, whereas MTL is doing better in label-readers but less so for non-label-readers.

- On the extremes - On ease of identification, HSR's performance among the non-label-aware group(M=5.38) is better than MTL's performance among the label-readers (M=5.20) as well. Similarly, HSR's performance on ease of identification is better than Warning Labels across all 4 label-reading behaviour groups.
- Similarly, on ease of understanding, HSR's performance among the non-label-aware group(M=4.98) is also better than MTL's performance among the label-readers (M=4.33). Similarly, HSR's performance on ease of understanding is better than Warning Labels across all 4 label-reading behaviour groups.
- The inter-group (between label-readers, non-label-readers and non-aware) variability in performance on reliability is lower across label types, indicating an indifference in benefits.

Thus, *non-label-readers* and *non-label-aware group* may benefit more on *ease of identification and understanding* from HSR as compared to other label types, while label-readers may also benefit marginally from HSR as compared to MTL and other label types.

Further, since the proportion of label-readers in rural is less than urban, among lower income groups is lesser and among lower educated groups is lesser, therefore all these groups are likely to benefit on ease of identification and understanding from HSR, while the other groups are likely to benefit marginally from HSR as compared to MTL. ANCOVA results with label reading as a co-variate and dependent variable as one of the six perceptions and independent variable as an FOPL are consistent with the above findings.

4.6.*Impact of FOPL on purchase intention*

A comparison of the control group with the treatment groups on intention to buy suggests that the presence of an FOPL changes the purchase intention significantly at the $p<.01$ level when there is a healthy or unhealthy prime in the treatment group across all FOPL formats when compared to no prime in the control group. Given, therefore, that the FOPL in itself is a prime of sorts when implemented, this means that just the presence of FOPL can influence purchase intentions as well. The tables below capture the change in intention to buy because of the FOPL.

Table 7: No prime control with no FOPL vs. unhealthy prime each FOPL

Comparison	Product	Mean of intention to buy	p-value	Significance
Unhealthy prime Warning labels Vs. No prime Control	Chips	$M_{CWUP} = 1.72$, $M_{CCNP} = 1.33$	$p < .01$	**Significant at 1%**
	Biscuits	$M_{BWUP} = 1.52$, $M_{BCNP} = 1.33$	$p < .01$	**Significant at 1%**
Unhealthy prime MLT Vs. No prime Control	Chips	$M_{CMUP} = 1.70$, $M_{CCNP} = 1.33$	$p < .01$	**Significant at 1%**
	Biscuits	$M_{BCUP} = 1.46$, $M_{BCNP} = 1.33$	$p < .01$	**Significant at 1%**
Unhealthy prime GDA Vs. No prime Control	Chips	$M_{CMUP} = 1.69$, $M_{CCNP} = 1.33$	$p < .01$	**Significant at 1%**
	Biscuits	$M_{BCUP} = 1.46$, $M_{BCNP} = 1.33$	$p < .01$	**Significant at 1%**
Unhealthy prime NS Vs. No prime Control	Chips	$M_{CMUP} = 1.67$, $M_{CCNP} = 1.33$	$p < .01$	**Significant at 1%**
	Biscuits	$M_{BCUP} = 1.47$, $M_{BCNP} = 1.33$	$p < .01$	**Significant at 1%**
Unhealthy prime HSR Vs. No prime Control	Chips	$M_{CMUP} = 1.72$, $M_{CCNP} = 1.33$	$p < .01$	**Significant at 1%**
	Biscuits	$M_{BCUP} = 1.49$, $M_{BCNP} = 1.33$	$p < .01$	**Significant at 1%**

Table 8: No prime control with no FOPL vs. healthy prime each FOPL

Comparison	Product	Mean of intention to buy	p-value	Significance
Healthy prime Warning labels Vs. No prime Control	Chips	$M_{CWHP} = 1.23$, $M_{CCNP} = 1.33$	$p < .01$	Significant at 1%
	Biscuits	$M_{BWHP} = 1.26$, $M_{BCNP} = 1.33$	$p < .01$	Significant at 1%
Healthy prime MLT Vs. No prime Control	Chips	$M_{CMHP} = 1.18$, $M_{CCNP} = 1.33$	$p < .01$	Significant at 1%
	Biscuits	$M_{BCHP} = 1.24$, $M_{BCNP} = 1.33$	$p < .01$	Significant at 1%
Healthy prime GDA Vs. No prime Control	Chips	$M_{CMHP} = 1.20$, $M_{CCNP} = 1.33$	$p < .01$	Significant at 1%
	Biscuits	$M_{BCHP} = 1.25$, $M_{BCNP} = 1.33$	$p < .01$	Significant at 1%
Healthy prime NS Vs. No prime Control	Chips	$M_{CMHP} = 1.20$, $M_{CCNP} = 1.33$	$p < .01$	Significant at 1%
	Biscuits	$M_{BCHP} = 1.24$, $M_{BCNP} = 1.33$	$p < .01$	Significant at 1%
Healthy prime HSR Vs. No prime Control	Chips	$M_{CMHP} = 1.23$, $M_{CCNP} = 1.33$	$p < .01$	Significant at 1%
	Biscuits	$M_{BCHP} = 1.27$, $M_{BCNP} = 1.33$	$p < .01$	Significant at 1%

Clearly, just the presence of an FOPL (along with a healthy or unhealthy prime) leads to a change in the level of purchase intention. Any FOPL will influence the purchase intention at $p<.01$ level with MTL being marginally ahead.

4.7. *Self-reported knowledge about morbidities*

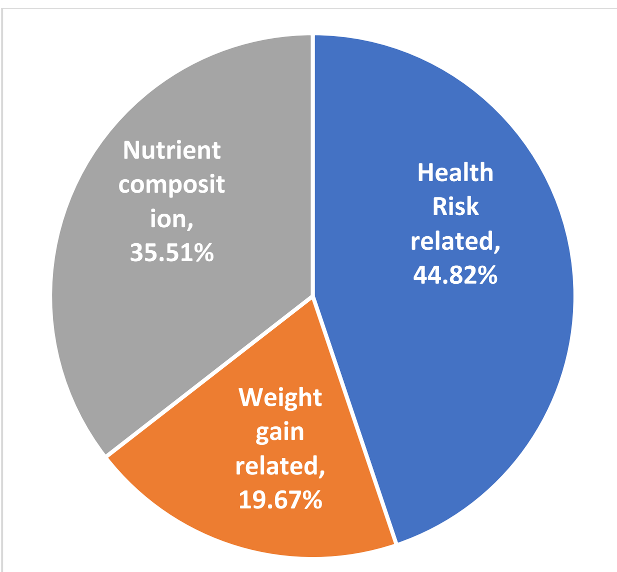
A set of 4 questions were asked about the respondent's perception of having knowledge about morbidities, including obesity, undernutrition, metabolic disorders and NCDs. This was captured on a scale of 1 to 7, with 7 being the highest. It is found that on the ease of identification as well as ease of understanding, lower knowledge levels about morbidities have a correlation with positive support for HSR and Warning at order labels in that order. On the other hand, higher knowledge about morbidities corresponds to higher support for MTL and GDA in that order. For the other items on the label feedback, so such clear trend is observed. All the detailed sub-population wise rankings are given in Appendix B for reference.

4.8. Responses on role of grocery shopping

Upon checking for the role in grocery shopping, it is also found that the strongest support for HSR in ease of identification, ease of understanding, provided needed health information as well as reliability is coming from the participants who are primarily responsible for grocery shopping in their household, while the support for HSR from those that are NOT responsible for grocery shopping or those that share responsibility is mixed. ANCOVA results on who is responsible for grocery shopping as a co-variate and dependent variable as one of the six perceptions and independent variable as an FOPL are consistent with the above findings.

4.9.Responses to whether the control group wants to see an FOPL

An additional question was asked to the control group, seeking a response to what they would like to see on a FOPL. The responses of the 2425 respondents were as follows:



While the health risk related information was the top response across groups, it was an even stronger response among the non-users of packaged food. This would appear to support HSR, MTL and Warning Label.

5. Conclusions

We conduct a first ever large scale randomized controlled trial within the complex socio-economic-demographic setting of the Indian consumers to determine which among the five popular formats of nutrient specific labels and summary ratings – Multiple Traffic Lights (MTL), Monochrome GDA, Nutri-Score, Warning Labels and Health Star Ratings (HSR) – is the easiest to understand and influences purchase intention. Our results indicate that on an average the summary ratings of HSR and Warning Labels are the most preferred from the perspective of ease of identification, understanding, reliability and influence. Among the two, HSR appears more acceptable, clearly outdoing the nutrient specific formats. HSR finds greater support among the Southern, Central and Western regions of the country. MTL was most preferred when it came to reflecting necessary health information and presence of an unwanted nutrient, however, ranked low in other parameters.

It is also observed that HSR has stronger performance on ease of identification, understanding, reliability and lack of complexity specifically among the sub-populations which are of higher consequence to influencing purchases - females, individuals primarily responsible for grocery shopping, urban individuals, individuals that read labels presently, individuals who don't read labels because they are not aware of labels as well as individuals who do not want information about good nutrients on the FOPL (73% of total sample).

6. Recommendations

The mandate of the research was twofold: first, to understand which FOPL is easier to understand for an average consumer; and second, which FOPL would most likely change consumer's purchase behavior. From an ease of identification and understanding perspective, HSR is clearly ahead of the other FOPL labels. From the perspective of changing consumer behavior in terms of purchase intention, all five FOPL formats lead to a significant change in the purchase intention at the 1% significance level; however, on the margin MTL leads to a higher change in purchase intention.

If the primary objective is ease of identification and understanding, then we recommend HSR. If change of purchase intention is most desired, then we recommend any of the five designs, with a marginal preference for MTL. If the objective of introducing an FOPL is a careful combination of, both, ease of identification and understanding on one hand, and change of purchase intention on the other, then we recommend HSR as the preferred FOPL.

References

AHMED, M., OH, A., VANDERLEE, L., FRANCO-ARELLANO, B., SCHERMEL, A., LOU, W. & L'ABBÉ, M. R. 2020. A randomized controlled trial examining consumers' perceptions and opinions on using different versions of a FoodFlip© smartphone application for delivery of nutrition information. *International Journal of Behavioral Nutrition and Physical Activity,* 17**,** 1-16.

ANG, F. J. L., AGRAWAL, S. & FINKELSTEIN, E. A. 2019. Pilot randomized controlled trial testing the influence of front-of-pack sugar warning labels on food demand. *BMC Public Health,* 19.1**,** 1-8.

ARES, G., ANTÚNEZ, L., CURUTCHET, M. R., GALICIA, L., MORATORIO, X., GIMÉNEZ, A. & BOVE, I. 2021. Immediate effects of the implementation of nutritional warnings in Uruguay: awareness, self-reported use and increased understanding. *Public Health Nutrition,* 24.2**,** 364-375.

ARRÚA, A., MACHÍN, L., CURUTCHET, M. R., MARTÍNEZ, J., ANTÚNEZ, L., ALCAIRE, F., GIMÉNEZ, A. & ARES, G. 2017. Warnings as a directive front-of-pack nutrition labelling scheme: comparison with the Guideline Daily Amount and traffic-light systems. *Public Health Nutrition,* 20.13**,** 2308-2317.

BANERJEE, A. V. & DUFLO, E. 2009. The experimental approach to development economics. *Annu. Rev. Econ.,* 1.1**,** 151-178.

BANERJEE, A. V., DUFLO, E., GLENNERSTER, R. & KOTHARI, D. 2010. Improving immunisation coverage in rural India: clustered randomised controlled evaluation of immunisation campaigns with and without incentives. *BMJ,* 340.

BANERJEE, A. V., DUFLO, E. & KREMER, M. 2016. The influence of randomized controlled trials on development economics research and on development policy. *The state of Economics, the state of the world***,** 482-488.

BARTLETT, J. 2013. The t-test and robustness to non-normality.

CAMPOS, S., DOXEY, J. & HAMMOND, D. 2011. Nutrition labels on pre-packaged foods: a systematic review. *Public health nutrition,* 14**,** 1496-1506.

CROKER, H., PACKER, J., RUSSELL, S. J., STANSFIELD, C. & VINER, R. 2020. Front of pack nutritional labelling schemes: a systematic review and meta-analysis of recent evidence relating to objectively measured consumption and purchasing. *Journal of Human Nutrition and Dietetics,* 33.4**,** 518-537.

CROSETTO, P., LACROIX, A., MULLER, L. & RUFFIEUX, B. 2020. Nutritional and economic impact of five alternative front-of-pack nutritional labels: experimental evidence. *European Review of Agricultural Economics,* 47.2**,** 785-818.

DUBOIS, P., ALBUQUERQUE, P., ALLAIS, O., BONNET, C., BERTAIL, P., COMBRIS, P., LAHLOU, S., RIGAL, N., RUFFIEUX, B. & CHANDON, P. 2021. Effects of front-of-pack labels on the nutritional quality of supermarket food purchases: evidence from a large-scale randomized controlled trial. *Journal of the Academy of Marketing Science,* 49.1**,** 119-138.

DUCROT, P., JULIA, C., MÉJEAN, C., KESSE-GUYOT, E., TOUVIER, M., FEZEU, L. K., HERCBERG, S. & PÉNEAU, S. 2016. Impact of different front-of-pack nutrition labels on consumer purchasing intentions: a randomized controlled trial. *American journal of preventive medicine,* 50.5**,** 627-636.

DUFLO, E., GLENNERSTER, R. & KREMER, M. 2007. Using randomization in development economics research: A toolkit. *Handbook of development economics,* 4**,** 3895-3962.

EGNELL, M., GALAN, P., FIALON, M., TOUVIER, M., PÉNEAU, S., KESSE-GUYOT, E., HERCBERG, S. & JULIA, C. 2021. The impact of the Nutri-Score front-of-pack nutrition label on purchasing intentions of unprocessed and processed foods: post-hoc analyses from three randomized controlled trials. *International Journal of Behavioral Nutrition and Physical Activity,* 18.1**,** 1-12.

EGNELL, M., TALATI, Z., GALAN, P., ANDREEVA, V. A., VANDEVIJVERE, S., GOMBAUD, M., DRÉANO-TRÉCANT, L., HERCBERG, S., PETTIGREW, S. & JULIA, C. 2020. Objective understanding of the Nutri-score front-of-pack label by European consumers and its effect on food choices: An online experimental study. *International Journal of Behavioral Nutrition and Physical Activity,* 17.1**,** 1-13.

FEUNEKES, G. I., GORTEMAKER, I. A., WILLEMS, A. A., LION, R. & VAN DEN KOMMER, M. 2008. Front-of-pack nutrition labelling: testing effectiveness of different nutrition labelling formats front-of-pack in four European countries. *Appetite,* 50**,** 57-70.

FINKELSTEIN, E. A., DOBLE, B., ANG, F. J. L., WONG, W. H. M. & VAN DAM, R. M. 2021. A randomized controlled trial testing the effects of a positive front-of-pack label with or without a physical activity equivalent label on food purchases. *Appetite,* 158**,** 104997.

HAMLIN, R. & MCNEILL, L. 2018. The impact of the Australasian 'Health Star Rating', front-of-pack nutritional label, on consumer choice: A longitudinal study. *Nutrients,* 10.7**,** 906.

HERNÁNDEZ-NAVA, L. G., EGNELL, M., AGUILAR-SALINAS, C. A., CÓRDOVA-VILLALOBOS, J. Á., BARRIGUETE-MELÉNDEZ, J. A., PETTIGREW, S., HERCBERG, S., JULIA, C. & GALÁN, P. 2019. Impact of different front-of-pack nutrition labels on foods according to their nutritional quality: a comparative study in Mexico. *Salud publica de Mexico,* 61.5**,** 609-618.

HODGKINS, C., BARNETT, J., WASOWICZ-KIRYLO, G., STYSKO-KUNKOWSKA, M., GULCAN, Y., KUSTEPELI, Y., AKGUNGOR, S., CHRYSSOCHOIDIS, G., FERNÁNDEZ-CELEMIN, L. & GENANNT BONSMANN, S. S. 2012. Understanding how consumers categorise nutritional labels: a consumer derived typology for front-of-pack nutrition labelling. *Appetite,* 59**,** 806-817.

JONES, A., NEAL, B., REEVE, B., MHURCHU, C. N. & THOW, A. M. 2019. Front-of-pack nutrition labelling to promote healthier diets: current practice and opportunities to strengthen regulation worldwide. *BMJ Global Health,* 4.6**,** e001882.

JONES, A., SHAHID, M. & NEAL, B. 2018. Uptake of Australia's health star rating system. *Nutrients,* 10**,** 997.

KANTER, R., VANDERLEE, L. & VANDEVIJVERE, S. 2018. Front-of-package nutrition labelling policy: global progress and future directions. *Public Health Nutrition,* 21.8**,** 1399-1408.

KENDALL, J. 2003. Designing a research project: randomised controlled trials and their principles. *Emergency medicine journal: EMJ,* 20.2**,** 164.

LUMLEY, T., DIEHR, P., EMERSON, S. & CHEN, L. 2002. The importance of the normality assumption in large public health data sets. *Annual review of public health,* 23.1**,** 151-169.

MHURCHU, C. N., EYLES, H. & CHOI, Y.-H. 2017. Effects of a voluntary front-of-pack nutrition labelling system on packaged food reformulation: The health star rating system in New Zealand. *Nutrients,* 9**,** 918.

MICHELS, K. B. & ROSNER, B. A. 1996. Data trawling: to fish or not to fish. *The Lancet,* 348**,** 1152-1153.

MIGUEL, E. & KREMER, M. 2004. Worms: identifying impacts on education and health in the presence of treatment externalities. *Econometrica,* 72.1**,** 159-217.
NETHAN, S., SINHA, D. & MEHROTRA, R. 2017. Non communicable disease risk factors and their trends in India. *Asian Pacific journal of cancer prevention: APJCP,* 18**,** 2005.
NGUYEN, T., DE BRAUW, A., VAN DEN BERG, M. & DO, H. T. P. 2021. Testing methods to increase consumption of healthy foods evidence from a school-based field experiment in Viet Nam. *Food Policy,* 101**,** 102047.
NIETO, C., TOLENTINO-MAYO, L., MONTERRUBIO-FLORES, E., MEDINA, C., PATIÑO, S. R.-G., AGUIRRE-HERNÁNDEZ, R. & BARQUERA, S. 2020. Nutrition label use is related to chronic conditions among Mexicans: data from the Mexican National Health and Nutrition Survey 2016. *Journal of the Academy of Nutrition and Dietetics,* 120.5**,** 804-814.
OGUNDIJO, D., TAS, A. & ONARINDE, B. 2021. An assessment of nutrition information on front of pack labels and healthiness of foods in the United Kingdom retail market. *BMC Public Health,* 21**,** 1-10.
PACKER, J., RUSSELL, S. J., RIDOUT, D., HOPE, S., CONOLLY, A., JESSOP, C., ROBINSON, O. J., STOFFEL, S. T., VINER, R. M. & CROKER, H. 2021. Assessing the effectiveness of front of pack labels: Findings from an online randomised-controlled experiment in a representative British sample. *Nutrients,* 13.3**,** 900.
RAMACHANDRAN, V. 2011. *The tell-tale brain: tales of the unexpected from inside your mind*, Windmill.
RIIS, N. L., BJOERNSBO, K., TOFT, U., TROLLE, E., HYLDIG, G., HARTLEY, I., KEAST, R. & LASSEN, A. D. 2021. Impact of salt reduction interventions on salt taste sensitivity and liking, a cluster randomized controlled trial. *Food Quality and Preference,* 87**,** 104059.
SATIJA, A., YU, E., WILLETT, W. C. & HU, F. B. 2015. Understanding nutritional epidemiology and its role in policy. *Advances in Nutrition,* 6.1**,** 5-18.
SEAH, S. S. Y., VAN DAM, R. M., TAI, B. C., TAY, Z., WANG, M. C. & REBELLO, S. A. 2022. An evaluation of the healthier dining programme effects on university student and staff choices in Singapore: A cluster-randomized trial. *Food Policy,* 107**,** 102211.
SHAHRABANI, S. 2021. The impact of Israel's Front-of-Package labeling reform on consumers' behavior and intentions to change dietary habits. *Israel Journal of Health Policy Research,* 10**,** 1-11.
SIBBALD, B. & ROLAND, M. 1998. Understanding controlled trials. Why are randomised controlled trials important? *BMJ: British Medical Journal,* 316**,** 201.
SIMON, H. A. 1957. Models of man; social and rational.
STERN, D., TOLENTINO, L. & BARQUERA, S. 2011. Revisión del etiquetado frontal: análisis de las Guías Diarias de Alimentación (GDA) y su comprensión por estudiantes de nutrición en México. *Cuernavaca: Instituto Nacional de Salud Pública***,** 1-40.
TAILLIE, L. S., REYES, M., COLCHERO, M. A., POPKIN, B. & CORVALÁN, C. 2020. An evaluation of Chile's Law of Food Labeling and Advertising on sugar-sweetened beverage purchases from 2015 to 2017: A before-and-after study. *PLoS Medicine,* 17.2**,** e1003015.
TALATI, Z., PETTIGREW, S., BALL, K., HUGHES, C., KELLY, B., NEAL, B. & DIXON, H. 2017. The relative ability of different front-of-pack labels to assist consumers discriminate between healthy, moderately healthy, and unhealthy foods. *Food Quality and Preference,* 59**,** 109-113.
TEMPLE, N. J. 2020. Front-of-package food labels: A narrative review. *Appetite,* 144**,** 104485.

VADIVELOO, M., PRINCIPATO, L., MORWITZ, V. & MATTEI, J. 2019. Sensory variety in shape and color influences fruit and vegetable intake, liking, and purchase intentions in some subsets of adults: A randomized pilot experiment. *Food quality and preference,* 71**,** 301-310.

VAN HERPEN, E., SEISS, E. & VAN TRIJP, H. C. 2012. The role of familiarity in front-of-pack label evaluation and use: A comparison between the United Kingdom and The Netherlands. *Food Quality and Preference,* 26.1**,** 22-34.

VARGAS-MEZA, J., JÁUREGUI, A., PACHECO-MIRANDA, S., CONTRERAS-MANZANO, A. & BARQUERA, S. 2019. Front-of-pack nutritional labels: Understanding by low-and middle-income Mexican consumers. *PloS one,* 14.11**,** e0225268.

WATSON, W. L., KELLY, B., HECTOR, D., HUGHES, C., KING, L., CRAWFORD, J., SERGEANT, J. & CHAPMAN, K. 2014. Can front-of-pack labelling schemes guide healthier food choices? Australian shoppers' responses to seven labelling formats. *Appetite,* 72**,** 90-97.

WHITE, M. & BARQUERA, S. 2020. Mexico adopts food warning labels, why now? *Health Systems & Reform,* 6.1**,** e1752063.

Appendix A

Primes used

Healthy Prime	**Chips** are consumed by a large majority of people in India. According to some research by scientists, people who eat **chips**, on an average, tend to have **better** health. **Biscuits** are consumed by a large majority of people in India. According to some research by scientists, people who eat **biscuits**, on an average, tend to have **better** health.
Unhealthy Prime	**Chips** are consumed by a large majority of people in India. According to some research by scientists, people who eat **chips**, on an average, tend to have **bad** health. **Biscuits** are consumed by a large majority of people in India. According to some research by scientists, people who eat **biscuits**, on an average, tend to have **bad** health.

Appendix B: Ranking tables across demographic variables for performance of all label types

Males						
Label Type	Ease of identification of label on pack	Ease of understanding of label	Label gives all the health information needed	Label helps detect presence of excess of an unwanted nutrient	Reliability of information provided	Complexity (Lesser is better)
Warning labels	3	2	4	2	2	2
MTL	4	4	1	1	1	4
NS	1	3	5	4	5	3
GDA	5	5	2	3	4	5
HSR	2	1	3	5	3	1

Source: Survey by IIMA and Dexter Consultancy

Females						
Label Type	Ease of identification of label on pack	Ease of understanding of label	Label gives all the health information needed	Label helps detect presence of excess of an unwanted nutrient	Reliability of information provided	Complexity (Lesser is better)
Warning labels	3	2	4	1	1	2
MTL	4	4	1	2	3	4
NS	2	3	5	5	5	3
GDA	5	5	3	3	4	5
HSR	1	1	2	4	2	1

Source: Survey by IIMA and Dexter Consultancy

Age Group (18-25 years)						
Label Type	Ease of identification of label on pack	Ease of understanding of label	Label gives all the health information needed	Label helps detect presence of excess of an unwanted nutrient	Reliability of information provided	Complexity (Lesser is better)
Warning labels	3	2	4	2	2	2
MTL	4	4	1	1	1	4
NS	1	3	5	4	5	3
GDA	5	5	2	3	4	5
HSR	2	1	3	5	3	1

Source: Survey by IIMA and Dexter Consultancy

Age Group (25-40 years)						
Label Type	Ease of identification of label on pack	Ease of understanding of label	Label gives all the health information needed	Label helps detect presence of excess of an unwanted nutrient	Reliability of information provided	Complexity (Lesser is better)
Warning labels	3	2	4	2	1	2
MTL	4	4	1	1	3	4
NS	1	3	5	4	5	3
GDA	5	5	3	3	4	5
HSR	2	1	2	5	2	1

Source: Survey by IIMA and Dexter Consultancy

Age Group (40-60 years)						
Label Type	Ease of identification of label on pack	Ease of understanding of label	Label gives all the health information needed	Label helps detect presence of excess of an unwanted nutrient	Reliability of information provided	Complexity (Lesser is better)
Warning labels	3	2	4	1	1	2
MTL	4	4	1	2	3	4
NS	2	3	5	5	5	3
GDA	5	5	3	3	4	5
HSR	1	1	2	4	2	1

Source: Survey by IIMA and Dexter Consultancy

Age Group (60+ years)						
Label Type	Ease of identification of label on pack	Ease of understanding of label	Label gives all the health information needed	Label helps detect presence of excess of an unwanted nutrient	Reliability of information provided	Complexity (Lesser is better)
Warning labels	3	2	4	2	2	2
MTL	4	4	1	1	3	4
NS	2	3	5	5	5	3
GDA	5	5	3	3	4	5
HSR	1	1	2	4	1	1

Source: Survey by IIMA and Dexter Consultancy

Rural						
Label Type	Ease of identification of label on pack	Ease of understanding of label	Label gives all the health information needed	Label helps detect presence of excess of an unwanted nutrient	Reliability of information provided	Complexity (Lesser is better)
Warning labels	3	2	4	2	1	2
MTL	4	4	1	1	2	4
NS	1	3	5	4	5	3
GDA	5	5	2	3	4	5
HSR	2	1	3	5	3	1

Source: Survey by IIMA and Dexter Consultancy

Urban						
Label Type	Ease of identification of label on pack	Ease of understanding of label	Label gives all the health information needed	Label helps detect presence of excess of an unwanted nutrient	Reliability of information provided	Complexity (Lesser is better)
Warning labels	3	2	4	2	2	2
MTL	4	4	1	1	3	4
NS	2	3	5	5	5	3
GDA	5	5	3	3	4	5
HSR	1	1	2	4	1	1

Source: Survey by IIMA and Dexter Consultancy

Self-employed in Agriculture						
Label Type	Ease of identification of label on pack	Ease of understanding of label	Label gives all the health information needed	Label helps detect presence of excess of an unwanted nutrient	Reliability of information provided	Complexity (Lesser is better)
Warning labels	2	2	4	2	1	2
MTL	4	5	1	1	2	5
NS	1	3	5	4	5	3
GDA	5	4	2	3	4	4
HSR	3	1	3	5	3	1

Source: Survey by IIMA and Dexter Consultancy

Salaried - Public sector						
Label Type	Ease of identification of label on pack	Ease of understanding of label	Label gives all the health information needed	Label helps detect presence of excess of an unwanted nutrient	Reliability of information provided	Complexity (Lesser is better)
Warning labels	2	3	4	2	2	2
MTL	4	4	1	1	1	3
NS	1	1	3	4	5	4
GDA	5	5	2	3	3	5
HSR	3	2	5	5	4	1

Source: Survey by IIMA and Dexter Consultancy

Salaried - Pvt Sector						
Label Type	Ease of identification of label on pack	Ease of understanding of label	Label gives all the health information needed	Label helps detect presence of excess of an unwanted nutrient	Reliability of information provided	Complexity (Lesser is better)
Warning labels	3	2	4	2	2	2
MTL	4	4	1	1	3	4
NS	2	3	5	5	5	3
GDA	5	5	3	3	4	5
HSR	1	1	2	4	1	1

Source: Survey by IIMA and Dexter Consultancy

Self-employed (No employees)						
Label Type	Ease of identification of label on pack	Ease of understanding of label	Label gives all the health information needed	Label helps detect presence of excess of an unwanted nutrient	Reliability of information provided	Complexity (Lesser is better)
Warning labels	3	3	4	2	2	2
MTL	4	5	1	1	3	5
NS	2	2	5	4	5	3
GDA	5	4	3	3	4	4
HSR	1	1	2	5	1	1

Source: Survey by IIMA and Dexter Consultancy

Employer						
Label Type	Ease of identification of label on pack	Ease of understanding of label	Label gives all the health information needed	Label helps detect presence of excess of an unwanted nutrient	Reliability of information provided	Complexity (Lesser is better)
Warning labels	3	2	3	1	1	2
MTL	4	5	1	2	3	5
NS	1	3	5	4	5	3
GDA	5	4	4	3	4	4
HSR	2	1	2	5	2	1

Source: Survey by IIMA and Dexter Consultancy

Agri & allied wage labour						
Label Type	Ease of identification of label on pack	Ease of understanding of label	Label gives all the health information needed	Label helps detect presence of excess of an unwanted nutrient	Reliability of information provided	Complexity (Lesser is better)
Warning labels	1	2	1	1	1	2
MTL	4	4	4	2	3	4
NS	2	3	5	5	5	3
GDA	5	5	3	3	4	5
HSR	3	1	2	4	2	1

Source: Survey by IIMA and Dexter Consultancy

Student						
Label Type	Ease of identification of label on pack	Ease of understanding of label	Label gives all the health information needed	Label helps detect presence of excess of an unwanted nutrient	Reliability of information provided	Complexity (Lesser is better)
Warning labels	1	2	4	3	3	1
MTL	2	1	1	1	1	5
NS	3	3	3	4	5	2
GDA	5	5	2	2	2	4
HSR	4	4	5	5	4	3

Source: Survey by IIMA and Dexter Consultancy

Unemployed						
Label Type	Ease of identification of label on pack	Ease of understanding of label	Label gives all the health information needed	Label helps detect presence of excess of an unwanted nutrient	Reliability of information provided	Complexity (Lesser is better)
Warning labels	3	2	4	2	1	2
MTL	4	4	1	1	3	4
NS	2	3	5	4	5	3
GDA	5	5	3	3	4	5
HSR	1	1	2	5	2	1

Source: Survey by IIMA and Dexter Consultancy

[i] https://www.who.int/news-room/fact-sheets/detail/healthy-diet

[ii] Argentina, Australia, Bulgaria, Canada, Denmark, France, Germany, Mexico, Singapore, Spain, the UK, USA

[iii] https://apps.fas.usda.gov/newgainapi/api/report/downloadreportbyfilename?filename=Update%20on%20Revised%20NOM-051%20Labeling%20Requirements_Mexico%20ATO_Mexico_10-18-2010.pdf

[iv] https://www.nytimes.com/2018/02/07/health/obesity-chile-sugar-regulations.html : accessed on 18.01.2022

[v] https://www.trade.gov/country-commercial-guides/peru-labeling-and-marking-requirements

[vi] https://www.trade.gov/country-commercial-guides/uruguay-labelingmarking-requirements

[vii] https://www.verisk3e.com/resource-center/blog/colombia-publishes-new-requirements-labeling-food-and-beverages

[viii] https://cdn.who.int/media/docs/default-source/thailand/ncds/ppt_clare_fopl1_final-presentation_cf.pdf?sfvrsn=388ab823_3

[ix] https://www.foodnavigator.com/Article/2020/01/27/Israel-introduces-mandatory-HFSS-warnings-front-of-pack

[x] https://foodregulation.gov.au/internet/fr/publishing.nsf/Content/front-of-pack-labelling-1

[xi] Note that at a 5% margin of error and a 95% confidence level, the sample per cell would be 377. We have taken a higher number to be conservative side.