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Stockpiling Behavior During the COVID-19 Pandemic: Evidence from a Field Experiment⁺

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Abstract

During the early stages of the COVID-19 outbreak, consumers rushed to buy food and daily necessities. This study investigates consumers' purchase and stockpiling behaviors during the pandemic. Although the number of new COVID-19 cases has not been large in our study site, we find that age, income, household size, profession, and anxiety significantly influence excessive buying. In addition, we examine the causal impacts of interventions in which we randomly provided guidelines on stockpiling and storage management on a wide range of items. The guidelines were designed to raise awareness and encourage individuals to look back at their storage. We estimate causal impact and find that the treated individuals significantly increased awareness, gained knowledge and skills on what and how much to stockpile. The estimated coefficients are larger for those who answered that they actually read the information. For outcomes on skills and actions, we find that overall impact is less significant, perhaps because untreated individuals have also started to manage their storage as the pandemic becomes more prolonged or prevention measures have varied with different variants. We also examine item-wise stockpiled quantities measured at the baseline and endline. We find that for untreated individuals, there are large significant changes in stockpiled quantities on food and daily necessities (i.e., they seemed to stock up many additional items or consume much of what they stored). In contrast, for the treated individuals, the changes in stockpiled quantities were significantly smaller for water and beverages, rice and dried noodles and disinfectants. The results indicate that the treated individuals tried to keep the recommended amounts of stockpiles, suggesting that they become resilient and better prepared to avoid panic buying.

JEL Classification: C93, D12

Keywords: Randomized Control Trial, COVID-19, Stockpiling, Hoarding, Storage Management.

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1. Introduction

During the COVID-19 pandemic, many consumers rushed to grocery stores, supermarkets, and drugstores to buy food, face masks, toilet paper, disinfectants, and so on. This was prevalent in many areas of the world (BBC, 2020; The Guardian, 2020; The Sankei Shimbun, 2020). Some stores rationed the number of items people could purchase or prioritized those who were disadvantaged and/or essential workers (CNN, 2020; Reuters, 2022). In Japan, from February to March 2020, the government closed all schools and requested work from home. The government declared the first state of emergency on April 7, 2020, followed by subsequent declarations (January, April, and August 2021).¹ Other policies including quasi-emergency measures were also in place both at the national and prefectural levels. Although these policies were not always mandatory and often without fines, many industries were required to close or shorten their business hours. Figure 1 shows the number of new COVID-19 cases (7-day cumulative, per 100,000 population) of Japan along with the timeline of the current study (for details, see Section 2). Universal cash transfers (100,000 yen) were paid to each individual from the government during summer 2021, regardless of age, income, family size or employment status.

In February 2020, face masks were sold out in stores most likely because of fake news. The news was spread on SNS that there would be a shortage of toilet paper because face masks and toilet paper are made from the similar materials (Konishi et al., 2022, Konishi et al., 2023). Consequently, the next week hit the highest sales of paper products. In response to this, the government urged people not to buy up toilet paper at the end of February and banned the resale of face masks in March 2020. The National Consumer Affairs Center of Japan reported a huge increase in the number of consultation cases to approximately 65,000 between January and August 2020 (National Consumer Affairs Center 2020). Many of the cases were related to personal concerns and problems regarding shortages of masks and toilet paper. Meanwhile, the sales of food products also increased concurrently by 33% for staple foods and 25% for processed foods (Konishi et al., 2022). While the government issued warnings repeatedly against panic buying (The Sankei Shimbun, 2020),² empty shelves at supermarkets and drugstores have often triggered consumers' excessive buying. There have been a lot of media

¹ The first declaration covered seven prefectures (Tokyo, Kanagawa, Saitama, Chiba, Osaka, Hyogo, and Fukuoka), but then covered all prefectures on April 16. The declaration was lifted on May 14 in 39 prefectures.

² This was also prevalent in other countries. For example, there have been similar announcements about price hikes, shortages of food, daily necessities, and other items, and warnings about fake news from the US Federal Trade Commission, the UK Competition and Market Authority, the Swedish Consumer Agency (Consumer Affairs Agency, 2021).

coverage on panic buying or (mis)information on the pandemic on TV and SNS, which have greatly influenced people's behavior (Bursztyn et al., 2020; Cato et al., 2021; Sakamoto et al., 2021a).³

How then do people consume or store items they bought? Do they plan ahead and consume them in an organized manner or just leave a clutter? Japan Association of Life Organizers (2019) and Sakamoto et al. (2021b) find that many of her clients usually have too many items. These are commonly stored in different places in their house. Some have strong beliefs such as “I may need them someday,” but often forget where they have stored them, underestimate the quantity of stockpiles, feel distress about discarding them, and are sometimes obsessed with possessing more. Impulsive buying with little planning in unorganized manner often interferes with everyday life: people cannot access cluttered rooms, may spend too much on unnecessary items, and the clutter can pose a health risk for the person and anyone who lives in or visits their house (Ikeuchi, 2014 and 2017; National Health Service, 2022).

Some of these behaviors may be related to Hoarding Disorder. People with hoarding disorder have persistent difficulty getting rid of or parting with possessions due to a perceived need to save the items (DSM-5, American Psychiatric Association, 2013). Hoarding disorders are challenging to treat because many people who hoard frequently do not see it as a problem or have little awareness of how it is affecting their life or the lives of others (National Health Service, 2022). Also, excessive buying may also be associated with other disorders such as Obsessive-Compulsive Disorder, Attention Deficit/Hyperactivity Disorder, depression and dementia (Morein-Zamir et al., 2022). Consequently, the current study focuses on excessive buying behavior in general, not only what is diagnosed as so.

In collaboration with the Consumer Affairs Agency of Japan (CAA), we empirically examine the characteristics of those who exhibit excessive buying during the first emergency declaration (Apr – May 2020) in Tokushima, Japan. While the actual number of COVID-19 cases and deaths has been smaller there relative to other areas of the country, many people seemed to change their behaviors especially in the early stage of the outbreak. Our survey questions include whether they lined up at a store before opening hours, visited different stores, bought additional goods even if they had enough, etc. Consistent with previous studies (Bentall et al.,

³ As an exception, one Japanese large supermarket chain obtained an ample stock of toilet paper, showed the piles in stores and rationed each customer to “10 packs” maximum (J-cast, 2020).

2020 and 2021; Wang et al. 2020., Micalizzi et al., 2021; Yoshino, 2021), we find that age, income, household size, occupation, and anxieties about shortages of food and household necessities influence excessive buying.⁴

Furthermore, this study also investigates the causal impacts of randomized interventions, in which we provided guidelines on stockpiling and storage management. Based on age, gender and income categories measured at the baseline, the respondents were randomly assigned to four groups. Each group received different flyers every 2 weeks. The flyers include information on what and how much one should store and how and where one should manage them. Based on Prochaska and Velicer's (1997) model of behavior change, our interventions were multifaceted and designed to reach people at different behavioral stages: Precontemplation, Contemplation, Preparation, Action, and Maintenance.

A post-intervention survey collected with low attrition was used to measure the quantitative impact of the interventions. Specifically, we examine the awareness on organizing and managing food and household necessities, knowledge of stockpiling, and implementation of skills provided by the interventions. Our outcome also includes the reported quantities of stockpiled items. We estimate causal impact and find that the treated individuals significantly increased awareness, gained knowledge, and skills on what and how much to stockpile. The impacts are larger for those who answered that they actually read the information. For outcomes on skills and actions, we find the overall impact is less significant, perhaps because untreated individuals might have also started to manage their storage as the pandemic becomes more prolonged and prevention measures have varied with different variants. We also examine item-wise storage quantities measured at the baseline and endline. Consistent with Wang et al. (2020), we find that for untreated individuals, there are large significant changes in stockpiled quantities of food and daily necessities (i.e., they seemed to stock up many additional items or consume much of what they stored). In contrast, for the treated individuals, the changes in stockpiled quantities were significantly smaller for water and beverages, rice and dried noodles, and disinfectants. People usually buy and store only what they are really interested in, not always what they really "need"; it would thus be important to provide information that allows people to fully realize and be equipped with appropriate items in

⁴ Bentall et al. (2021) report that hoarding behavior is correlated with household income, number of children, and location of residence. Micalizzi et al. (2021) find that stockpiling was more commonly observed among conservative individuals. Yoshino (2021) shows that psychological attributes, such as authoritarian tendencies, threat sensitivity, distress, and distrust influence panic buying. Amaral et al. (2020) find that people with internal Locus of Control (LOC) are less likely to stockpile than those with an external LOC.

appropriate quantities, which would also lead to reducing unnecessary spending. Our results suggest that the treated individuals tried to keep the recommended amounts of stockpiles, indicating that they become resilient and better prepared to avoid panic buying.

This study makes several contributions. First, our findings contribute to policy debate on how to prevent panic buying. Our results show that individuals can become aware, gain knowledge and skills of desirable stockpiling. While existing policy recommendations mostly focus on announcements for the general public, media, and sellers, we find that informed individuals can change behaviors and may avoid panic buying.

Second, this study contributes to the literature on consumption behavior during the pandemic. A number of existing studies use transaction data to analyze when and what people bought during the pandemic (Baker et al., 2020; Brodeur et al., 2021; Kaneda et al. 2021; Kubota et al, 2021; Ueda et al., 2021; Konishi et al., 2022; Watanabe and Omori, 2021; Inoue and Todo, 2023; Kikuchi et al. 2023). However, to the authors' knowledge, the literature to date has provided limited evidence on savings or storage in terms of "goods." This study helps us understand how consumers store and manage goods on their shelves because of increased shopping during the pandemic.

The remainder of this paper is organized as follows. Section 2 describes the background of the study sites, details of the randomized intervention, and characteristics of the sample. Section 3 presents the empirical strategies. Section 4 provides the results, and Section 5 presents the discussion. Section 6 concludes.

2. Background and Data

The baseline survey was handed over to almost all 60,000 members of the consumers' co-operative society in Tokushima Prefecture, Japan (Figure 2). Tokushima Prefecture has a population of approximately 710,000 and is located on the island of Shikoku. Its number of new COVID-19 cases has been relatively smaller than, for example, Tokyo. Many of the new cases there seems to have been brought from Osaka Prefecture (nearest large population center) as the two prefectures have similar trends in the number of new cases (Figure 1). The first emergency declaration covered Tokushima during April 16 to May 14, 2021. Since then, the Prefectural Government has issued quasi-emergency alerts repeatedly, calling for mostly voluntary prevention.

The Tokushima Consumers' Co-operative Society (Tokushima Co-op), established in 1984, delivers

weekly a wide range of more than 10,000 items, such as fresh produce, ready-to-eat food, and daily necessities.⁵ As of 2022, Tokushima Co-op has approximately 120,000 memberships. Members choose items from weekly catalogs and order what they want by handing over the OCR-based order forms when they receive the week's delivery.⁶ About half of them order and receive delivery every week. Deliveries are either individual-based or group-based, and ordered items are usually handed over on a certain day of the week.⁷

During the pandemic, there were notable increases in membership and sales. Figure 3a shows the number of new members. There is a clear seasonal pattern: a large increase in April every year, when the fiscal/academic year begins, and six months later in September – these are the months when the co-op usually holds intensive new subscriber-campaigns.⁸ During the early stage of the outbreak in 2020, the increase in new memberships was unusually large.⁹ Figure 3b reports the weekly sales from January 2018 to March 2021. The figure shows a large increase in the intensive margin during the pandemic. The co-op reports that FY2020 hits the highest sales of 11.8 billion yen, which is 114.9% over the previous year.¹⁰

The baseline survey was collected for 8,988 individuals in January 2021, approximately six weeks prior to the intervention (Figure 1).¹¹ Four branch offices (Tokushima South, the capital; Mima, Anan and Itano) are involved. (Figure 4). The survey asks for information on socioeconomic characteristics of the respondents' households, income, consumption, shopping during and prior to the pandemic, psychological stress, stockpiling,

⁵ Items listed in weekly catalogs include vegetables, fruits, meat, eggs, milk, fish, frozen food, pre-packaged foods, seasoning, drinks, household necessities, cosmetics, stationaries, drugs, books, clothes, glasses, electric appliances, flowers, plants, toys, bedding, and furniture.

⁶ Only 7% of deliveries are ordered online.

⁷ Of the 120,000, 91.3% register as delivery-members. The rest are store-only members who pick up the items they order at the co-op supermarkets in the central area. Personalized delivery fees vary: 210 yen for door-to-door delivery, free if a member is pregnant or has infant(s) under 3 years old, 105 yen if a member is 65 years old and above or has disabilities, 105 yen for groups of two members, free for groups of more than three members.

⁸ The campaign usually includes door-to-door visits and flyer postings.

⁹ Meanwhile, there were unusually few new memberships around September 2021. This is because the co-op's campaigns were suspended due to the spread of the delta variant.

¹⁰ Figure 3b shows another seasonal pattern. Each year sales spike from November to December and drop during the holiday season. Sales are recorded on a weekly basis, and year-end is also counted as a week even if there are less than seven days.

¹¹ Appendix Table 1 examines the representativeness of the current sample. In particular, we list the relevant variables from the current study and Sakamoto et al. (2021) and conduct t-tests. The sample in Sakamoto et al. (2021) includes 3,938 individuals randomly selected from the pool of a survey company to reproduce the population distribution of the latest Japanese Census (based on sex, age group in 10-year categories and location of residence). Compared to their study, the sample of the current study is predominantly female, older, less educated, living in a larger house with smaller income. The current sample seems closer when we limit Sakamoto et al. (2021)'s sample to female, co-op users and areas not subject to the very first emergency declarations in April 2020 (i.e., all but Tokyo, Kanagawa, Saitama, Chiba, Osaka, Hyogo, and Fukuoka). For stockpiles, the current sample seems to store more items than Sakamoto et al. (2021)'s. This may be because the current sample is generally older and lives in distant areas.

management of household goods and money, and information literacy and other changes in livelihood during the pandemic. The baseline survey also asked for item-wise stockpiled quantities. In particular, the survey asked how many days a respondent could afford the upkeep of their household members if each food or non-food item became unavailable.¹²

Our randomized information intervention was implemented three times (March 1 – 5, March 15 – 19, and March 29 – April 2, Figure 1). Based on the age, gender, and income category measured at baseline, the respondents were randomly assigned to four groups. Each four group received different types of flyers all three times. For each respondent, the flyers were enclosed at the top of the weekly catalogs and delivered along with their orders. The information provided in the flyers was designed based on Prochaska and Velicer (1997) and supervised by a professional organizing consultant. Figure 5 shows Prochaska and Velicer (1997)'s model. It decomposes behavioral change into six stages (Precontemplation, Contemplation, Preparation, Action, and Maintenance and Termination).¹³ Usually, public information provided by the Japanese government is targeted to individuals only at the Precontemplation and Action stages. In contrast, our intervention focuses individuals at broader stages.

Table 1 shows the details of intervention design. The contents of each flyer were carefully placed into four parts: i) awareness and self-diagnosis, ii) knowledge and skills, iii) co-op ads, and iv) information from CAA. Each part corresponds to different stages of Prochaska and Velicer (1997)'s model. Motivational pictures and self-diagnosis checks may help people in the Precontemplation and Contemplation stages to initiate actions. The knowledge section includes guidelines for storage and stockpiling, and the skills section includes tips for tidying and organizing. Table 1 lists the details of the flyers. Groups A received all the treatment information, including advertisements for related co-op items of the week (Appendix Figure 1). Group B's flyer is identical to Group A's except for ads. The flyer to Group C lacks knowledge and skills and co-op ads. Group D is the

¹² The specific items listed in the survey include water and beverages, ready-made-staple foods, rice and noodles, canned or frozen foods and perishables. The original choices were from the following categories: a) less than one day, b) 2 – 3 days, c) 4 – 7 days, d) 1 – 2 weeks, e) 2 weeks or more. We take median values of each category (0.5 days, 2.5 days, 5.5 days, and 10.5 days). Choice e) was treated as 21 days. Respondents who chose “not necessary” or “don't know” were excluded.

¹³ Precontemplation is the first stage in which people are uninformed, underinformed, unmotivated or demoralized, followed by the Contemplation Stage in which people increase awareness, have some knowledge, and understand the pros and cons of the relevant action. People at this stage may still be unwilling to take relevant actions and often procrastinate. At the Preparation Stage, people can plan ahead, gain confidence to initiate the relevant actions. Action is the stage in which people exhibit observable behavioral changes. With support from external sources, they can attain their goals. Some individuals proceed to Maintenance and Termination stages.

control group, and the flyer only covers announcements from the Consumer Affairs Agency (Appendix Figure 2).

Table 2 summarizes the flyer details. Each intervention focuses on specific topics. The first flyer (Appendix Figure 1) covers stockpiling guidelines for daily necessities. In particular, it lists specific items that should be stored, provides recommended quantities (e.g., one toilet roll per person per week) for four weeks. Also, it includes tips from a professional consultant on storing them for 4 weeks on a routine basis. The second flyer (Appendix Figure 2) includes stockpiling guidelines for face masks and tips on how to organize such as labelling and sorting.¹⁴ The third flyer (Appendix Figure 3) covers food items such as rice, grain, cup noodles, pre-packaged food and drinks. It recommends readers to prepare enough food to survive for at least three days.¹⁵ It also includes tips on how to use the rolling-stock method to manage them.

The endline survey was conducted three months after the interventions were completed (Figure 1). For comparison, the endline survey asked the same set of questions as the baseline one, followed by a new set of questions which are related to the contents of the flyers. We evaluate these outcomes to examine the causal impact of the intervention. In the following sections, we examine a wide range of outcomes. The potential impacts on individuals in the Precontemplation and Contemplation Stages are related with awareness and knowledge outcomes such as perceptions on organization and management of food, household necessities, and stockpiling in general. Outcomes on skills and actions for desirable stockpiling would be related with those who are in the Preparation and more advanced stages.

The overall attrition rate is 19%; however, no evidence of differential attrition was observed. Table 3 shows that the group dummies are not correlated with attrition. Some of the explanatory variables correlated with attrition are controlled in the regressions to alleviate any potential bias. To verify the validity of the randomization, Table 4 presents balance checks. It compares the mean values of variables measured at the baseline across groups and shows that none of the differences is statistically significant from zero. Table 5 shows

¹⁴ It should be noted that the second flyer was designed and distributed when the alpha variant had spread. It then includes how to organize cloth masks rather than disposable masks, which were reported to be in short supply. The Abe administration provided cloth masks to Japanese citizens and foreign residents almost around the same time (Figure 1).

¹⁵ Japanese and other governments recommend having at least a 3-day supply hand for emergencies (Ministry of Agriculture, Forestry and Fisheries of Japan, Centers for Disease Control and Prevention). For COVID-19, a minimum 3-day supply also does not seem to be too little as local Japanese governments now provide free food within a day or two of a person reporting positive.

the balance checks for quantities of stockpiled items. Except for water and beverages, ready-made staple foods, and rice and dried noodles, the differences in mean values are insignificant.

Tables 6 and 7 present summary statistics of the baseline variables. The average age is 58.7 years old and 89.5% are female. The average household size is 2.94. About 30% of them have a child or children (under 18 years old) living with them. At the baseline, the average annual household income is 5.67 million yen (54,624 USD).¹⁶ About 23% and 20% of them have full-time and part-time jobs, respectively.¹⁷ Forty-four percent of them are high-school graduates. It is noticeable that respondents increased purchases from the co-op during the pandemic from 34.7% to 40.6%, and the ratio remained high (39.6%) even after the emergency declarations were lifted.¹⁸ Fifty-six percent of them answered that they read all or some parts of the flyers. Table 4 shows that the percentages of people who read the flyer for each group are significantly different. In particular, Group D has a significantly lower percentage of respondents who answered that they read the flyer.¹⁹ Table 7 presents summary statistics of item-wise stockpiles. At the baseline, the average number of affordable days for water and beverages were 5.8 days. Ready-made staple food, rice, and dried noodles were stored for an average of 4.5 and 14.4 days. Face masks, disinfectants, and toilet paper were stored on average for 18.3, 18.1, and 17.7 days, respectively. Medication was stored for 15 days.

3. Empirical Analysis

3.1 Determinants of Excessive Buying

To examine determinants of excessive buying, we estimate the following:

$$ExcessBuy_i = \alpha + \beta X + \delta_b + \epsilon_i$$

where the outcome $ExcessBuy_i$ takes one if the relevant excessive buying happened more than twice. In

¹⁶ 1 USD = 103.8 Japanese yen (January 18, 2021, Federal Reserve System) The original choices are from the following categories: a) less than or equal to 3-million-yen, b) 3 to 6 million yen, c) 6 to 9 million yen, d) 9 to 12 million yen, e) 12 to 15 million yen, f) 15 million and above. We take median values for each category except for the last one (3, 4.5, 7.5, 10.5, 13.5, and 15 million yen).

¹⁷ The full-time-worker dummy takes one if a respondent answered so, which excludes those who answered as self-employed or freelance. Similarly, the part-time-worker dummy takes one if a respondent answered so, which excludes temporary or dispatched workers or contract employees.

¹⁸ Percentages of co-op purchases are the median values of the following choices: a) 80 – 100%, b) 50 – 79%, c) 20 – 49%, d) less than 20%.

¹⁹ The p-values for the difference between Group A vs Group D, Group B vs Group D, and Group C vs Group D are 0.07, 0.03, and 0.07, respectively.

particular, the dummies take one if, during the first emergency declaration (April to May 2020), a respondent 1) lined up at a store before opening hours, 2) visited multiple stores, 3) bought more goods even if he/she already had enough, 4) bought items for his/her family, relatives, friends, even those who live far away, and 5) bought items via a marketplace app or SNS. Table 8 reports that only 5.4% of the respondents lined up at a store before opening hours, while 25.5% and 31.6% of them went to multiple stores or bought extra amounts even if they already had enough, and 14.5% of them shopped for their family, relatives, and friends living far away. Only 6.4% of them used transactions via marketplace apps or SNS. These suggest that the respondents changed their shopping behavior largely during the pandemic even though the actual number of new COVID-19 cases in Tokushima was very few compared to neighboring large cities.

In the regression, the expandatory variables include baseline socioeconomic variables such as age, female dummy, children, income, percentage of pre-COVID co-op purchases, house (square meters), occupation dummies, and schooling. We also control for anxiety, which takes 1 if a respondent experiences anxiety about shortages of food or daily necessities. The estimations also control for branch-specific factors by δ_b . Standard errors are clustered at branch level. We also analyze the determinants of excessive buying of specific food and non-food items; when the first state of emergency was declared, how many more of the items he/she bought compared to prior to the outbreak. In particular, our dependent variables are instant noodles, rice, pasta, pancake mix, pre-packaged food, frozen and perishable foods, mask, toilet paper, disinfectants and gargling solutions.²⁰

3.2 Impact of Interventions

To identify the causal impact of the interventions, we estimate intention-to-treat effects.²¹ In particular, we compare the treatment groups with a control group irrespective of whether the intervention flyers were viewed.

The estimation model is

$$Y_i = \alpha + \beta_1 T_g + \beta_2 X_i + \delta_b + \epsilon_i$$

where the outcome Y_i is a dummy for a relevant outcome, and T_i denotes the treatment group dummies ($g =$

²⁰ We include gargling solutions as a falsification test. Hirofumi Yoshimura, the governor of Osaka Prefecture, spread fake news in August 2020 that the use of gargles containing povidone-iodine would result in a negative PCR test. While he corrected his statement soon afterwards, this triggered panic buying.

²¹ The ITT estimates the mean of the outcome variables of all those assigned to the treatment and compares it to the mean of the outcome for those who were assigned to the comparison group (Glennester and Takavarasha, 2013).

A, B, C, and D). In line with McKenzie (2012), we also include the socioeconomic characteristics measured at the baseline. The estimations also control for branch-specific factors by δ_b . The parameter of interest (ITT effect) is β_1 . Standard errors are clustered at branch level.

As we examine various outcomes, we conduct multiple-hypothesis testing. Following Anderson (2008), we use the Benjamini-Hochberg step-up method and report q -values, which are the smallest alpha values at which the null is rejected. We also limit the sample to those who answered that they read all or some parts of the flyers.

3.3 Changes in Quantity Stockpiled

We also investigate whether the interventions influence the change in storage quantities between the baseline and endline. In particular, we estimate

$$Diff_i = \alpha + \beta_1 Level_c + \beta_2 T_g + \beta_3 Level_c \times T_g + \beta_4 X_i + \epsilon_i$$

where $Diff_i$ is a difference in the number of affordable days for which a respondent stores each item. $LEVEL_c$ is a dummy of baseline storage level in the following categories: a) less than one day, b) 2 – 3 days, c) 4 – 7 days, d) 1 – 2 weeks, e) 2 weeks or more. T_i denotes the treatment groups. The coefficient β_3 captures heterogenous impacts across groups, if any. Standard errors are clustered at the branch level.

4. Results

4.1 Determinants of Excessive Buying

Table 9 reports the estimation results of the determinants of excessive buying. Column 1 shows that an increase in household size significantly increases the probability of having lined up at a store by 0.011. It is noticeable that those who have anxiety about goods being unavailable are significantly more likely to exhibit excessive buying behaviors (Columns 1 – 5). These results are in line with Sakamoto et al, (2021), and robust to controlling for multiple hypothesis testing. Columns 2 – 3 shows that people with full- or part-time jobs visited multiple stores and bought additional goods even if they already had enough. Income is also significantly correlated: one-million yen increase in income increases the probability of excessive buying by 0.008 to 0.01 (Columns 2 – 5). These results are in line with Wang et al. (2020), Bentall et al. (2021) and Yoshino (2021). A

respondent with a child/children under 18 years old is less likely to buy additional items nor for those who live away from them by 0.050 and 0.086, respectively (Columns 3 – 4). This is not surprising as anecdotal evidence at the study site reveals that people often shipped face masks and disinfection items to their adult children (older than 18 years) living in large cities such as Tokyo and Osaka, where these items were reported to be in short supply. Age is significantly negatively correlated (Columns 4 – 5). Taken together, consistent with Wang et al. (2020), Bentall et al. (2021), Sakamoto et al. (2021), Yoshino (2021) and Kikuchi et al. (2023), the results are intuitive in the sense that younger, richer, and more anxious people with jobs and larger families (but not with children under 18) were more likely to exhibit excessive buying. These results are robust to controlling for multiple hypothesis testing. We do not observe significant results for house size (square meters), percentage of pre-COVID co-op purchases or educational background.

Tables 10 and 11 present the results of item-wise purchase behavior. Columns 1 and 3 in Table 10 show that younger respondents bought noodles and pasta significantly more than usual, but this is not significant after controlling multiple hypothesis testing. The results also report that people with larger families are more likely to buy noodles and pasta compared to pre-COVID levels probably due to increased demand as more people stay at home (Columns 1 and 3). People who use coops tend buy more rice (Column 2). This might be because members benefit from co-op deliveries delivering heavy items such as rice during shelter-in-place. This is robust to controlling multiple hypothesis testing. Consistent with the results above and Lehberger et al. (2021), anxiety is significantly correlated with item-wise excessive purchase (Columns 1 - 7). The results are robust to controlling hypothesis testing. Living with children under 18 years old increases the probability of buying frozen food by 0.127 (Column 6). Table 11 shows similar results, but female respondents are more likely to buy face masks and toilet paper. While many of other socio-economic characteristics are not significantly associated, anxiety is significantly associated with buying more toilet paper. These results are consistent with earlier studies such as Yamamura and Tsutsui (2022) that females are more likely to feel anxiety than males and robust to controlling hypothesis testing. In Column 4 of Table 11, we find income are significantly associated with buying gargling solutions, but the results are not robust to controlling hypothesis testing. Again, we do not observe significant results for house size (square meters), percentage of pre-COVID co-op purchases or educational background.

4.2 Outcomes: Awareness, Knowledge and Skills

Table 12 reports the estimation results of the awareness and knowledge outcomes. Each row shows the estimated ITT effects for the corresponding dependent variables for full sample and subsample (those who answered that they read all or some parts of the flyers). All estimations in Tables 12 and 13 control for corresponding baseline variables, age, sex, household size, schooling, dummies variables for child(ren), income, occupation, and branch.

Row a. shows that the respondents in Group A are significantly more likely to realize that their house is cluttered by 0.037 points. The estimated coefficient is larger for the subsample. The estimated coefficients are generally larger for Group A, but not always significant. Rows b. and c. report that individuals in Group A and B are significantly more likely to claim that they have difficulties in organizing. As people who collect or hoard frequently do not see it as a problem, the intervention seems to contribute to increased awareness. As Prochaska and Velicer (1997) discuss, individuals in the Precontemplation Stage are often stuck in the first place, left underinformed or unmotivated. However, our intervention seems to increase awareness and knowledge. We also find that people in Group C are *less* likely to answer that they cannot discard many items (row. d). Rows g. and h. show that treated respondents are more likely to feel that they are too busy tidying up or organize, even though they know that their shelves and drawers are full of goods. These effects are robust to controlling hypothesis testing. The significant impact for the treated groups suggests that individuals seem to look back at their floor, shelves and drawers and become aware that they often have too many items that they don't know where they are stored. They also realize that they need some time tidying up the clutter.

Row a. in Table 13 shows that treated individuals in Group A claim that they do not understand the need for stockpiling. The estimated coefficient is significant at 5%, but not robust to hypothesis testing. Row b. reports that treated respondents in the subsample are more likely to feel it useless to prepare for an emergency by 0.018 points. This is significant at 1%. For results in rows c. and d, we do not observe significant effects. We also find that treated respondents in Groups A and C answer that they do not have stockpiling space ready for the family (row. e). Consistent with earlier results, the results indicate that treated people especially in the Contemplation Stage now acknowledge that they need to tidy up but still procrastinate; now they realize that they lack storage space, but they may still feel unmotivated to initiate desirable stockpiling. Again, the estimated coefficients are generally larger for the subsample. The estimated coefficients are generally larger for Group A,

but not always significant. Those who are in Group C are more likely to answer that they cannot bear the expiration dates and replacement in mind by 0.069 (row. f)

We report the impact on knowledge and skills outcomes in Tables 14 and 15.²² The outcomes are designed to correspond to behaviors in the Contemplation and Preparation Stages. While Table 14 presents many insignificant coefficients, the result in row a. shows that all treated groups (A, B and C) significantly gained knowledge on the desirable number of toilet paper stockpiles. The estimated coefficient is generally smaller than those for Group B and C for the full sample even though Group A receives the greatest amount of information, including co-op ads. This may be because respondents in Group A were less attentive to the contents, or they might even incorrectly believe that the flyers were published by the co-op. In fact, the number of correct answers to the quiz is significantly larger for Group B by 0.123 points (row. g).

Table 15 also reports the results for skills and actions for the past three months. Respondents in Group A (subsample) were significantly more likely to buy toilet paper (row. a). However, similar to the previous table, many of the results are insignificant. The result can be interpreted that respondents in the control group also took the relevant actions, perhaps spontaneously. In particular, the table lists that 63.6%, 42.4%, and 38.8% of them respectively decided where to store face masks, checked expiration or best-before dates, and cleaned up their house during shelter-in-place. As the pandemic becomes more prolonged and prevention measures have varied with different variants concurrently, untreated individuals also seemed to manage their storage, leading to smaller impacts.

4.3 Action Outcomes: Changes in Quantity Stockpiled

We further examined whether the interventions change respondents' item-wise storage quantities between the baseline and the endline. Tables 16 and 17 show the results for the full sample.²³ The dependent variable is a change in the number of days a respondent could afford the upkeep of their household members if the relevant items were unavailable. For Table 16, the base category is 2 – 3 days, which is the minimum recommended

²² All estimations in Tables 14 and 15 control for age, sex, household size, schooling, dummies variables for child(ren), income, occupation, and branch. Estimations in Table 15 also control for baseline hoarding behaviors, knowledge and branches dummies.

²³ Other explanatory variables include female, age (10-year categories), income (by 2 million yen), house size (by 20 square meters) and branch dummies.

level of storage listed on the flyer. Panel A of Table 16 shows how respondents changed the quantity of their stockpiles compared to the baseline, irrespective of whether they are treated or not. The panel generally shows that those who used to have fewer stocks increased them while those who used to have many stocks decreased them, implying reversion to the mean.

Column 1 reports that those who had less-than-one-day storage of drinks at the baseline significantly increased it by 0.633 days, while those who stored them for 1 – 2 weeks (median 10.5 days) decreased it by 4.557 days, suggesting that now they now have drinks for 5.943 ($=10.5 - 4.557$) days.²⁴ Most of the estimated coefficients in Panel A are significant at 1% and robust to controlling hypothesis testing. While Wang et al. (2020) find that people generally store food for longer days after the outbreak in China, our results show that the number of stockpiling days has changed in both directions.

Panel B reports the heterogeneity in changes in quantities for the treated individuals. Column 1 shows that treated individuals significantly *increased* their storage, partially cancelling out the reversion to the mean. For example, while untreated individuals who had 1 – 2 weeks-storage decreased it by 4.557 days, treated individuals of the same level of storage *only* decreased it by 3.535 ($= (-4.557) + 1.022$) days. Panel A also shows mean reversion in other columns. However, treated individuals significantly increase the stored quantities, suggesting cancelling out effects (Column 3). Overall, the treated individuals showed significant smaller changes in stockpiles than the controls.

Table 17 presents the results for non-food items. The base category is 2 weeks, which is the recommended level of storage listed on the flyer. Consistent with the results in the previous table, the results in Panel A exhibit reversion to the mean. Column 2 shows that there is no significant change in quantity for face masks between treated and control groups. This can be interpreted that types of face masks to prevent different variants have been changing between when the flyers were handed over and when the endline survey was conducted. Column 3 reports that treated individuals with baseline storage level of 2 – 3 days of disinfectants significantly *increased* storage quantities for disinfectants by 9.796 ($= 6.536 + 3.260$) days. The results suggest that the treated individuals now have larger quantities which is close to the recommended levels. For toilet paper, Panel A

²⁴ The original choices were from the following categories: a) less than one day, b) 2 – 3 days, c) 4 – 7 days, d) 1 – 2 weeks, e) 2 weeks or more. We take median values of each category (0.5 days, 2.5 days, 5.5 days, 10.5 days). Choice e) was treated as 21 days.

implies that respondents stock up additional items and now they keep quantities close to the recommended level, irrespective of whether they are treated or not: 14.517 days ($= 0.5 + 14.017$) days, 11.613 ($= 2.5 + 9.113$) days, 14.825 ($= 5.5 + 9.325$) days and 17.453 ($= 10.5 + 6.953$) days. Columns 5 – 6 present similar results. As a robustness check, we examine different specifications, other definitions of variables and other combinations of explanatory variables. The results of these analyses were found to be robust.

5. Discussion

Our results show that socioeconomic variables such as age, income and household size significantly influence excessive buying during the pandemic even in areas where the number of new cases has not been large, compared to neighboring big cities. The results are largely consistent with findings in the literature such as Bentall et al. (2021), Lehberger et al. (2021) Micalizzi et al. (2021), Sakamoto et al. (2021), Yoshino (2021) and Kikuchi et al. (2023). Also, we find that treated respondents significantly change their behaviors; now they become aware, gain knowledge and skills, and initiate actions toward desirable stockpiling.

The possible underlying mechanism is that treated individuals are more likely to advance to higher stages of Prochaska and Velicer's (1997) model. Table 18 reports percentages of respondents who seem to be in the Action Stage.²⁵ In particular, limiting the sample to those who read all parts of the flyers in Group B, 41.7% were at the Action Stage at the baseline, while 51.8 % of them reach the stage at the endline. The difference is significant at 10%. While Group A receives the greatest amount of information, the findings suggest that compliers in Group B are significantly more likely to reach the Action Stage than those in Group A. This is consistent with the fact that the number of correct answers to the quiz is significantly larger for Group B (Table 14, row. g). Analysis on other potential mechanisms will be dealt with in future work.

It should be noted that the changes in storage quantities are calculated based on self-reported numbers, not actual numbers. Chandon and Wansink (2006) discuss that consumers estimate household inventory levels based on their own (subjective) estimation, not actual inventory levels. Complementing their paper, the results of this

²⁵ We use original answers (in Likert scale) for the following: whether a respondent 1) cannot bear the expiration dates and replacement in mind, 2) do not have stockpiling space ready for family members, 3) do not know what to stockpile, 4) do not know how much to stockpile, 5) do not understand the need for stockpiling, 6) feel it useless to prepare for an emergency. If a respondent chose "3: neither agree nor disagree", "4: disagree", or "5: strongly disagree" to all 6 questions, he/she is categorized as being in the Action Stage.

study suggest that raising awareness, gaining knowledge and skills would correct people's self-estimation, thus assisting them not to panic buy.

6. Conclusion

While changing habitual behaviors such as excessive buying or hoarding large quantities is not easy, our empirical analysis provides evidence that multifaceted intervention induces people to look back at their shelves and think about what and how much they should have in their stockpile. Also, the results of this study show that treated individuals significantly adjusted stockpiling quantities in response to the interventions. Our findings further suggest that treated individuals become resilient and better prepared to avoid panic buying and, more broadly, in various types of emergencies, including natural disasters.

References

- Ahmadi, I., Habel, J., Jia, M., Lee, N., Wei, S. (2021) “Consumer Stockpiling Across Cultures During the COVID-19 Pandemic.” *Journal of International Marketing*, 1-10. DOI:10.1177/1069031X211037590
- Amaral, N. B. N., Chang, B., B, Burns, B. (2021) “Understanding Consumer Stockpiling: Insights provided during the COVID-19 Pandemic” *Journal of Consumer Affairs*, 1-26. DOI: 10.1111/joca.12434
- American Psychiatric Association (2013) *Diagnostic and Statistical Manual of Mental Disorders*, 5th Edition. American Psychiatric Association Publishing, Arlington, VA.
- Amuakwa-Mensah et al. (2022) “Stockpiling and food worries: Changing Habits and Choices in the Midst of COVID-19 Pandemic.” *Socio-Economic Planning Sciences*, Vol. 82, Part A, 101181. DOI: 10.1016/j.seps.2021.101181
- Anderson, M. L. 2008. “Multiple Inference and Gender Differences in the Effects of Early Intervention: A Reevaluation of the Abecedarian, Perry Preschool, and Early Training Projects.” *Journal of the American Statistical Association*, 103(484): 1481-1495 DOI:10.1198/016214508000000841
- Baker, S. R., Farrokhnia, R. A., Meyer, S., Pagel, M., Yannelis, C. (2020) “How Does Household Spending Respond to an Epidemic? Consumption during the 2020 COVID-19 Pandemic.” *The Review of Asset Pricing Studies*, 10(4): 834–862. DOI:10.1093/rapstu/raaa009
- BBC (2020) “Coronavirus Panic: Why Are People Stockpiling Toilet Paper?” <https://www.bbc.com/news/world-australia-51731422> (accessed on February 9, 2023)
- Bentall, R. P., Lloyd, A., Bennett, K., McKay, R., Mason, L. Murphy, J., McBride, O., Hartman, T. K., Gibson-Miller, J., Levita, L., Martinez, A. P., Stocks, T. V. A., Butter, S., Vallières, F., Hyland, P., Karatzias, T., Shevlin, M. (2021) “Pandemic Buying: Testing a Psychological Model of Over-purchasing and Panic Buying Using Data from the United Kingdom and the Republic of Ireland during the Early phase of the COVID-19 Pandemic.” *PLOS ONE* 16(1). DOI: 10.1371/journal.pone.0246339
- Brodeur, A., Gray, D., Islam, A., Bhuiyan, S. (2021) “A Literature Review of the Economics of COVID-19.” *Journal of Economic Surveys*. Vol. 35:4, 1007-1044. DOI: 10.1111/joes.12423
- Bursztyn, L., Rao, A., Roth, C., Yanagizawa-Drott, D. (2020) “Misinformation during a Pandemic” *NBER Working Paper* No. 27417. DOI:10.3386/w27417

Cato, S. Iida, T., Ishida K., Ito A., Katsumata H., McElwain K. M., Shoji, M. (2021) “The Bright and Dark sides of Social Media Usage during the COVID-19 Pandemic: Survey Evidence from Japan.” *International Journal of Disaster Risk Reduction*, 54: 102034 DOI: 10.1016/j.ijdrr.2020.102034

Chandon, P., Wansink, B. (2006) “How Biased Household Inventory Estimates Distort Shopping and Storage Decisions.” *Journal of Marketing*, 70:118-135. DOI:10.1509/jmkg.70.4.118

CNN (2020) “Panic Buying is Forcing Supermarkets to Ration Food and Other Supplies” <https://edition.cnn.com/2020/03/18/business/supermarkets-rationing-coronavirus/index.html> (accessed on February 9, 2023)

The Guardian (2020) “Off Our Trolleys: What Stockpiling in the Coronavirus Crisis Reveals about Us” <https://www.theguardian.com/news/2020/apr/03/off-our-trolleys-what-stockpiling-in-the-coronavirus-crisis-reveals-about-us> (accessed on February 9, 2023)

Ikeuchi, H. (2014) “Why Do They Hoard? Development of a Hoarding Tendency Scale and Examination of the Relationship between Animistic Thinking and Hoarding Behavior.” *Research in Social Psychology*, 30(2): 86-98. DOI:10.14966/jssp.30.2_86. (in Japanese)

Ikeuchi, H. (2017) “The Psychology of Hoarding: Who Hoards? What Do They Hoard? Why Do They Hoard?” *Material Cycles and Waste Management Research*, 28(3): 186-193. DOI:10.14966/jssp.30.2_86. (in Japanese)

Inoue, H., Todo, Y. (2023) “Has Covid-19 Permanently Changed Online Consumption Behavior?” *EPJ Data Science*, 12:1 DOI:10.2139/ssrn.4040973

Japan Association of Life Organizers (2019) “Report on the Implementation of the Survey on Household Food Stocks and Food Losses in Fiscal Year 2008”

J-cast (2020) “Behind the Scenes of Aeon's Massive Display of Toilet Paper, Aiming to ‘Quell the Hoax’ by Making Every Effort in Manufacturing, Distribution, and Sales” <https://www.j-cast.com/2020/03/05381403.html?p=all> (in Japanese, accessed on February 9, 2023)

Kaneda, M., Kubota, S., Tanaka, S. “Who Spent Their COVID-19 Stimulus Payment? Evidence from Personal Finance Software in Japan.” *Japanese Economic Review* 72, 409–437. DOI: 10.1007/s42973-021-00080-0

Kawashima, S., Morita, A., Higuchi, T. (2009) “An Analysis on Emergency Food Preparation -Analysis Recent Survey Evidence of Sendai City, Japan.” *Journal of Food System Research*, 16(1): 14-24. DOI:10.5874/jfsr.16.1_14 (in Japanese)

- Kikuchi, J., Nagao, R., Nakazono, Y. (2023) “Expenditure Responses to the COVID-19 Pandemic.” *Japan and the World Economy*, Vol. 65. DOI: 10.1016/j.japwor.2022.101174.
- Konishi, Y., Saito, T., Ishikawa, T., Kanai H., Igei, N. (2022) “How Did Japan Cope with COVID-19? Big Data and Purchasing Behavior” *Asian Economic Papers*, 20(1): 146-167. DOI:10.1162/asep_a_00797
- Konishi, Y., Saito, T., Igei, N., Miyashita, Y., Yamamoto, N. (2023) “Documenting Three Years of Daily Life during the COVID-19 Pandemic Using Consumption Big Data” *RIETI Discussion Paper Series 23-J-028*. (in Japanese)
- Kubota, S., Onishi, K., Toyama, Y. (2021) “Consumption Responses to COVID-19 Payments: Evidence from a Natural Experiment and Bank Account Data” *Journal of Economic Behavior & Organization*. Vol. 188: 1-17, DOI: 10.1016/j.jebo.2021.05.006.
- Matsumoto, C. (2019) “Behavior Change Stage Model” Ministry of Health, Labour and Welfare. e-HealthNet. (in Japanese)
- McKenzie, D., Puerto, S. (2021) “Growing Markets through Business Training for Female Entrepreneurs: A Market-Level Randomized Experiment in Kenya” *American Economic Journal: Applied Economics*, 13(2): 297-332. DOI: 10.1257/app.20180340
- Micalizzi, L., Zambrotta, N. S., and Bernstein, M. H. (2021) “Stockpiling in the Time of COVID-19” *British Journal of Health Psychology*, 26, 535–543. DOI: 10.1111/bjhp.12480
- Morein-Zamir, S., Kasese, M., Chamberlain, S. R., Trachtenberg, E. (2022) “Elevated Levels of Hoarding in ADHD: A Special Link with Inattention” *Journal of Psychiatric Research*, 145: 167-174. DOI: 10.1016/j.jpsychires.2021.12.024
- National Consumer Affairs Center of Japan (2020) “Summary of Consumer Consultation Cases on the COVID-19 (to August 2020)” (in Japanese)
- National Health Service, UK (2022) <https://www.nhs.uk/mental-health/conditions/hoarding-disorder/#:~:text=A%20hoarding%20disorder%20is%20where,little%20or%20no%20monetary%20value> (accessed on February 9, 2023)
- Nippon.com (2019) “Advice on Emergency Stockpiles” <https://www.nippon.com/en/guide-to-japan/gu016003/> (accessed on February 9, 2023)
- Prochaska, J.O., Velicer, W. F. (1997) “The Transtheoretical Model of Health Behavior Change.” *American Journal of Health Promotion*, 12(1), 38-48. DOI: 10.4278/0890-1171-12.1.38

Reuters (2022) “Hong Kong Retail Chains Ration Staples to Curb COVID Panic Buying” <https://www.reuters.com/business/healthcare-pharmaceuticals/hong-kong-retail-chains-ration-staples-curb-covid-panic-buying-2022-03-04/> (accessed on February 9, 2023)

Sakamoto, Y. (2021) “Consumer Education in Home Economics for 18-Year-Olds Attaining Adulthood: An Empirical Analysis of the Factors Influencing Consumer Trouble” *Journal of the Japan Association of Home Economics Education*, 63 (4), 215-224. DOI: 10.11549/jjahee.63.4_215

Sakamoto, Y., Matsuda, A., Inakura, N. (2021a) “Purchase Behavior during the Outbreak of the COVID-19 and Consumer Troubles: Implications for Consumer Education” *Research Discussion Paper No.2*. International Consumer Policy Research Center, Consumer Affairs Agency, Japan. (in Japanese)

Sakamoto, Y., Takeuchi, M., Fujiwara, Y., Imashiba, T. (2021b) “Research Report on Consumer Education for Clothing Loss Reduction” Naruto University of Education.

The Sankei Shimbun (2020) “Deputy Director-General Okada Urges People Not to Buy up Toilet paper” <https://www.sankei.com/article/20200228-66NHNZ64IZIADJ42A4HOEZIDBQ/> (in Japanese, accessed on February 9, 2023).

Sekiguchi, T., Hayashi, N., Terada, Y., Ooue, M., Sugino, H. (2022) “Purchasing Behavior and Awareness during COVID-19-related Panic Buying - A Case Study Conducted in Three Japanese Cities” *International Review for Spatial Planning and Sustainable Development, A: Planning Strategies and Design Concepts*, 10(2): 1-18. (in Japanese)

Statistics Bureau of Japan (2015) “National Census” Government of Japan.

Ueda, K., Watanabe, K., and Watanabe, T. (2021) “Household Inventory, Temporary Sales, and Price Indices.” *CARF Working Paper*; CARF-F-520.

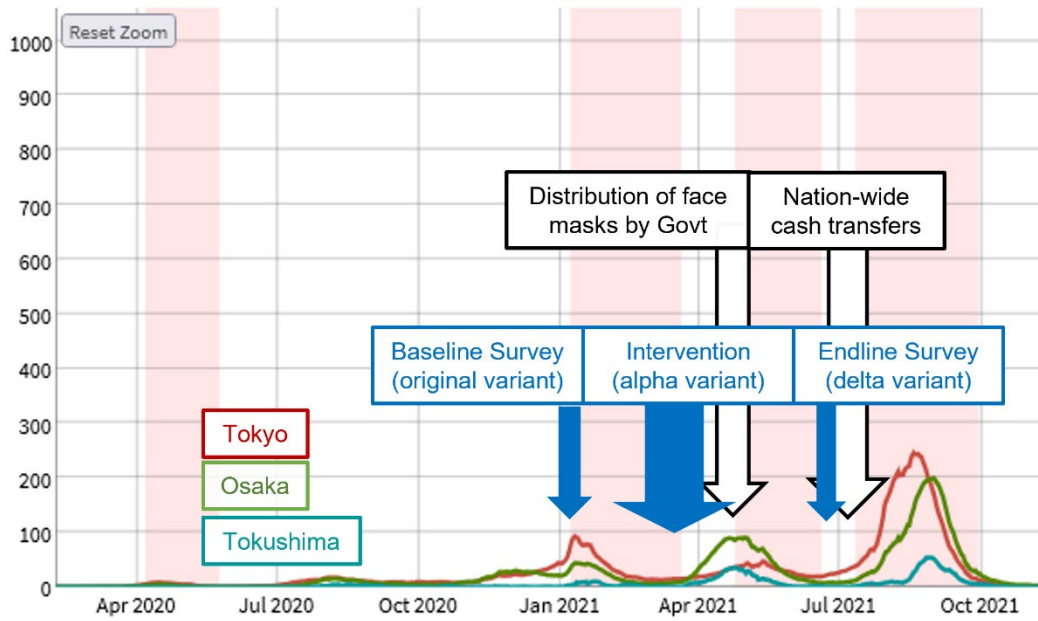
Wang, E., An, N., Gao, Z., Kiprop, E., and Geng, X. (2020) “Consumer food stockpiling behavior and willingness to pay for food reserves in COVID-19” *Food Security*, 12:739–747. DOI:10.1007/s12571-020-01092-1

Watanabe, T., Omori, Y. (2021) “Online Consumption During and After the COVID-19 Pandemic: Evidence from Japan.” *CARF Working Paper*; CARF-F-524.

Yoshino, S., Shimotsukasa, T., Hashimoto, Y., Oshio, A. (2021) “The Association between Personality Traits and Hoarding Behavior during the COVID-19 Pandemic in Japan.” *Personality and Individual Differences*, Vol. 179, 110927. DOI: 10.1016/j.paid.2021.110927

Figure 1: Timeline and Number of new COVID-19 cases

(7-day cumulative, per 100,000 population)



Source: Author based on Real-time Local Information Provider, Tokai University

Note: The light red areas indicate the periods during which states of emergency were declared in Tokyo.

Figure 2: Study Site (1)



Source: Tokushima Prefecture <https://discovertokushima.net/en/accessinfo/>

Figure 3a: Number of New Memberships

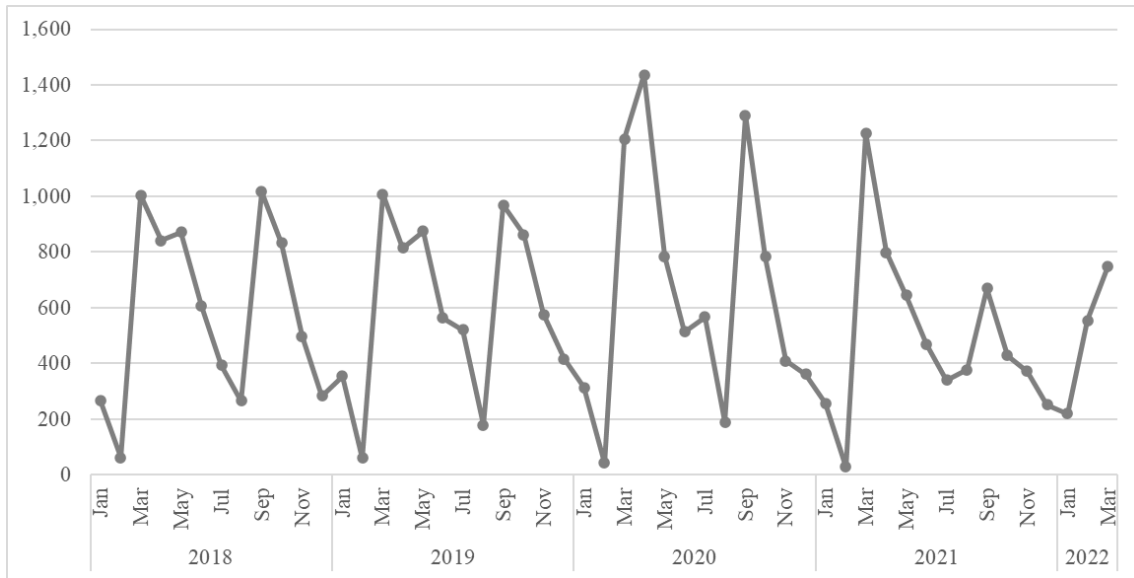
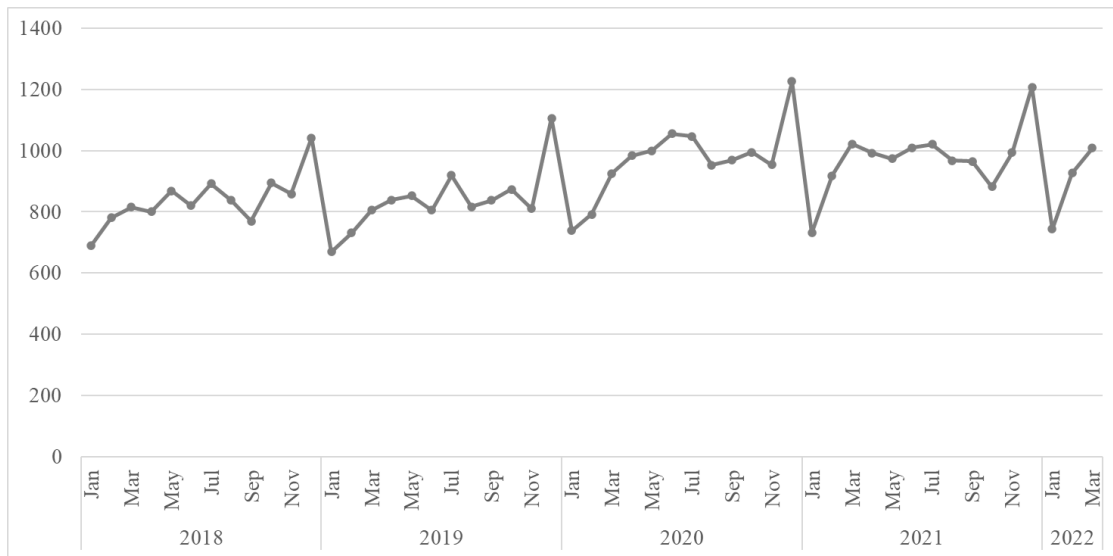
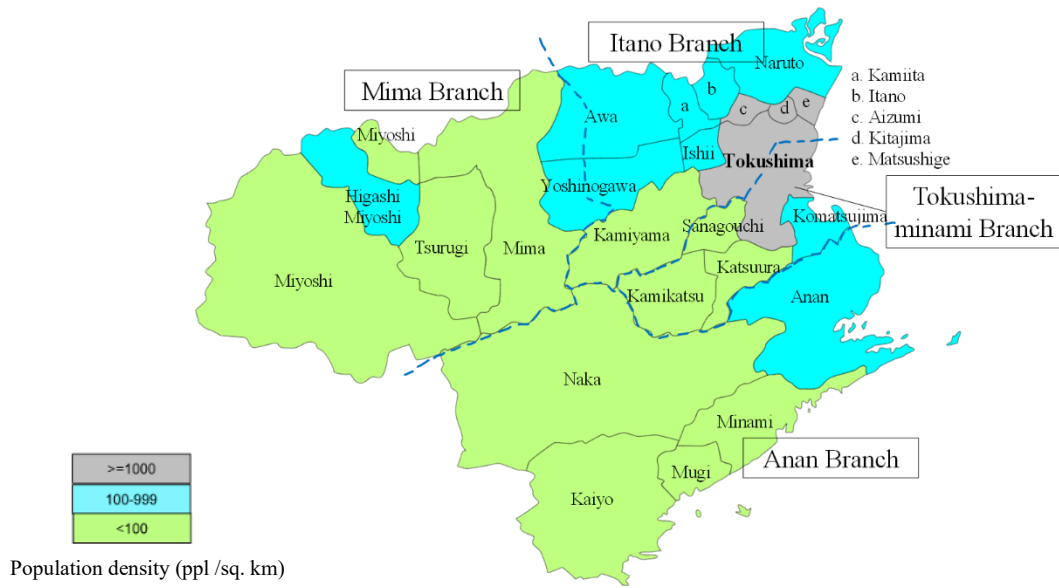


Figure 3b: Monthly Sales (million yen)



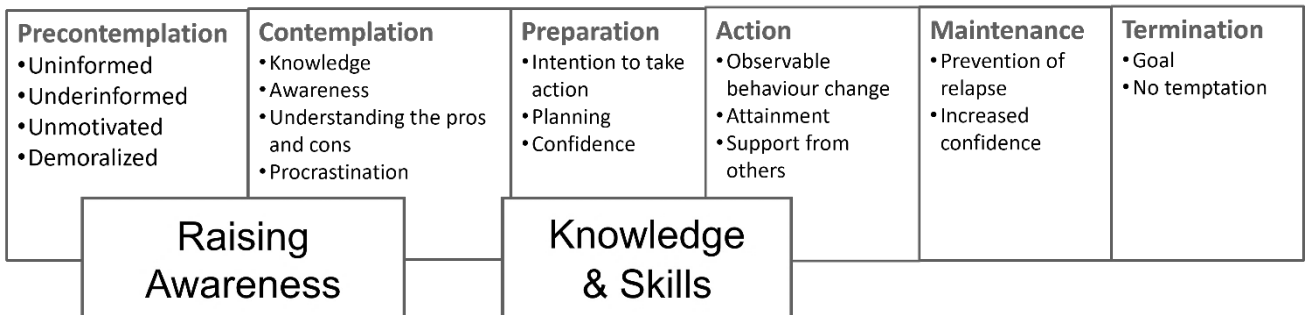
Source: The Tokushima Consumers' Co-operative Society

Figure 4: Study Site (2)



Sources: Statistical Bureau of Japan and The Tokushima Consumers' Co-operative Society.
 The map was created via <https://discovertokushima.net/en/accessinfo/>
https://n.freemap.jp/make/mapComp/20220405_1410533058

Figure 5: Model of Behavior Change



Source: Prochaska and Velicer (1997). Figure by the authors.

Table 1: Details on intervention design

| | Group A | Group B | Group C | Group D (Control) |
|----------------------------|---------|---------|------------|-------------------|
| Awareness & self-diagnosis | Y | Y | Y | |
| Knowledge & skills | Y | Y | | |
| Co-op ads | Y | | | |
| Information from CAA | | Y (#1) | Y (#1& #2) | Y (#1, #2 & #3) |

Table 2: Flyer Details

| Periods | Items featured | Topic | Information from CAA |
|-----------------------------|----------------------------------|------------------------------------|---|
| #1 March 1 – 5, 2021 | Toilet paper & daily necessities | What and how much should be stored | i. Tips on stating opinions ii. Warnings on fraudulent sales iii. Consumer Hotline 188 |
| #2 March 15 – 19, 2021 | Face masks & disinfection items | Where to stockpile | i. Check list on how to not be deceived ii. Warnings on online shopping iii. Consumer Hotline 188 |
| #3 March 29 – April 2, 2021 | Food & drinks | Rolling stock: what & how | i. Warnings on subscription purchases ii. Tips when purchasing online iii. Consumer Hotline 188 |

Table 3: Attrition

| Probit model (marginal effects) | Attrited = 1 |
|--|---------------------|
| <i>Group Dummies</i> | |
| A | 0.007 (0.012) |
| B | -0.008 (0.012) |
| C | 0.008 (0.012) |
| <i>Branch Dummies</i> | |
| Anan | -0.007 (0.014) |
| Tokushima-South | 0.004 (0.013) |
| Itano | 0.021* (0.013) |
| <i>Age (base=50s)</i> | |
| <=29 | 0.147*** (0.029) |
| 30's | 0.086*** (0.016) |
| 40's | 0.046*** (0.015) |
| 60'S | -0.013 (0.013) |
| 70's | 0.004 (0.014) |
| >=80 | 0.057*** (0.019) |
| Obs. | 6,541 |

Table 4: Balance Check in Treatment and Control Groups (1)

| | Group A | Group B | Group C | Group D (Control) | F-test p-value |
|---|------------------|------------------|------------------|----------------------|-------------------|
| <i>Socioeconomic variables</i> | | | | | |
| Age | 58.66 (0.37) | 58.98 (0.37) | 58.51 (0.38) | 58.70 (0.37) | 0.85 |
| Female (dummy) | 0.89 (0.01) | 0.89 (0.01) | 0.90 (0.01) | 0.90 (0.01) | 0.52 |
| HH size | 2.88 (0.03) | 2.96 (0.03) | 2.97 (0.03) | 2.93 (0.03) | 0.18 |
| Child (<18yo) (dummy) | 0.30 (0.01) | 0.29 (0.01) | 0.30 (0.01) | 0.31 (0.01) | 0.64 |
| Income (10,000 yen) | 573.30 (7.34) | 571.70 (7.36) | 563.58 (7.14) | 562.17 (7.24) | 0.62 |
| <i>Occupation</i> | | | | | |
| Full-timer (dummy) | 0.25 (0.01) | 0.26 (0.01) | 0.24 (0.01) | 0.24 (0.01) | 0.40 |
| Part-timer (dummy) | 0.18 (0.01) | 0.20 (0.01) | 0.21 (0.01) | 0.21 (0.01) | 0.26 |
| <i>Co-op purchase (%)</i> | | | | | |
| Prior to COVID-19 (Feb 2020) | 34.60 (0.52) | 35.02 (0.51) | 34.86 (0.50) | 34.13 (0.49) | 0.62 |
| During the Emergency Declaration Period (April-May 2022) | 41.14 (0.55) | 40.72 (0.55) | 40.35 (0.55) | 40.22 (0.54) | 0.64 |
| A month prior to the endline (June 2021) | 39.74 (0.52) | 39.56 (0.52) | 39.66 (0.50) | 39.28 (0.50) | 0.93 |
| <i>School dummies</i> | | | | | |
| Highschool | 0.43 (0.01) | 0.46 (0.01) | 0.45 (0.01) | 0.44 (0.01) | 0.58 |
| Vocational | 0.14 (0.01) | 0.15 (0.01) | 0.15 (0.01) | 0.15 (0.01) | 0.84 |
| Junior college | 0.18 (0.01) | 0.17 (0.01) | 0.18 (0.01) | 0.18 (0.01) | 0.51 |
| University or grad school | 0.25 (0.01) | 0.23 (0.01) | 0.23 (0.01) | 0.23 (0.01) | 0.41 |
| <i>Branches</i> | | | | | |
| Tokushima-South (capital) | 0.28 (0.01) | 0.27 (0.01) | 0.28 (0.01) | 0.27 (0.01) | 0.82 |
| Mima | 0.18 (0.01) | 0.18 (0.01) | 0.17 (0.01) | 0.17 (0.01) | 0.54 |
| Anan | 0.21 (0.01) | 0.25 (0.01) | 0.23 (0.01) | 0.24 (0.01) | 0.06 |
| Itano | 0.32 (0.01) | 0.31 (0.01) | 0.33 (0.01) | 0.32 (0.01) | 0.47 |
| <i>Outcomes</i> | | | | | |
| Flyer viewing (dummy) | 0.563 (0.012) | 0.572 (0.012) | 0.564 (0.012) | 0.531 (0.012) | 0.10 |
| Obs. | 1749 | 1768 | 1700 | 1731 | |

Note: Socioeconomic variables are measured at the baseline. The original choices were from the following categories: a) less than or equal to 3-million-yen, b) 3 to 6 million yen, c) 6 to 9 million yen, d) 9 to 12 million yen, e) 12 to 15 million yen, f) 15 million and above. We take median values for each category except for the last one (3, 4.5, 7.5, 10.5, 13.5 and 15 million yen). Percentages of co-op purchases are the median values of the corresponding categories: a) 80 – 100%, b) 50 -79%, c) 20 – 49%, and d) less than 20%. Flyer viewing dummy takes one if an individual responded that he or she read all or some parts of the flyers. #Correct answers are those to queries about the information provided in the intervention flyers (multiple choice questions, total 6 points): a) how many single regular rolls of toilet paper should be stock up per person? b) for how many days should toilet rolls be stored to survive for an emergency? c) If cloth masks are available, how many boxes of disposable masks should be stored? d) for how many days of food a family should have on hand for an emergency? e) which of the storage method seems unsuitable for small daily items? f) what is the appropriate place to store newly purchased food for stockpiling? Pairwise t-tests for all the variables are conducted and none of the differences are statistically significant from zero.

Table 5: Balance Check in Treatment and Control Groups (2)

| (# days) | Group A | Group B | Group C | Group D (Control) | F-test p-value |
|---------------------------------|-------------------|-------------------|-------------------|----------------------|-------------------|
| <i>Food</i> | | | | | |
| Water & Beverages | 5.960 (0.166) | 5.984 (0.164) | 5.639 (0.166) | 5.495 (0.153) | 0.084* |
| Ready-made staple food | 4.378 (0.116) | 4.743 (0.126) | 4.297 (0.118) | 4.303 (0.111) | 0.021** |
| Rice & dried noodles | 14.041 (0.198) | 14.977 (0.190) | 14.419 (0.198) | 13.986 (0.198) | 0.001*** |
| Canned & frozen foods | 5.780 (0.133) | 5.803 (0.131) | 5.577 (0.131) | 5.601 (0.127) | 0.487 |
| Vegetables & dried foods | 4.754 (0.117) | 4.853 (0.120) | 4.672 (0.117) | 4.873 (0.120) | 0.607 |
| <i>Daily necessities</i> | | | | | |
| Cassette gas cylinders | 6.737 (0.183) | 6.839 (0.186) | 6.666 (0.190) | 6.391 (0.182) | 0.361 |
| Masks | 18.296 (0.136) | 18.455 (0.134) | 18.355 (0.139) | 18.218 (0.137) | 0.653 |
| Disinfectants | 18.001 (0.141) | 18.153 (0.138) | 18.112 (0.142) | 17.915 (0.142) | 0.622 |
| Toilet paper | 17.656 (0.142) | 17.735 (0.141) | 17.805 (0.143) | 17.558 (0.144) | 0.649 |
| Diapers & sanitary pads | 13.807 (0.237) | 14.195 (0.240) | 13.787 (0.243) | 13.648 (0.241) | 0.408 |
| Medication | 14.880 (0.219) | 15.123 (0.206) | 15.115 (0.217) | 14.609 (0.216) | 0.278 |
| Obs. | 1641 | 1672 | 1604 | 1624 | |

Note: The survey asked how many days a respondent could afford the upkeep of his/her household members if the items (listed) become unavailable. The original answers were from the following categories: a) less than one day, b) 2-3 days, c) 4-7 days, d) 1-2 weeks, e) 2 weeks or more. We take median values of each category (0.5 days, 2.5 days, 5.5 days and 10.5days). Choice e) was treated as 21 days. Respondents who chose “not necessary” or “don’t know” were excluded.

Table 6: Summary Statistics (1)

| | Obs | Mean | S.D. | Min | Max |
|--|------------|-------------|-------------|------------|------------|
| <i>Panel A: Socioeconomic variables</i> | | | | | |
| Age | 6,948 | 58.713 | 15.475 | 18 | 97 |
| Female (dummy) | 6,948 | 0.895 | 0.306 | 0 | 1 |
| Household size | 6,912 | 2.936 | 1.396 | 1 | 10 |
| Child (<18yo, dummy) | 6,948 | 0.300 | 0.458 | 0 | 1 |
| Income (10,000 yen) | 6,323 | 567.737 | 289.037 | 300 | 1500 |
| House size (sq. m, median) | 6,017 | 118.129 | 61.672 | 30 | 250 |
| Full-time job (dummy) | 6,891 | 0.237 | 0.425 | 0 | 1 |
| Part-time job (dummy) | 6,648 | 0.199 | 0.400 | 0 | 1 |
| Highschool graduate (dummy) | 6,898 | 0.441 | 0.497 | 0 | 1 |
| Vocational school graduate (dummy) | 6,898 | 0.146 | 0.354 | 0 | 1 |
| Junior college graduate (dummy) | 6,898 | 0.176 | 0.381 | 0 | 1 |
| College/grad school graduate (dummy) | 6,898 | 0.232 | 0.422 | 0 | 1 |
| <i>Panel B: Percentage of co-op purchases</i> | | | | | |
| Before the pandemic (Feb 2020) | 6,833 | 34.652 | 20.897 | 6,833 | 34.7 |
| During the emergency declaration (Apr - May, 2020) | 6,856 | 40.610 | 22.678 | 6,856 | 40.6 |
| Month before the endline (Dec 2020) | 6,860 | 39.557 | 21.161 | 6,860 | 39.6 |
| <i>Panel C: Outcomes</i> | | | | | |
| Flyer viewing (dummy) | 6,541 | 0.558 | 0.497 | 0 | 1 |

Note: Socioeconomic variables are measured at the baseline. The original choices were from the following categories: a) less than or equal to 3 million yen, b) 3 to 6 million yen, c) 6 to 9 million yen, d) 9 to 12 million yen, e) 12 to 15 million yen, f) 15 million and above. We take median values for each category except for the last one (3, 4.5, 7.5, 10.5, 13.5, and 15 million yen). Percentages of co-op purchases are the median values of the corresponding choices: a) 80 – 100%, b) 50 – 79%, c) 20 – 49%, d) less than 20%. Flyer viewing dummy takes one if an individual responded that s/he read all or at least some parts of the flyer.

Table 7: Summary Statistics (2)

| Quantity stockpiled for family (# days) | Obs | Mean | SD | Min | Max |
|--|------------|-------------|-----------|------------|------------|
| <i>Food</i> | | | | | |
| Water & Beverages | 6,335 | 5.810 | 6.303 | 0.5 | 21 |
| Ready-made staple food | 6,641 | 4.472 | 4.730 | 0.5 | 21 |
| Rice & dried noodles | 6,669 | 14.422 | 7.768 | 0.5 | 21 |
| Canned & frozen foods | 6,733 | 5.771 | 5.286 | 0.5 | 21 |
| Vegetables & dried foods | 6,696 | 4.832 | 4.761 | 0.5 | 21 |
| <i>Daily necessities</i> | | | | | |
| Cassette gas cylinders | 6,263 | 6.697 | 7.139 | 0.5 | 21 |
| Face Masks | 6,757 | 18.324 | 5.449 | 0.5 | 21 |
| Disinfectants | 6,750 | 18.064 | 5.600 | 0.5 | 21 |
| Toilet paper | 6,792 | 17.699 | 5.703 | 0.5 | 21 |
| Diapers & sanitary napkins | 4,751 | 13.844 | 8.099 | 0.5 | 21 |
| Medication | 5,718 | 15.008 | 7.830 | 0.5 | 21 |

Note: The survey asked how many days a respondent could afford the upkeep of his/her household members if the items (listed) become unavailable. The original choices were from the following categories: a) less than one day, b) 2-3 days, c) 4- 7 days, d) 1-2 weeks, e) 2 weeks or more. We take median value of each category (0.5 days, 2.5 days, 5.5 days, 10.5 days). Choice e) was treated as 21 days. Respondents who chose “not necessary” or “don’t know” were excluded.

Table 8: Summary of Excessive Buying

| <i>At the time of the 1st emergency declaration (Apr – May 2021), did you ...</i> | Obs | Mean | Std. Dev. |
|--|------------|-------------|------------------|
| (1) line up at a store before opening hours? | 6,744 | 0.054 | 0.225 |
| (2) visit multiple stores? | 6,761 | 0.255 | 0.436 |
| (3) buy additional goods even if you already had enough? | 6,770 | 0.316 | 0.465 |
| (4) buy items for your family, relatives, & friends, even those who live far away? | 6,742 | 0.145 | 0.352 |
| (5) buy items via a marketplace app or SNS? | 6,719 | 0.064 | 0.246 |

Note: Yes, if more than 2 times.

Table 9: Determinants of Excessive Buying

| | (1) | (2) | (3) | (4) | (5) |
|--------------------------------|---------------------------------|---------------------------------|----------------------------------|----------------------------------|----------------------------------|
| Socioeconomic variables | | | | | |
| Age | -0.001 (0.275) [0.353] | -0.002 (0.111) [0.216] | -0.003 (0.063)* [0.134] | -0.002 (0.014)** [0.046]** | -0.001 (0.018)** [0.055]** |
| Female | -0.009 (0.698) [0.651] | 0.009 (0.745) [0.651] | 0.073 (0.084)* [0.171] | 0.019 (0.144) [0.264] | 0.002 (0.883) [0.672] |
| HH size | 0.011 (0.100)* [0.197] | 0.021 (0.024)** [0.070]* | 0.022 (0.006)** [0.031]** | -0.002 (0.761) [0.651] | 0.006 (0.320) [0.376] |
| Child (<18 yo, dummy) | -0.021 (0.244) [0.329] | -0.011 (0.518) [0.522] | -0.050 (0.005)** [0.029]** | -0.086 (0.002)** [0.015]** | -0.034 (0.199) [0.311] |
| Income (million yen) | -0.002 (0.157) [0.274] | 0.008 (0.005)** [0.029]** | 0.011 (0.032)** [0.082]* | 0.010 (0.008)** [0.033]** | 0.007 (0.008)** [0.033]** |
| % Co-op purchase | 0.0003 (0.356) [0.426] | -0.0006 (0.179) [0.287] | 0.0001 (0.779) [0.651] | -0.0001 (0.719) [0.651] | -0.000003 (0.985) [0.681] |
| House (sq. m) | -0.00004 (0.454) [0.490] | -0.00007 (0.586) [0.572] | -0.0002 (0.114) [0.216] | 0.00002 (0.836) [0.664] | -0.00006 (0.398) [0.476] |
| Full-timer | 0.019 (0.216) [0.324] | 0.048 (0.081)* [0.170] | 0.075 (0.034)** [0.084]* | 0.051 (0.095)* [0.191] | 0.020 (0.252) [0.329] |
| Part-timer | -0.003 (0.408) [0.480] | 0.066 (0.007)** [0.032]** | 0.076 (0.002)** [0.015]** | 0.037 (0.172) [0.286] | 0.007 (0.467) [0.494] |
| Anxiety | 0.027 (0.007)** [0.032]** | 0.126 (0.006)** [0.031]** | 0.113 (0.002)** [0.015]** | 0.070 (0.001)** [0.013]** | 0.032 (0.031)** [0.082]** |
| School dummies | | | | | |
| Highschool | -0.009 (0.896) [0.672] | 0.117 (0.293) [0.370] | 0.166 (0.131) [0.242] | 0.092 (0.247) [0.329] | 0.002 (0.972) [0.681] |
| Vocational school | -0.020 (0.787) [0.651] | 0.077 (0.453) [0.490] | 0.133 (0.226) [0.324] | 0.081 (0.250) [0.329] | -0.020 (0.767) [0.651] |
| Junior college | -0.007 (0.917) [0.681] | 0.150 (0.219) [0.324] | 0.203 (0.149) [0.268] | 0.093 (0.236) [0.329] | 0.011 (0.869) [0.672] |
| University or grad school | -0.021 (0.772) [0.651] | 0.112 (0.311) [0.370] | 0.161 (0.159) [0.274] | 0.053 (0.440) [0.490] | -0.009 (0.890) [0.672] |
| Obs. | 5116 | 5128 | 5133 | 5122 | 5107 |

Notes: p-values are in parentheses. q-values are in brackets. The dependent variables take 1 if one of the following happened more than twice. "At the time of the 1st emergency declaration (Apr – May 2021), did you (1) line up at a store before opening hours? (2) visit multiple stores? (3) buy additional goods even if you already had enough? (4) buy items for your family, relatives, friends, even those who live far away? (5) buy items via a marketplace app or SNS. The dependent variables take 1 if each happened more than twice. Income (10,000 yen) includes median values of each category. % Co-op purchase is asked for the average value prior to COVID-19. Anxiety variables take 1 if respondents answer they have anxiety about food or daily necessities not being available. Standard errors are clustered at the branch level and reported in parentheses. *p < 0.1 **p < 0.05, ***p < 0.01.

Table 10: Excessive Buying of Food

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|--------------------------------|-----------------------------------|----------------------------------|----------------------------------|-------------------------------|-------------------------------|---------------------------------|---------------------------------|
| | Noodles | Rice | Pasta | Pancake mix | Pre-packaged | Frozen food | Perishable food |
| <i>Socioeconomic variables</i> | | | | | | | |
| Age | -0.002 (0.064)* [0.235] | -0.00002 (0.974) [1.000] | -0.002 (0.042)** [0.195] | -0.0002 (0.465) [0.698] | 0.0005 (0.363) [0.610] | 0.001 (0.099)* [0.310] | 0.001 (0.215) [0.475] |
| Female | 0.013 (0.445) [0.676] | 0.015 (0.151) [0.359] | 0.044 (0.049)** [0.219] | 0.020 (0.311) [0.576] | 0.010 (0.641) [0.926] | 0.063 (0.027)** [0.138] | 0.004 (0.589) [0.870] |
| HH size | 0.038 (0.005)*** [0.052]* | 0.003 (0.181) [0.410] | 0.018 (0.003)*** [0.046]** | 0.027 (0.060)* [0.233] | 0.002 (0.604) [0.888] | -0.009 (0.133) [0.349] | 0.002 (0.491) [0.727] |
| Child (<18yo) (dummy) | 0.051 (0.131) [0.349] | 0.021 (0.227) [0.481] | 0.067 (0.078)* [0.257] | 0.057 (0.114) [0.322] | 0.056 (0.146) [0.359] | 0.127 (0.011)** [0.084]* | 0.033 (0.057)* [0.231] |
| Income (million yen) | 0.0005 (0.826) [1.000] | 0.001 (0.106) [0.313] | 0.003 (0.006)*** [0.057]* | -0.0001 (0.968) [1.000] | -0.002 (0.148) [0.359] | -0.002 (0.387) [0.610] | 0.0005 (0.294) [0.573] |
| House (sq. m) | -0.0001 (0.312) [0.576] | -0.0001 (0.095)* [0.307] | -0.0001 (0.294) [0.573] | -0.0001 (0.191) [0.428] | -0.0001 (0.393) [0.610] | 0.0001 (0.070)* [0.241] | 0.0001 (0.543) [0.794] |
| % Co-op purchase | -0.0001 (0.851) [1.000] | 0.0006 (0.007)*** [0.061]* | 0.0001 (0.785) [1.000] | 0.0002 (0.311) [0.576] | 0.0004 (0.165) [0.385] | 0.0007 (0.026)** [0.138] | 0.0001 (0.736) [0.960] |
| Full-timer | -0.022 (0.056)* [0.231] | -0.020 (0.343) [0.590] | -0.002 (0.922) [1.000] | 0.010 (0.492) [0.727] | -0.025 (0.399) [0.610] | -0.031 (0.076)* [0.255] | -0.024 (0.044)** [0.200] |
| Part-timer | 0.002 (0.909) [1.000] | -0.012 (0.143) [0.359] | 0.023 (0.401) [0.610] | 0.010 (0.634) [0.926] | -0.021 (0.309) [0.576] | -0.022 (0.269) [0.555] | -0.030 (0.015)** [0.098]* |
| <i>Anxiety</i> | 0.077 (0.000)*** [0.001]*** | 0.055 (0.002)*** [0.037]** | 0.056 (0.011)** [0.084]* | 0.053 (0.052)* [0.224] | 0.070 (0.062)* [0.233] | 0.089 (0.005)*** [0.052]* | 0.044 (0.024)** [0.133] |
| <i>School dummies</i> | | | | | | | |
| Highschool | -0.003 (0.985) [1.000] | -0.028 (0.708) [0.936] | -0.009 (0.913) [1.000] | -0.019 (0.843) [1.000] | -0.001 (0.997) [1.000] | 0.066 (0.676) [0.936] | -0.015 (0.843) [1.000] |
| Vocational School | -0.014 (0.915) [1.000] | -0.022 (0.791) [1.000] | 0.017 (0.822) [1.000] | 0.008 (0.933) [1.000] | 0.039 (0.822) [1.000] | 0.065 (0.698) [0.936] | -0.004 (0.962) [1.000] |
| Junior college | 0.008 (0.948) [1.000] | -0.022 (0.787) [1.000] | 0.006 (0.940) [1.000] | 0.015 (0.856) [1.000] | 0.059 (0.711) [0.936] | 0.055 (0.710) [0.936] | -0.019 (0.793) [1.000] |
| University or grad school | -0.014 (0.912) [1.000] | -0.031 (0.719) [0.938] | 0.031 (0.659) [0.931] | 0.017 (0.852) [1.000] | 0.050 (0.759) [1.000] | 0.070 (0.652) [0.928] | -0.006 (0.939) [1.000] |
| Obs | 5151 | 5138 | 5120 | 5123 | 5147 | 5172 | 5140 |

Notes: p-values are in parentheses. q-values are in brackets. Income (10,000 yen) includes median values of each category. % Co-op purchase is asked for the average value prior to COVID-19. Anxiety variables take 1 if respondents answer they have anxiety about goods not being available. Other explanatory variables include branch dummies. Standard errors are clustered at branch level and reported in parentheses. *p < 0.1 **p < 0.05, ***p < 0.01.

Table 11: Excessive Buying of Daily Necessities

| | (1) | (2) | (3) | (4) |
|--------------------------------|-------------------------------|---------------------------------|--------------------------------|--------------------------------|
| | Mask | Toilet Paper | Disinfectants | Gargles |
| <i>Socioeconomic variables</i> | | | | |
| Age | 0.002 (0.029)** [0.141] | 0.001 (0.342) [0.590] | 0.002 (0.012)** [0.085]* | 0.001 (0.050)* [0.219] |
| Female | 0.040 (0.016)** [0.101] | 0.037 (0.012)** [0.085]* | 0.048 (0.117) [0.326] | 0.014 (0.153) [0.359] |
| Household size | 0.017 (0.177) [0.404] | 0.012 (0.253) [0.536] | 0.008 (0.539) [0.794] | -0.005 (0.259) [0.541] |
| Child (dummy) | -0.038 (0.120) [0.329] | -0.002 (0.955) [1.000] | -0.026 (0.264) [0.548] | -0.004 (0.821) [1.000] |
| Income (million yen) | 0.006 (0.132) [0.349] | 0.003 (0.335) [0.590] | 0.009 (0.141) [0.359] | 0.0041 (0.035)** [0.168] |
| House (sq. m) | 0.0003 (0.169) [0.391] | 0.00002 (0.887) [1.000] | 0.0002 (0.381) [0.610] | 0.00003 (0.781) [1.000] |
| % Co-op purchase | -0.0008 (0.189) [0.428] | -0.0004 (0.141) [0.359] | -0.0006 (0.275) [0.555] | -0.0001 (0.699) [0.936] |
| Full-timer | 0.024 (0.322) [0.581] | 0.010 (0.678) [0.936] | 0.019 (0.288) [0.572] | -0.004 (0.517) [0.757] |
| Part-timer | 0.006 (0.602) [0.888] | -0.010 (0.564) [0.817] | -0.011 (0.523) [0.763] | -0.023 (0.102) [0.310] |
| <i>Anxiety</i> | 0.046 (0.072)* [0.244] | 0.102 (0.004)*** [0.049]* | 0.036 (0.149) [0.359] | 0.049 (0.104) [0.312] |
| <i>School dummies</i> | | | | |
| Highschool | 0.195 (0.224) [0.479] | 0.056 (0.629) [0.926] | 0.187 (0.335) [0.590] | 0.001 (0.997) [1.000] |
| Vocational School | 0.195 (0.276) [0.555] | 0.038 (0.737) [0.960] | 0.215 (0.299) [0.576] | -0.029 (0.841) [1.000] |
| Junior college | 0.211 (0.202) [0.452] | 0.054 (0.641) [0.926] | 0.216 (0.281) [0.558] | 0.008 (0.955) [1.000] |
| University or grad school | 0.204 (0.221) [0.478] | 0.014 (0.903) [1.000] | 0.220 (0.247) [0.529] | -0.006 (0.966) [1.000] |
| Obs | 5163 | 5171 | 5170 | 5163 |

Notes: p-values are in parentheses. q-values are in brackets. Income (10,000 yen) includes median values of each category. % Co-op purchase is asked for the average value prior to COVID-19. Anxiety variables take 1 if respondents answer they have anxiety about goods not being available. Other explanatory variables include branch dummies. Standard errors are clustered at branch level and reported in parentheses. *p < 0.1 **p < 0.05, ***p < 0.01.

Table 12: Outcome: Awareness and Knowledge (1)

| Dependent variable: Dummy if Yes | BL Mean (SD) | Treatment | | Group A | | Group B | | Group C | |
|--|------------------|-----------------------------------|------------------------------|-------------------------------|------------------------------|-------------------------------|----------------------------------|-------------------------------|---------------------------------|
| | | (1) Full Sample | (2) Sub-sample | (1) Full Sample | (2) Sub-sample | (1) Full Sample | (2) Sub-sample | (1) Full Sample | (2) Sub-sample |
| a. My house is cluttered with many goods. | 0.298 (0.457) | 0.015 (0.278) [0.441] | 0.022 (0.148) [0.324] | 0.037 (0.063)* [0.215] | 0.046 (0.067)* [0.221] | -0.005 (0.752) [0.751] | 0.006 (0.776) [0.761] | 0.012 (0.287) [0.441] | 0.013 (0.553) [0.621] |
| b. There are many goods I don't know how to organize. | 0.274 (0.446) | 0.015 (0.072)* [0.224] | -0.005 (0.767) [0.761] | 0.026 (0.061)* [0.215] | 0.008 (0.661) [0.688] | -0.003 (0.825) [0.775] | -0.014 (0.657) [0.688] | 0.020 (0.248) [0.423] | -0.008 (0.612) [0.662] |
| c. There are many goods that are placed directly on the floor. | 0.324 (0.468) | 0.015 (0.054)* [0.200] | 0.023 (0.109) [0.282] | 0.028 (0.037)** [0.157] | 0.023 (0.453) [0.565] | 0.006 (0.584) [0.650] | 0.033 (0.007)*** [0.044]** | 0.009 (0.607) [0.659] | 0.013 (0.395) [0.545] |
| d. There are many goods that I don't use but cannot discard. | 0.567 (0.496) | 0.006 (0.632) [0.668] | -0.005 (0.794) [0.770] | 0.019 (0.448) [0.565] | 0.021 (0.567) [0.637] | 0.011 (0.243) [0.420] | -0.006 (0.774) [0.761] | -0.011 (0.429) [0.555] | -0.032 (0.019)** [0.100]* |
| e. There are many goods on desks and tables, and I cannot use them when I need. | 0.241 (0.428) | 0.007 (0.396) [0.545] | -0.002 (0.877) [0.822] | 0.001 (0.947) [0.878] | 0.002 (0.959) [0.881] | 0.018 (0.260) [0.432] | 0.006 (0.737) [0.741] | 0.003 (0.830) [0.775] | -0.015 (0.494) [0.591] |
| f. I often don't know where I placed the goods I want to use, or I often lose goods. | 0.261 (0.439) | 0.013 (0.201) [0.379] | 0.008 (0.718) [0.724] | 0.012 (0.330) [0.489] | 0.011 (0.594) [0.650] | 0.009 (0.499) [0.591] | 0.005 (0.851) [0.797] | 0.017 (0.093)* [0.259] | 0.007 (0.794) [0.770] |
| g. I am too busy to tidy up or organizing. | 0.260 (0.439) | 0.022 (0.001)*** [0.010]*** | 0.023 (0.139) [0.317] | 0.014 (0.043)** [0.170] | 0.012 (0.455) [0.565] | 0.027 (0.022)** [0.111] | 0.033 (0.191) [0.368] | 0.025 (0.041)** [0.170] | 0.026 (0.189) [0.367] |
| h. There are many shelves and drawers full of goods. | 0.446 (0.497) | 0.018 (0.004)*** [0.027]** | 0.025 (0.372) [0.529] | 0.027 (0.049)** [0.182] | 0.050 (0.165) [0.338] | 0.017 (0.154) [0.327] | 0.030 (0.429) [0.555] | 0.010 (0.349) [0.512] | -0.003 (0.900) [0.849] |

Notes: p-values are in parentheses. q-values are in brackets. For each outcome, the first value is the estimated coefficient. SEs are clustered at branch level. Other explanatory variables include baseline variable, age, sex, household size, child (<18 years old) dummy, income, occupation, schooling, anxiety and branch dummies. * p<0.10 ** p<0.05 *** p<0.01.

Table 13: Outcome: Awareness and Knowledge (2)

| Dependent var: Dummy if Yes | BL Mean (SD) | Treatment | | Group A | | Group B | | Group C | |
|--|------------------|------------------------------|----------------------------------|-------------------------------|--------------------------------|------------------------------|------------------------------|-------------------------------|--------------------------------|
| | | (1) Full Sample | (2) Sub- sample | (1) Full Sample | (2) Sub- sample | (1) Full Sample | (2) Sub- sample | (1) Full Sample | (2) Sub- sample |
| a. Do not understand the need for stockpiling. | 0.159 (0.365) | 0.010 (0.076)* [0.156] | -0.015 (0.156) [0.259] | 0.017 (0.042)** [0.111] | -0.0004 (0.861) [0.799] | 0.007 (0.526) [0.594] | -0.018 (0.290) [0.411] | 0.007 (0.427) [0.513] | -0.028 (0.233) [0.338] |
| b. Feel it useless to prepare for an emergency. | 0.090 (0.286) | 0.007 (0.241) [0.351] | 0.018 (0.003)*** [0.025]** | 0.002 (0.799) [0.759] | 0.015 0.143 [0.250] | 0.007 (0.377) [0.494] | 0.009 (0.403) [0.504] | 0.013 (0.224) [0.329] | 0.030 (0.101) [0.190] |
| c. Do not know what to stockpile. | 0.395 (0.489) | 0.006 (0.827) [0.767] | 0.028 (0.264) [0.387] | -0.002 (0.906) [0.825] | 0.018 (0.305) [0.423] | 0.014 (0.658) [0.695] | 0.026 (0.421) [0.511] | 0.005 0.880 [0.807] | 0.042 (0.302) [0.421] |
| d. Do not know how many to stockpile. | 0.474 (0.499) | 0.006 (0.699) [0.710] | 0.029 (0.343) [0.460] | 0.009 (0.529) [0.594] | 0.032 (0.440) [0.521] | -0.005 (0.698) [0.710] | 0.009 (0.578) [0.636] | -0.005 (0.698) [0.636] | 0.047 (0.274) [0.394] |
| e. Do not have stockpiling space ready for family | 0.306 (0.461) | 0.033 (0.093)* [0.179] | 0.051 (0.086) [0.168] | 0.044 (0.069)* [0.148] | 0.069 (0.027)** [0.084]* | 0.017 (0.550) [0.612] | 0.017 (0.677) [0.697] | 0.038 (0.044)** [0.113] | 0.070 (0.012)** [0.056]* |
| f. Cannot bear the expiration dates and replacement in mind. | 0.538 (0.499) | 0.011 (0.595) [0.641] | 0.050 (0.078) [0.159] | 0.017 (0.679) [0.697] | 0.064 (0.231) [0.337] | -0.002 (0.839) [0.772] | 0.016 (0.397) [0.504] | -0.002 (0.839) [0.318] | 0.069 (0.043)** [0.113] |

Notes: p-values are in parentheses. q-values are in brackets. For each outcome, the first value is the estimated coefficient. SEs are clustered at branch level. Other explanatory variables include baseline variable, age, sex, household size, child (<18 years old) dummy, income, occupation, schooling, anxiety and branch dummies. * p<0.10 ** p<0.05 *** p<0.01.

Table 14: Outcome: Knowledge and Skills

| Dependent var: Dummy if correct | Control mean (SD) | Treatment | | Group A | | Group B | | Group C | |
|--|-------------------|------------------------------|--------------------------------|------------------------------|------------------------------|------------------------------|--------------------------------|-------------------------------|------------------------------|
| | | (1) Full Sample | (2) Sub-sample | (1) Full Sample | (2) Sub-sample | (1) Full Sample | (2) Sub-sample | (1) Full Sample | (2) Sub-sample |
| a. How many rolls of single regular toilet paper should be stockpiled per person? | 0.248 (0.432) | 0.011 (0.189) [0.353] | 0.038 (0.021)** [0.093]* | 0.013 (0.062)* [0.190] | 0.026 (0.099)* [0.247] | 0.015 (0.281) [0.433] | 0.045 (0.028)** [0.117] | 0.006 (0.420) [0.529] | 0.043 (0.070)* [0.202] |
| b. For how many days should toilet paper be stored in order to survive an emergency? | 0.533 (0.499) | -0.004 (0.726) [0.673] | -0.027 (0.292) [0.437] | 0.015 (0.188) [0.353] | -0.005 (0.814) [0.733] | -0.028 (0.239) [0.404] | -0.054 (0.035)** [0.135] | -0.0007 (0.975) [0.529] | -0.022 0.625 [0.625] |
| c. Suppose that you have enough fabric masks. How many boxes of disposable masks you should store? | 0.365 (0.481) | -0.012 (0.513) [0.570] | 0.012 (0.640) [0.625] | -0.026 (0.245) [0.404] | -0.040 (0.232) [0.394] | 0.006 (0.802) [0.722] | 0.032 (0.362) [0.473] | -0.016 (0.426) [0.533] | 0.047 (0.248) [0.404] |
| d. What is the minimum number of days for which you and your family should store for an emergency? | 0.231 (0.422) | -0.008 (0.591) [0.612] | 0.022 (0.125) [0.277] | -0.007 (0.717) [0.666] | 0.018 (0.673) [0.637] | -0.003 (0.870) [0.788] | 0.028 (0.036)** [0.135] | -0.015 (0.341) [0.446] | 0.020 (0.214) [0.380] |
| e. Which of the choices are not adequate to store small daily necessities? | 0.555 (0.497) | 0.020 (0.452) [0.539] | 0.048 (0.174) [0.342] | 0.005 (0.849) [0.776] | 0.036 (0.196) [0.360] | 0.041 (0.078)* [0.220] | 0.058 (0.105) [0.135] | 0.013 (0.684) [0.647] | 0.051 (0.347) [0.463] |
| f. Which of the choices are appropriate to store newly purchased stockpiles? | 0.776 (0.417) | 0.010 (0.340) [0.462] | 0.010 (0.600) [0.616] | 0.011 (0.333) [0.458] | 0.013 (0.556) [0.586] | -0.001 (0.878) [0.792] | 0.005 (0.804) [0.722] | 0.020 (0.125) [0.647] | 0.011 (0.444) [0.537] |
| g. #Correct answers | 2.710 (1.301) | 0.015 (0.772) [0.702] | 0.106 (0.160) [0.319] | 0.011 (0.842) [0.769] | 0.051 (0.419) [0.529] | 0.028 (0.549) [0.585] | 0.123 (0.086)* [0.236] | 0.005 (0.930) [0.838] | 0.147 (0.183) [0.352] |

Notes: For each outcome, the first value is the estimated coefficient. P-values and q-values are in parentheses and brackets, respectively. Correct answers to the questions above a. approximately 4 rolls, b. for more than 4 weeks, c. 1-2 box(es), d. for three days, e. 2 (The choices are: 1. storing them in specific places, 2. storing in many convenient locations, 3. Sorting them out by types of goods, 4. not sure), f. 2 (The choices are: 1. in front of the current food stock, 2. behind current food stock, 3. away from the current food stock, 4. not sure). SEs are clustered at branch level. Other explanatory variables include age, sex, household size, child (<18 years old) dummy, income, occupation, schooling, anxiety, co-op purchase (%) and branch dummies. * p<0.10 ** p<0.05 *** p<0.01.

Table 15: Outcome: Skills and Actions

| <i>For the past three months or so, you..</i> Dependent var: Dummy if Yes | Control mean (SD) | Treatment | | Group A | | Group B | | Group C | |
|--|-------------------------|------------------------------|-------------------------------|------------------------------|--------------------------------|-------------------------------|------------------------------|------------------------------|------------------------------|
| | | (1) Full Sample | (2) Sub- sample | (1) Full Sample | (2) Sub- sample | (1) Full Sample | (2) Sub- sample | (1) Full Sample | (2) Sub- sample |
| a. Bought toilet paper for stockpile. | 0.493 (0.500) | 0.011 (0.632) [0.972] | 0.021 (0.172) [0.415] | 0.015 (0.524) [0.860] | 0.045 (0.010)** [0.090]* | -0.003 (0.901) [1.000] | 0.006 (0.704) [1.000] | 0.023 (0.381) [0.734] | 0.011 (0.659) [1.000] |
| b. Decided where to store face masks. | 0.636 (0.481) | 0.003 (0.810) [1.000] | 0.001 (0.932) [1.000] | 0.002 (0.889) [1.000] | 0.01 (0.715) [1.000] | -0.0007 (0.858) [1.000] | -0.004 (0.918) [1.000] | 0.007 (0.762) [1.000] | -0.002 (0.922) [0.914] |
| c. Thought about what are desirable food stockpiles for your own HH. | 0.274 (0.446) | 0.010 (0.470) [0.808] | 0.032 (0.184) [0.434] | 0.025 (0.116) [0.329] | 0.067 (0.048)** [0.193] | 0.002 (0.936) [1.000] | 0.010 (0.792) [1.000] | 0.003 (0.874) [1.000] | 0.018 (0.459) [0.804] |
| d. Checked whether you store enough daily necessities. | 0.336 (0.472) | 0.021 (0.263) [0.571] | 0.033 (0.416) [0.758] | 0.025 (0.167) [0.408] | 0.046 (0.181) [0.431] | 0.013 (0.576) [0.836] | 0.007 (0.900) [1.000] | 0.026 (0.175) [0.419] | 0.048 (0.266) [0.573] |
| e. Checked expiration or best-before dates. | 0.424 (0.494) | 0.012 (0.364) [0.720] | 0.032 (0.039)** [0.183] | 0.013 (0.117) [0.329] | 0.021 (0.561) [0.894] | 0.023 (0.258) [0.561] | 0.032 (0.339) [0.908] | 0.001 (0.952) [1.000] | 0.042 (0.172) [0.415] |
| f. Thought about where to store what. | 0.280 (0.449) | 0.010 (0.554) [0.893] | 0.011 (0.605) [0.941] | 0.023 (0.170) [0.412] | 0.037 (0.184) [0.434] | 0.011 (0.614) [0.949] | 0.006 (0.884) [1.000] | -0.005 (0.814) [1.000] | -0.012 (0.686) [1.000] |
| g. Used baskets or bags to organize small items. | 0.318 (0.466) | 0.005 (0.736) [1.000] | -0.022 (0.552) [0.893] | 0.009 (0.506) [0.836] | -0.020 (0.571) [0.908] | (0.011) 0.557 [0.893] | -0.013 (0.753) [1.000] | -0.007 (0.609) [0.946] | -0.034 (0.436) [0.792] |
| h. Labelled storage items so that you can easily manage. | 0.160 (0.366) | -0.005 (0.530) [0.862] | 0.002 (0.928) [1.000] | -0.003 (0.787) [1.000] | 0.002 (0.937) [1.000] | -0.002 (0.846) [1.000] | 0.002 (0.901) [1.000] | -0.010 (0.171) [0.414] | 0.003 (0.950) [1.000] |
| i. Cleaned up the house during shelter-in-place. | 0.388 (0.488) | 0.014 (0.514) [0.847] | 0.033 (0.043)** [0.187] | 0.009 (0.710) [1.000] | 0.021 (0.428) [0.775] | 0.022 (0.334) [0.684] | 0.050 (0.079)* [0.261] | 0.022 (0.334) [1.000] | 0.028 (0.471) [0.808] |

Notes: p-values and q-values are in parentheses and brackets, respectively. For each outcome, the first value is the estimated coefficient. SEs are clustered at branch level. Other explanatory variables include baseline variable, age, sex, household size, child dummy, income, occupation, schooling, dummies for hoarding behaviors and knowledge measured at the baseline and for branches. * p<0.10 ** p<0.05 *** p<0.01.

Table 16: Action Outcomes (1)

| Dependent var: Changes in #Days Base Category: 2 -3 days | (1) | (2) | (3) | (4) | (5) |
|--|-------------------------------------|-------------------------------------|--------------------------------------|----------------------------------|--------------------------------------|
| | Water & Beverages | Ready-made staple food | Rice & dried noodles | Canned & frozen foods | Perishables |
| Panel A: Quantity stockpiled at the baseline (# days) | | | | | |
| Less than one day | 0.633 (0.004)*** [0.021]** | 0.820 (0.012)** [0.042]** | -1.024 (0.196) [0.334] | 1.241 (0.031)** [0.090]* | 0.981 (0.044)** [0.113] |
| 4 days - 1 week | -0.608 (0.231) [0.374] | -1.486 (0.010)** [0.039]** | -2.831 (0.011)** [0.041]** | -1.171 (0.057)* [0.135] | -1.465 (0.002)*** [0.013] |
| 1 - 2 weeks | -4.557 (0.0002)*** [0.006]*** | -5.276 (0.006)*** [0.028]** | -5.436 (0.003)*** [0.017]** | -4.452 (0.002)*** [0.013] | -4.792 (0.008)*** [0.034]** |
| More than 2 weeks | -10.306 (0.001)*** [0.011]** | -11.569 (0.001)*** [0.008]*** | -11.674 (0.0001)*** [0.006]*** | -10.669 (0.002)*** [0.013] | -11.152 (0.0004)*** [0.007]*** |
| Panel B: Heterogenous effects across groups | | | | | |
| Treatment | -0.014 (0.867) [0.822] | -0.174 (0.087)* [0.185] | -0.516 (0.270) [0.406] | -0.025 (0.904) [0.834] | -0.083 (0.574) [0.656] |
| (Less than one day) * treated | 0.430 (0.034)** [0.096] | 0.174 (0.358) [0.483] | 3.376 (0.038)** [0.104] | -0.262 (0.211) [0.350] | 0.173 (0.641) [0.691] |
| (4 days - 1 week) * treated | -0.291 (0.469) [0.575] | 0.130 (0.534) [0.621] | 1.662 (0.026)** [0.079]* | -0.131 (0.697) [0.737] | 0.195 (0.249) [0.384] |
| (1 - 2 weeks) * treated | 1.022** (0.047)** [0.117] | 0.919 (0.391) [0.502] | 0.639 (0.474) [0.578] | 0.590 (0.211) [0.350] | 0.733 (0.373) 0.483 |
| (More than 2 weeks) * treated | -0.366 (0.717) [0.737] | -0.45 (0.317) [0.439] | 0.358 (0.525) [0.616] | -0.313 (0.703) [0.737] | 1.215 (0.052)* [0.127] |
| Obs | 5,050 | 5,318 | 5,337 | 5,377 | 5,364 |

Notes: For each outcome, the first value is the estimated coefficient. P-values and q-values are in parentheses and brackets, respectively. The dependent variable is a change in the number of days for which a respondent stores the relevant items, asked both at the baseline and endline. The base category is 2 – 3 days, which is the recommended minimum level of storage listed in the flyer. The original choices were from the following categories: a) less than one day, b) 2 – 3 days, c) 4 – 7 days, d) 1- 2 weeks, e) 2 weeks or more. We take median values of each category (0.5 days, 2.5 days, 5.5 days, 10.5 days). Choice e) was treated as 21 days. Respondents who chose “not necessary” or “don't know” were excluded. Other explanatory variables include female, age (by 10), income (by 2 million yen), house size (by 20 square meters) and branch dummies.

Table 17: Action Outcomes (2)

| Dependent var: Changes in #Days Base Category: 2 weeks | (1) | (2) | (3) | (4) | (5) | (6) |
|--|-------------------------------------|------------------------------------|----------------------------------|------------------------------------|----------------------------------|------------------------------------|
| | Cassette gas cylinders | Face Masks | Disinfectants | Toilet papers | Diapers & sanitary pads | Medication |
| <i>Panel A: Quantity stockpiled at the baseline (# days)</i> | | | | | | |
| Less than one day | 10.796 (0.001)*** [0.008]*** | 13.025 (0.000)*** [0.001]*** | 9.585 (0.001)*** [0.011]** | 14.017 (0.010)** [0.039]** | 9.980 (0.006)*** [0.027]** | 10.489 (0.005)*** [0.023]** |
| 2 - 3 days | 10.978 (0.0004)*** [0.007]*** | 6.546 (0.031)** [0.090]* | 6.536 (0.001)*** [0.011]** | 9.113 (0.016)** [0.054]* | 8.870 (0.001)*** [0.013]** | 10.375 (0.008)*** [0.034]** |
| 4 days - 1 week | 10.04 (0.001)*** [0.011]** | 8.806 (0.000)*** [0.001]*** | 7.709 (0.009)*** [0.035]** | 9.325 (0.0004)*** [0.007]*** | 9.171 (0.003)*** [0.017]** | 9.450 (0.002)*** [0.013]** |
| 1 - 2 weeks | 7.404 (0.001)*** [0.008]*** | 6.612 (0.001)*** [0.013]** | 6.495 (0.001)*** [0.013]** | 6.953 (0.0003)*** [0.007]*** | 6.863 (0.003)*** [0.017]** | 6.964 (0.0002)*** [0.006]*** |
| <i>Panel B: Heterogenous effects across groups</i> | | | | | | |
| Treatment | 0.081 (0.918) [0.836] | -0.259 (0.361) [0.483] | -0.224 (0.282) [0.409] | -0.094 (0.462) [0.574] | -0.374 (0.120) [0.236] | 0.221 (0.361) [0.483] |
| (Less than one day) * treated | 0.110 (0.889) [0.830] | 2.083 (0.103) [0.209] | 3.260 (0.006)*** [0.029]** | -0.819 (0.777) [0.773] | -0.208 (0.822) [0.814] | 0.981 (0.567) [0.653] |
| (2 – 3 days) * treated | -0.126 (0.861) [0.822] | 3.997 (0.122) [0.239] | 3.181 (0.069)* [0.160] | 0.820 (0.669) [0.723] | 1.681 (0.300) [0.428] | -0.553 (0.619) [0.682] |
| (4 days – 1 week) * treated | -0.105 (0.927) [0.836] | 0.298 (0.452) [0.568] | 1.871 (0.318) [0.439] | -0.406 (0.384) [0.497] | 0.048 (0.948) [0.840] | 0.381 (0.708) [0.737] |
| (1 – 2 weeks) * treated | -0.244 (0.742) [0.737] | -0.165 (0.710) [0.737] | -0.159 (0.770) [0.772] | -0.099 (0.863) [0.822] | -0.241 (0.811) [0.803] | -0.354 (0.470) [0.575] |
| Obs | 4,848 | 5,419 | 5,412 | 5,468 | 3,270 | 4,217 |

Notes: For each outcome, the first value is the estimated coefficient. P-values and q-values are in parentheses and brackets, respectively. The dependent variable is a change in the number of days a respondent could afford the upkeep of their household members if the relevant items became unavailable. The base category is 2-3 days, which is the recommended level of storage listed on the flyer. The original choices were from the following categories: a) less than one day, b) 2-3 days, c) 4-7 days, d) 1-2 weeks, e) 2 weeks or more. We take median values of each category (0.5 days, 2.5 days, 5.5 days, 10.5 days). Choice e) was treated as 21 days. Respondents who chose "not necessary" or "don't know" were excluded. Other explanatory variables include age (by 10), income and house size (by 20 square meters).

Table 18: Percentages of individuals in the Action Stage

| Groups | Compliance | Baseline | Endline | Diff. |
|---------------|-------------------|-----------------|----------------|--------------|
| A | Read all | 33.6 | 36.4 | 2.80 |
| | Read some parts | 35.9 | 37.0 | 1.11 |
| | Read very little | 28.2 | 26.6 | -1.66 |
| | Didn't notice | 26.2 | 27.9 | 1.67 |
| B | Read all | 41.7 | 51.8 | 10.07* |
| | Read some parts | 33.9 | 38.9 | 4.97* |
| | Read very little | 27.6 | 32.7 | 5.12 |
| | Didn't notice | 27.2 | 28.5 | 1.26 |
| C | Read all | 41.6 | 47.2 | 5.63 |
| | Read some parts | 32.0 | 34.3 | 2.29 |
| | Read very little | 27.9 | 25.7 | -2.11 |
| | Didn't notice | 28.6 | 29.1 | 0.57 |
| D | Read all | 40.8 | 41.6 | 0.80 |
| | Read some parts | 34.8 | 38.6 | 3.84 |
| | Read very little | 33.7 | 33.7 | 0.00 |
| | Didn't notice | 29.0 | 30.8 | 1.71 |

Note: We use original answers (in Likert scale) for the following: whether a respondent 1) cannot bear the expiration dates and replacement in mind, 2) do not have stockpiling space ready for family, 3) do not know what to stockpile, 4) do not know how many to stockpile, 5) do not understand the need for stockpiling, 6) feel it useless to prepare for an emergency. If a respondent chose "3: neither agree nor disagree", "4: disagree", or "5: strongly disagree" to all the 6 questions, he/she is categorized to be in the Action Stage.

Appendix Table 1: Representativeness

| | Current Sample | | Sakamoto et al. (2021)'s sample | | | | | | | | | | | |
|---------------------------------------|----------------|--------|---------------------------------|--------|---------|--------|--------|---------|-------------|--------|---------|--|--------|---------|
| | | | Total | | | Female | | | Co-op users | | | Areas "not" subject to the 1st emergency declaration | | |
| | Mean | SD | Mean | Diff. | p-value | Mean | Diff. | p-value | Mean | Diff. | p-value | Mean | Diff. | p-value |
| <i>Socioeconomic variables</i> | | | | | | | | | | | | | | |
| Age | 58.71 | 15.47 | 49.88 | 8.84 | [0.000] | 49.90 | 8.81 | [0.000] | 53.77 | 4.94 | [0.000] | 50.40 | 8.31 | [0.000] |
| Household size | 2.94 | 1.40 | 2.65 | 0.28 | [0.000] | 2.64 | 0.30 | [0.000] | 2.96 | -0.03 | [0.593] | 2.71 | 0.23 | [0.000] |
| Income | 567.74 | 289.04 | 625.50 | -57.77 | [0.000] | 605.46 | -37.72 | [0.000] | 659.43 | -91.69 | [0.000] | 608.57 | -40.83 | [0.000] |
| House size (sq. m, median) | 118.13 | 61.67 | 92.47 | 25.66 | [0.000] | 91.34 | 26.79 | [0.000] | 109.06 | 9.07 | [0.001] | 99.12 | 19.00 | [0.000] |
| Child (dummy) | 0.30 | 0.46 | 0.24 | 0.06 | [0.000] | 0.23 | 0.07 | [0.000] | 0.34 | -0.04 | [0.051] | 0.24 | 0.07 | [0.000] |
| Junior college graduate (dummy) | 0.17 | 0.38 | 0.13 | 0.04 | [0.000] | 0.20 | -0.03 | [0.007] | 0.15 | 0.02 | [0.166] | 0.13 | 0.04 | [0.000] |
| Highschool graduate (dummy) | 0.44 | 0.50 | 0.27 | 0.17 | [0.000] | 0.30 | 0.14 | [0.000] | 0.22 | 0.22 | [0.000] | 0.31 | 0.13 | [0.000] |
| College/grad school graduate (dummy) | 0.23 | 0.42 | 0.48 | -0.25 | [0.000] | 0.36 | -0.13 | [0.000] | 0.52 | -0.29 | [0.000] | 0.44 | -0.21 | [0.000] |
| Vocational school graduate (dummy) | 0.15 | 0.35 | 0.12 | 0.03 | [0.000] | 0.15 | 0.00 | [0.984] | 0.11 | 0.04 | [0.016] | 0.12 | 0.02 | [0.013] |
| Female (dummy) | 0.90 | 0.30 | 0.50 | 0.39 | [0.000] | 1.00 | -0.10 | [0.000] | 0.56 | 0.33 | [0.000] | 0.50 | 0.39 | [0.000] |
| Full-time job (dummy) | 0.24 | 0.43 | 0.42 | -0.19 | [0.000] | 0.28 | -0.04 | [0.000] | 0.37 | -0.13 | [0.000] | 0.42 | -0.18 | [0.000] |
| Part-time job (dummy) | 0.20 | 0.40 | 0.17 | 0.03 | [0.000] | 0.25 | -0.05 | [0.000] | 0.18 | 0.02 | [0.174] | 0.17 | 0.03 | [0.004] |
| <i>Food</i> | | | | | | | | | | | | | | |
| Water & Beverage | 5.81 | 6.30 | 5.16 | 0.65 | [0.000] | 5.31 | 0.50 | [0.003] | 6.26 | -0.45 | [0.116] | 4.92 | 0.89 | [0.000] |
| Ready-made staple food | 4.47 | 4.73 | 4.01 | 0.47 | [0.000] | 4.04 | 0.44 | [0.000] | 4.52 | -0.05 | [0.815] | 3.99 | 0.48 | [0.000] |
| Rice & dried noodles | 14.42 | 7.77 | 10.58 | 3.84 | [0.000] | 11.61 | 2.81 | [0.000] | 10.90 | 3.52 | [0.000] | 10.83 | 3.59 | [0.000] |
| Canned & frozen foods | 5.77 | 5.29 | 4.55 | 1.22 | [0.000] | 4.80 | 0.97 | [0.000] | 5.41 | 0.36 | [0.111] | 4.54 | 1.23 | [0.000] |
| <i>Daily necessities</i> | | | | | | | | | | | | | | |
| Cassette gas cylinders | 6.70 | 7.14 | 5.28 | 1.42 | [0.000] | 5.81 | 0.88 | [0.000] | 6.09 | 0.61 | [0.039] | 5.46 | 1.23 | [0.000] |
| Mask | 18.32 | 5.45 | 16.66 | 1.66 | [0.000] | 17.75 | 0.58 | [0.000] | 17.48 | 0.84 | [0.002] | 16.56 | 1.76 | [0.000] |
| Hygiene products | 18.06 | 5.60 | 15.89 | 2.17 | [0.000] | 17.30 | 0.76 | [0.000] | 16.73 | 1.33 | [0.000] | 15.84 | 2.22 | [0.000] |
| Toilet paper | 17.70 | 5.70 | 15.41 | 2.29 | [0.000] | 16.63 | 1.07 | [0.000] | 16.31 | 1.38 | [0.000] | 15.35 | 2.35 | [0.000] |
| Diapers & sanitary products | 13.84 | 8.10 | 11.21 | 2.64 | [0.000] | 13.59 | 0.25 | [0.310] | 12.48 | 1.36 | [0.002] | 11.14 | 2.70 | [0.000] |
| Medicine for chronic disease | 15.01 | 7.83 | 11.82 | 3.19 | [0.000] | 12.69 | 2.32 | [0.000] | 13.33 | 1.68 | [0.000] | 11.98 | 3.03 | [0.000] |
| Observations | 6948 | | 3938 | | | 1985 | | | 621 | | | 2284 | | |

Note: See Sakamoto et al. (2021) for the details. The right-most column shows the variables of the sample from prefectures not subject to the 1st emergency declarations in April 2020 (i.e., all but Tokyo, Kanagawa, Saitama, Chiba, Osaka, Hyogo, and Fukuoka)

Well prepared means being well covered

Vol.1 Let's prepare! By Mari TAKEUCHI



There is always a rush on toilet paper when there is an emergency. If you have supplies **for about 4 weeks** or more, you can see off any confusion in an emergency.

[Daily necessities in short supply in past emergencies]

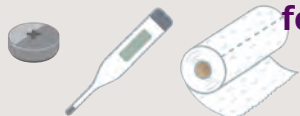
Toilet paper

Spread of infection

Earthquake

- Kitchen paper
- Coin batteries
- Thermometers

- Cassette gas cylinders
- Dry batteries
- Sparebatteries for mobile phones

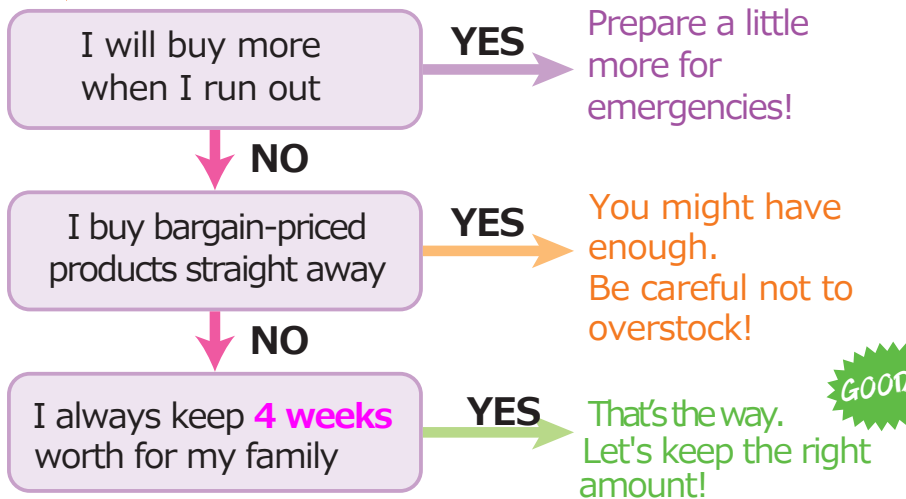


It is recommended that you stock up on the above daily necessities on a routine basis. Other recommended daily necessities include small and large plastic bags (transparent/black), plastic wrap, and heat packs.

There seems to be no end in sight yet for COVID. Now that natural disasters and the spread of infections are expected to increase, it is essential to be prepared so that we can respond to emergencies.

We will look at routine preparations in a 3-part series.

EVERYONE CHECK!! Do you have spare toilet paper?



For people who fall under the following conditions, it is reassuring to have a few more spares.

- People with infants and the elderly who need constant supervision
- People busy with work who can't go shopping

Tips for storing stockpiles

We asked a professional life organizer!

Spare rolls of toilet paper are best kept in the bathroom. As for the stockpile, please think about the amount necessary for your family using **4 rolls** or more per person as a guide.

Tip 1: Place a wooden box on the floor for storage, and cover it with a cloth for a stylish look!

Tip 2: You can put a lot of items on high shelves!

Tip 3: If double rolls, it's enough to keep at least 8 rolls for a family of four.

Tip 4: This is 12 rolls = 4 weeks for a family of 3!

Tip 5: If you're worried, it's a good idea to keep another unopened pack for storage only. Since toilet paper is light, it can be stored even in high places such as the top of a closet.

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Nationwide Number **188**

Consumer Affairs Agency
Consumer Hotline 188
Image Character
Iyayan

We will guide you to local consumer affairs centers and local government consumer affairs inquiry counters.

Well prepared means being well covered

2021
March

Points when "consumers convey opinions"

As an independent consumer, please refer to the following three points when "conveying your opinion" so that your opinion can be properly conveyed to the other party.

Point 1

Take a breath and pause!

Remarks made in anger have the opposite effect.

Take a breath and stay calm. It is important for employees to respect each other as the same "people".



Point 2

Politely convey what you want to say and request "clearly" and "why"!

It is important to clearly and politely convey whether you want to return or cancel, and the reason.



Point 3

Listen to the company's explanation!

Good communication is the key to a solution.

Don't just make one-sided claims; listen to the business operator's explanation.



Employees and businesses are doing their best. Be careful how you express your opinion.

In order to prevent the spread of infection, it is necessary to establish a "new lifestyle" and avoid "five situations" where the risk of infection increases. There is also concern that malicious business methods that take advantage of stay-at-home consumption will increase. Please take serious note.



"Pretending" to be administrative agencies, etc.

"Benefit frauds" that try to defraud money by claiming it is necessary for corona-related benefits, and "phishing frauds" that attempt to extract personal information by sending an email claiming to be from a financial institution or major company, urging people to change their registered information are taking place.

Be sure to carefully check who is calling/sending email!



Internet shopping trouble

Problems such as "I didn't receive the product I ordered online" and "I thought it was a trial but it turned out to be a regular purchase" have occurred. There are also malicious fake shopping sites that illegally extract personal information.

Be sure to carefully check the URL and site terms!



The delivery of unfamiliar goods

Problems have occurred where unordered products such as masks have been sent.

Don't rush to contact the business, but keep the product without using it, and then dispose of it after 14 days!

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Well prepared means being well covered

Vol.2 In the right place! By Mari TAKEUCHI



If you have cloth masks, you should have 1-2 boxes of spare disposable masks. Decide where to store both of them.

[Sanitary goods in short supply due to the spread of infection to date]



It is recommended that you stock up on the above sanitary goods on a routine basis. Other sanitary items that are recommended to stock include first aid kits, diapers, sanitary products, and emergency toilets.

The shortage of masks and disinfectants during the first wave of COVID was serious. These shortages also occurred during the 2009 H1N1 influenza pandemic. In this second part of our series, we will look at the preparation of sanitary goods.

EVERYONE CHECK!!



Being organized is more important for people who:

- Have large families
- Are usually busy and don't have time to tidy up



Tips for storing stockpiles

We asked a professional life organizer!

Labeling bags and shelves will reduce the number of lost items. For miscellaneous items such as masks and antiseptic solutions, it is recommended to gather like objects in a bag or basket.

*Tokushima Life Organizing Lab
Mari Takeuchi*

Sort thoroughly using labels and separating by type

Effective use of paper bags! Convenient for collecting small items!

Collect in a basket and put it on the shelf!

Make use of baskets that allow you to see the contents inside!

The basics of tidying up are to keep like with like, separate different things, and put them in their proper place. The smaller the item, the more consciously you should decide where to put it!

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Research on changes in consumer behavior due to the spread of COVID

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2021
March

Are you thinking "I'm fine"!?

Mental
Susceptibility
Diagnosis

Psychological tendency
check to measure gullibility!

Consumer
harm
prevention

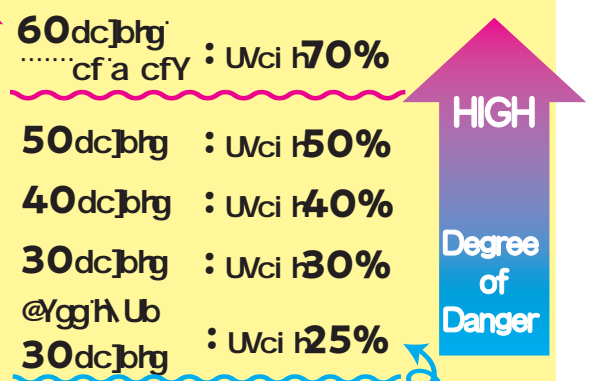
Add the points to get your total score.

| | | | |
|----|---|-------------------------------|-------|
| 1 | Weak when entreated | 1 point: Rarely applicable | point |
| 2 | Easily flattered | 2 points: Not very applicable | point |
| 3 | Convinced when told with a lot of confidence | 3 points: Neither | point |
| 4 | Can't help but believe when the person looks decent | 4 points: Somewhat applicable | point |
| 5 | Can't refuse an invitation from an attractive member of the opposite sex | 5 points: Very applicable | point |
| 6 | Want to try right away products featured in the media | | point |
| 7 | Feel like buying products recommended by favorite celebrities | | point |
| 8 | Quickly jump onto new diets and beauty regimens | | point |
| 9 | Follow the opinions of experts and people with important titles | | point |
| 10 | Like to give it a try when it's free or has a money-back guarantee | | point |
| 11 | Don't hesitate to spend money to improve qualifications and skills | | point |
| 12 | Immediately respond to requests for donations that I think are good causes | | point |
| 13 | Get what you want even if it entails a little risk | | point |
| 14 | Listen right to the end of a phone call no matter who it's from | | point |
| 15 | Have you ever bought something simply because you tried it on or tasted it? | | point |

Your total point

(Probability of signing a contract when solicited)

The higher the total score, the more dangerous! Be careful of solicitations!



Even if you think "I won't be victimized because of my personality" ... 1 in 4 sign contracts! Don't let your guard down!

Knowing your weaknesses is the first step in preventing consumer harm!

Prevent the spread of new coronavirus infections by refraining from going out

Limit going out by shopping online from home

Malicious sites and malicious businesses are targeting you!

1 Is this a fake shopping site?

There are malicious sites on the market that skillfully make you pay even though there is no actual sale.

2 Beware of phishing sites!

There are also malicious sites posing as shopping sites that fraudulently extract personal information.

3 Beware of counterfeit brand products even at major mall sites!

Beware of counterfeit branded goods even on major mall sites! Some people hide their identities and sell counterfeit branded goods.

Malicious sites and malicious businesses are targeting you!

4 Please check carefully! Beware of regular purchase problems!

Even if you try to purchase with a "trial price, one-time only", it may actually be a multiple purchase contract at a high price.

5 Please check the return policy carefully!

Please carefully check the rules displayed by the business about returns. It is difficult to return an item if it is marked as "non-returnable".

non-returnable

before you click!

To avoid trouble, check again!

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Well prepared means being well covered

Vol.3 What should I prepare? By Mari TAKEUCHI



Prepare enough food for your family to survive for at least 3 days!

- [Foods hoarded in past emergencies]**
- Instant ramen
 - Canned food
 - Water
 - Retort pouch food
 - Packaged cooked rice
 - Pasta
 - Bread
 - Instant food

In the first wave of COVID, there were shortages of various foods. Hoarding tends to occur in emergencies. In this third part of our series, we will look at the preparation of food supplies.



◎What is rolling stock?

It is a method for always stockpiling a certain amount of food at home by buying a little extra food and processed foods on a regular basis, and then replacing what you use.

Tips for storing stockpiles

We asked a professional life organizer!

- 1) Group like together and different things separately.
- 2) Don't cram it in so you can see what's there!
- 3) Labels are important for maintaining what you put and where you put it!
- 4) Put the new ones you bought in the back so you can use from the front!

Labeling helps prevent confusion

Put the deadline in a visible spot

Tokushima Life Organizing Lab Mari Takeuchi

First, decide what foods you need to prepare. Stock up on things you want to eat that you can store to some extent, and buy more as you use them. Stockpiling food doesn't end after purchase. Techniques 1) to 4) to prevent food loss are essential!

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2021
March-April



Beware of "Recurring Purchases"

Before you know it, it's an ongoing purchase!!

Screen examples

Normal Price ~~¥6,000~~ ¥0

Completely free Get it now

< Order entry screen >

To confirmation screen

I agree with the Terms & Conditions

• Notation based on the Act on Specified Commercial Transactions
• About returns and cancellation

★ " Trial"
★ " Free for the first time!"
★ " Recruiting Monitors"
★ " First time special price"
Beware of advertisements that say!

Take care here!

- Before purchasing, check the contract details to the end to see if it says "automatic renewal" or "need to continue XX times or more".
- Be sure to read the "Terms and Conditions" and "Returns and Cancellations" pages. Important items such as how to cancel midway are outlined.
- You need to scroll many times But... if you press the "Get it now" button, you will be taken to the input screen for your name, etc.
- Important contract items may be outlined in skipped screens or places written in small letters.

Order (recurring purchase) confirmation screen

| | |
|------------------------|-------------|
| Order details | |
| XX 0 yen 1 item | 0 yen |
| subtotal 0 yen | |
| Shipping charges 0 yen | Total 0 yen |

| | |
|---------------------------------|--|
| Customer information | |
| Name: Joe Consumer | |
| Address: Chiyoda Ward, Tokyo... | |

| | |
|------------------|--|
| Contract details | |
| | |
| | |

Purchase completed

Be careful of recurring purchases and return rules

Confirmation points before applying for mail-orders

| | | | | |
|---|--|---|--|---|
| <p>One-time purchase? Recurring purchase?</p> | <p>For recurring purchases, how many? Will it continue indefinitely if you don't cancel?</p> | <p>What are the cancellation method/ conditions* and return method/conditions?</p> <p><small>*There is no cooling-off period. Check the cancellation period and deadline.</small></p> | <p>For recurring purchases, what is the total amount and how much is paid over a given period of time?</p> | <p>What is the timing of payment and delivery?</p> <p><small>*In the case of recurring purchases, check how many days it will take for the second and subsequent products to arrive after the previous product.</small></p> |
|---|--|---|--|---|

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