

Food consumption tendencies of Turkish consumers within COVID-19 process

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Abstract

Some occasions and situations lead significant variation and evolutions in continuity of livelihoods. The impact of COVID-19 pandemic has been visible in many aspects since its first announcement in 2020. Even if the people seemed to turn back to their old routines, the routines had already changed within the process. This paper aimed to look at the changing nutrition preferences and demand for specific products. An online consumer survey was applied in 2020 in Turkey with 499 randomly selected individuals to understand their changing demand for fresh fruits and vegetables and animal products. The rising purchases were estimated against socio-demographic factors with multinomial logistic regression. The outputs indicated the importance of education, level of income and amount of prospective spending on nutrition for maintenance of demand and supplies under pandemic conditions. JEL Codes: D12, D91, I12, H24

Key words

COVID-19, consumption, food, logit, income

Introduction

There have been many changes in lifestyles, socio-economic conditions, preferences, and attitudes of individuals due to emergence and persistence of unexpected COVID-19 pandemic in 2020. The effects of the disease have been harsh on socio-economic situations in many countries. Individuals have been experiencing many challenges in their daily routines since then, due to rising health consciousness and economic consequences of the disease.

Departing from a representative sample of consumers from Turkey, changing food purchases and consumption tendencies of the society within the COVID-19 process were evaluated. The main objective was to differentiate the factors that affect the rising tendency to buy and consume specific products under pandemic conditions. This emphasis was considered as necessary for potential future occasions, and it was aimed to provide some information to the producer and suppliers in a comparative way. Therefore, probability to increase purchases consumption of vegetables, fruits, meat and milk products were estimated due to responses of a random sample of 499 people to understand the factors that affect rising consumption.

Materials and methods

Dependent Variables

If the household started to buy and consume more:

- Vegetables – Cv=1
- Fruits – Cf=1
- Meat products – Cmeat=1
- Milk products – Cmilk=1

If the household started to buy and consume less or made no difference in consumption attitudes: 0

Independent Variables

• Gi: Gender of the individual – Binary (female – 1; male – 0)

• Ai: Age of the individual – Discrete

• ACi: Age category of individual – scale (below 29: 0; 30-49: 1; above 50: 2)

• Ei: Level of education (1: elementary; 2: secondary; 3: BA/BSc; 4: MSc+)

• ESi: Sector employed in (public: 1; industry: 2; construction: 3; agriculture: 4; services: 5)

• VEi: **Expenditure on FFFVs** (Quantitative – Continuous, TL)

• VE_Ci: Categorical **Expenditure on FFFVs** (below \$136,26: 0; \$136,26-\$272,51: 1; above \$272,51: 2)

• **AEi : Expenditure on Animal Products** (Quantitative – Continuous, TL)

• AE_Ci: Categorical **Expenditure on Animal Products** (below \$136,26: 0; \$136,26-\$272,51: 1; above \$272,51: 2)

• Ui: Unemployment situation in the household (there is unemployed member:1; no one is unemployed within COVID-19 process)

• **DHi: Downsizing in Household Income** (Quantitative – Continuous, TL)

• HHi: Categorical Household Income (below minimum wage -\$313,38:1; minimum wage-\$313,38: 2; \$313,38-\$613,14:3; \$613,14-\$885,64:4; \$885,64 above:5)

Checking out the binomial characteristics of dependent variables and multiple independent variables, multivariate logistic regression analyses were conducted. The logistic regression model was initially proposed by Berkson (1944) and developed thereafter for inference on situational or behavioural probabilities. The logit or log of probability function adapted to four product groups can be demonstrated as following. The equity intends to infer on effects of discrete/continuous variables via estimates of β and effects of categorical variables with estimates of α .

$$\log[Pr(Y = 1|x)] = \ln \left[\frac{Pr(Y = 1|x)}{1 - Pr(Y = 1|x)} \right] = \sum \beta_i x_i + \sum \alpha_i D_i + u_i$$

Detected probability ranging between 0 and 1 were estimated against

Posterior to the initial shutdowns in Turkey to disable dispersion of COVID-19 after March 2020, an online consumer survey was conducted randomly. Changing lifestyles and purchasing - consumption tendencies of 499 correspondents within the COVID-19 process were assessed. Detection of changing demand for specific food and agricultural product groups and factors affecting those demand shifts are considered as contributory for marketing organisations and management of supplies both for the pandemic conditions and for future occasions. Therefore, COVID-19 related changing tendency to buy and consume more vegetable products, fruits, meat and milk products of the representative sample were estimated with binary logistic regression. The analyses focused on rising consumption on four product groups and its possible categorical or continuous factorial causes. These sorts of probabilistic analyses are made by binomial or multinomial analyses that infer on the detected probability estimation of a binary/dichotomous or scaled/polychotomous variable (McFadden, 1973). For the concerned multiple dependent variables referring to binary choices and factors related to probability of realisation of these choices can be indicated as following.

grouped/scaled or discrete/quantitative variables to find out and comment on the probability of odds (Efron, 1988, Cox and Snell, 1989). Parameter estimates are inferred as odds of occurrence for binary/categorical variables over non-occurrence. Odds ratio for the estimate is reached by antilog transformation or taking e^b and the odds lead inference on the relationship between two categorical variables (Bland and Altman, 2010).

Results

In the first instance, it is important to note that variations in consumption behaviours were measured though categorical responses of consumers. The share of 499 individuals that declare a rising tendency for four product groups ranges around 32 %. The rising tendency of the respondents for meat products was lowest with 27 %. On the contrary the declination was highest for fruits

with 9 %, followed by meat (8%), vegetables (7%) and milk products (6%). Prior to measuring and evaluating the effects, it is important to note the varying spending on FFVs and animal products within the process. It was understood that 28 % of the consumers were spending below \$136,26 to FFVs, while 38 % were paying more. However, 69 % or participants were spending below \$136,26 on milk/meat products, while only 8 % were spending above \$272,51 by the date of survey.

Many random respondents were female with 60 % share and the average age was 40. This may be considered as an indication of well-endowment on nutrition information of the households. In addition, education level was high enough with 54 % Bachelor's graduates and 30 % of the surveyed seemed to hold MSc and above degrees. This educational stance can be related with the online survey process. More than half of the participants (55 %) seemed to live alone or with 2 companies at most and 41 % declared that they have children. This social frame signs participation of mostly white-collared workers. While 51 % of the audience were public workers, the share of fully employed people rises to 85 % with private workers.

Keeping these demographic features of the target groups on mind, it is essential to understand and evaluate the changing purchasing and consumption attitudes hereafter.

Probability to buy more vegetables and fruits within the COVID-19 process

Respecting the potential indicators, the probability to buy more vegetables was estimated in the first instance towards all indicators. The antilog of estimators and their individual and joint significance were inspected due to statistical and economical requirements. Odds ratio that is equal or almost equal to 1 has no statistical impact on the dependent variable (Adams and Conway, 2014). The odds with more than 1 may induce rise in the effect, while the impact is reverse for strictly low odds. Checking out odds and Wald test following a Z distribution results, the indicators were reduced. Therefore, the probability to buy and/or consume more vegetables within COVID-19 process seemed to be determined by the amount of expenditure on Fresh Fruits and Vegetables (FFVs), level of education, household income, sector employed and existence of unemployed family member. The results were demonstrated in Table 1.

The statistical strength of the estimates was the following concern. Cox-Snell and Nagelkerke pseudo-R² joint significance statistics are produced by SPSS to be used in exchange of Mc Fadden R² (Cox and Snell, 1989, Nagelkerke, 1991). Yet, these significance statistics were lower than expected. Therefore, joint significance of the estimation can be viewed by Likelihood Ratio test (Gujarati, 2003) and higher log-likelihood statistic refers to significance of estimates (Crochiere et al., 1980). In addition, Hosmer - Lemeshow (H-L) statistic also provides insights on joint significance as well. The significance of binomial estimators can be confirmed with the probability value of H-L statistic. As the p-value of the statistic gets higher, the estimates can be inferred due to the (Hosmer and Lemeshow, 1989).

The rising expenditure devoted to FFVs in scales indicates 1,4 times more vegetable purchases. An individual paying between \$136,26 and \$272,51 would buy 1,4 times more vegetables than one paying below \$136,26. The raise for above \$272,51 budget was almost double (1,96) of the base budget share.

While exp(b) provides the odds ratio and comparison between existence and inexistence of situations, the estimated probability is important for evaluation of the changing individual conditions (Cramer, 2002). Therefore, probability to consume more vegetables was compared depending on the individual characteristics taking household income as a reference. For individuals having moderate household income (\$613,14-\$885), a moderate spending amount on FFVs (\$136,26-\$272,51), having no unemployed household member were categorized due to the sector they were employed (public -industry) and education level as (BA/BSc – MSc and above). Occurrence probability of relevant cases was calculated with the following formula and indicated in Table 2.

$$P=1/(1+e^{-E(Y)})$$

In comparison to the original set up, it can be said that the probability of public workers to consume more vegetable products was lower than the other employees as can be seen in Table 2. The rising probability was visible concerning the rising education level. It can be concluded that public workers with tertiary and higher degrees and industry sector employees having below master's degrees are expected not to rise their vegetable purchases and consumption in Turkey with probability scores below 0,5. However, it is important to keep in mind that the reference education levels are comparatively high and above 0,5 probability can be understood with this perspective.

Following vegetables, socio-economic impact on probability to purchase more fruits was estimated and initial parameter estimates were indicated in Table 3. The statistical significance of estimation outputs was close to vegetable purchases. An individual is expected to buy 1,4 fold more with rising scale of income as it was the case for vegetables. Specifically log-likelihood and H-L statistics enables further inference. Rather than the inference of odds-ratio, a probability comparison was intended due to employment status of the correspondent or the household. Therefore, the probability estimated for

different sectors employed were demonstrated in Table 4 briefly.

As the only variation measure left was the sector employed, the probabilities were estimated and calculated accordingly. All estimates were below 0,5 and there was no significant evidence of rising fruits purchases during the COVID-19 process for the concerned households. In contrast to vegetable purchases and consumption, tendency to increase fruits consumption seemed to be lower. This finding seemed to be contradictory with findings of some similar research. A probit analysis conducted via telephone interviews with 1.023 individuals indicated rising focus on fruits as well as other fresh products (Guney and Sarigun, 2021). A comparative analysis between Turkey and Portuguese inferred rising tendency to buy and consume more organic fruits and vegetables in both countries (Guiné et al., 2022). These varying findings call the need to analyse the impact of price and income alterations as well for sample of Turkey. Prior to further discussions, the decisions regarding meat and milk products were analysed as well.

Probability to buy more meat and milk products within the COVID-19 process

The determinants for variation in demand for meat products were appeared as education level of the correspondent, the sector that the individual is employed, and the amount of budget devoted for animal products. The parameter estimates were indicated in Table 5.

The statistical significances of the parameters and the equation estimated were similar. All parameters seemed to lead rising meat demand. The expected value of estimated parameters indicated the scaled rise for ranges of variables. High school graduates seemed to demand 1,27 folds more meat than primary school graduates. Yet, ones that hold college degree purchased 1,62 and that hold MA and above degrees 2,06 times more meat than primary school graduates. The budgetary allotment provides a similar upscaling in demand and purchases. The ones that spend between 136,26 and 272,51 Dollars to animal products seemed to buy 1,256 times more meat, the highest class spending more than 272,51 Dollars were buying 1,57 times more meat within the pandemic process. The scenario was renewed for meat products taking the sectors as a reference again.

The exact intention to buy more meat products is only visible for services sector workers holding at least MSc degree with the probability estimate above 0,5 which also means positive likelihood of meat consumption. The remaining estimates were demonstrated in Table 6. Besides, the share of the participants that declared wiring intention to buy more meat products was lowest within four groups and households dedicating more than \$272,51 was very low with 8 % and many participants seemed prefer paying more to FFVs rather than animal products. Yet, even if the measured probability scores were lower for the rest scales, it is still visible that the tendency rises with rising education level.

Milk consumption variations were estimated to seek the impact of the pandemic as follows. The determinants of the intention to buy and consume more milk products were the same as meat products and the alternative aggregate significance statistics enable inference. It can be said from probability estimates Taking place in Table 7 that the scaled rise for education, sector employed, and budget devoted for animal products is more than 100 %. In other words, university graduates were demanding 1,42, those with higher education were demanding 1,69 times more than elementary school graduates. The ones devoting highest share of their budget declared that they demand 1,48 times more than the lowest share as below 136,26 Dollars. Finally, the probabilities of rising milk products demand were compared depending on the sectoral focus. The comparison due to the changing preference towards milk-based product preference based on employment situation and income and education levels was demonstrated in Table 8.

It was understood that the tendency to purchase and consume more milk products as raw milk, yoghurt, butter or cream had risen relatively within the COVID-19 process in 2020. Due to the feedback from 499 individuals, leaving public officials aside, the people with higher education seemed to declare their pure intention to buy more milk products, with detected probability above 0,5. The figure provided the same inference for college graduates that were employed in construction, agriculture, and services sectors. However, it is still important to remember that the variation for milk products were much lower than the other product groups.

Discussion

Statistical analyses of four product groups provided compatible and comparable outcomes. A significant finding is the rising probability in response to rising education level. In comparison of the odds, the average household income and the amount of income devoted to FFVs or animal products were taken as fixed. Yet, the rising impact of the expenditure level is visible from positive parameter estimates in all cases. So, even if it was not signified quantitatively, rising consumable income and the amount devoted for products affect the tendency positively.

Although there has been much primary research focused on rising consumption within the pandemic process, the changing patterns were mostly attributed to psycho-social factors. Health and nutrition related findings strictly emphasized rising food intake of Turkish consumers during the pandemic and continuous stockpiling activities (Bolek, 2021, Ozenoglu et al.,

2021). Yet, our current research provided a different and complementary view for supply management and pricing of products. Especially positive impact of tertiary education on rising demand and the change related with occupational status of correspondents refer to the rising potential of online order and delivery systems for the audience.

Previously, in the research prepared from the same sample, the impact of rising income was recognised in purchases from all venues including online systems (Ceylan et al., 2021). In other words, rising tendency of online shopping with rising education can be confirmed with the current findings as well. In addition, another survey study completed in Tokat province of Turkey with 277 consumers inferred impact of rising education and income on the purchasing decisions. Serbian consumers declared positive valuation of online shopping and rising interest through rising education (Ivanović and Antonijević, 2021). Even though the major focus was online shopping in these examples, impact of education and income was visible as well.

An aggregate evaluation may focus on price and income alterations. A nationwide survey with more than 1.000 people in Turkey indicated that changing purchasing and consumption attitudes were related with changing prices. This was correlated with changing economic conditions as well (Güney and Sarıgün, 2021). Their relevance to our research is related with the declining tendency effect of unemployment situation for fruits and vegetables. The meat consumption tendency was surveyed within different settings. For different meat kinds, 1.000 consumers declared no change or slight increases in demand. Yet, the survey that was conducted at the early days of COVID-19, considerable decline in demand was observed for fish products with 31 %, while the rate was around 11 % for red and white meat. Medium-term economic views and prices seemed to affect the audience especially in meat product (Haskaraca et al., 2021).

There have been alternative ways of looking at the variations. A factor analysis

was undertaken in three countries focused on rising product preferences in 2020 demonstrated that Portuguese consumers increased consumption of sea-food, bread and butter. It was found out that Chinese maintained their traditional preference as rice and meat and Turkish consumers declared raised consumption of meat and eggs. However, the FFVs focus seemed to rise more in the Mediterranean Portugal and Turkey (Kartari et al., 2021). This is relevant to our findings as well. In addition to focus on online shopping tendency, rising interest on grocery or meat purchases was confirmed for Morocco through an online survey (El Bilali et al., 2021). Therefore, panic buying and stockpiling had been effective at the onset of the process and is still preferred by educated ones and individuals receiving above-moderate income.

Conclusions

As an unexpected incidence, the COVID-19 pandemic led to many changes in perceptions and preferences of consumers. Demand for different product groups mainly varied with education, income and employment status related factors. Besides, sectoral orientation of employment signed importance of reaching products that public officials or workers in industry seemed to be affected from variations on education or income related factors on a lower extent. In other words, rising education or income seemed to direct workers in agriculture and services sectors to buy and consume more food products, considering the odds ratio indications in almost all product groups. As the survey was conducted at the early days of the pandemic in Turkey, the views and perceptions of households may have evolved then. However, regardless of the impact's size, the effective factors seem to be comparable with relevant field-based research findings. Therefore, price and income alterations and supply management seemed to be important for these kinds of situations and policy makers should keep socio-economic effects in mind.

Tables

Table 1. Probability estimates for vegetables

Variable	Estimate (b)	Wald (p)	Exp (b)
VE_Ci	0,337	5,625 (0,018)	1,401
Ei	0,080	0,30 (0,584)	1,083
Hii	-0,238	4,976 (0,026)	,788
ESi	0,087	0,741 (0,389)	1,091
Ui	-0,554	3,268 (0,071)	,575
Constant	-,502	0,612 (0,434)	,605
LR:	-2 LL: 612,497	Cox & Snell R2: 0,024 Nagelkerke R2: 0,034	H-L: 8.28 (0,36)

Table 2. Comparative probability for vegetables based on education and sector employed

	Public	Industry	Construction	Agriculture	Services
FFVs Expenditure: 136,26-\$272,51 Household Income: \$613,14-\$885,64 Education: BA/BSc	0,45	0,48	0,54	0,59	0,64
FFVs Expenditure: 136,26-\$272,51 Household Income: \$613,14-\$885,64 Education: MSc+	0,49	0,54	0,59	0,64	0,70

Table 3. Probability estimates for fruits

Variable	Estimate (b)	Wald (p)	Exp (b)
VE_Ci	0,338	5,606 (0,018)	1,402
Hii	-0,199	3,561 (0,059)	,819
ESi	-0,947	8,317 (0,04)	,388
Ui	0,139	1,952 (0,162)	1,150
Constant	-0,477	,861 (0,353)	,620
LR:	-2 LL: 604,429	Cox & Snell R2: 0,34 Nagelkerke R2: 0,047	H-L: 10,17 (0,18)

Table 4. Comparative probability for fruits based on sector employed

	Public	Industry	Construction	Agriculture	Services
FFVs Expenditure: 136,26-\$272,51 Household Income: \$613,14-\$885,64	0,152	0,059	0,023	0,009	0,003

Table 5. Probability estimates for meat products

Variable	Estimate (b)	Wald	Exp (b)
Ei	,241	2,507 (0,113)	1,273
ESi	,045	0,192 (0,661)	1,046
AE_Ci	,228	2,802 (0,094)	1,256
Constant	-2,091	12,987 (0,00)	,124
LR:	-2 LL: 575,437	Cox & Snell R2: 0,014 Nagelkerke R2: 0,021	H-L: 5,58 (0,58)

Table 6. Comparative probability for meat products based on education and sector employed

	Public	Industry	Construction	Agriculture	Services
Animal product Expenditure: 136,26-\$272,51 Education: BA/BSc	0,34	0,35	0,37	0,38	0,40
Animal product Expenditure: 136,26-\$272,51 Education: MSc+	0,43	0,45	0,47	0,49	0,51

Table 7. Probability estimates for milk products

Variable	Estimate (b)	Wald (p)	Exp (b)
Ei	,175	1,523 (0,217)	1,192
ESi	,115	1,443 (0,230)	1,121
AE_Ci	,198	2,358 (0,125)	1,219
Constant	-1,738	10,413 (0,00)	,176
LR:	-2 LL: 619,573	Cox & Snell R 2: 0,010 Nagelkerke R 2: 0,014	H-L: 6,09 (0,53)

Table 8. Comparative probability for milk products based on education and sector employed

	Public	Industry	Construction	Agriculture	Services
Animal product Expenditure: 136,26-\$272,51 Education: BA/BSc	0,407	0,456	0,512	0,574	0,644
Animal product Expenditure: 136,26-\$272,51 Education: MSc+	0,484	0,543	0,610	0,684	0,767

Statement of Conflict of Interest

The author(s) declare no conflict of interest for this study.

Author's Contributions

The contribution of the authors is equal

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