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Analyze of main factors influencing Household Food Waste
——A case study of Shijiazhuang

【ABSTRACT】 Objective: From the perspective of consumers, this paper discusses the characteristics and related influencing factors of household food waste, and provides suggestions for effectively reducing household food waste. **Methods:** Questionnaire survey was conducted on the respondents, and SPSS 23.0 software was used for descriptive statistical analysis and correlation test. **Results:** (1) Among the 105 respondents, the most common variety of the household food waste was vegetables and fruits, followed by staple food; the most common amount of the food waste were 100-249 grams and 250-499 grams per week, respectively. (2) The overall difference analysis between the general situation of respondents, purchasing patterns, food storage methods and family food waste behavior showed that women, people with high education, high income, married people with children and people living in cities cause more household food waste; People who eat out 1-3 times per week and who buy food 1-2 times per week caused more household food waste. Food waste still occurred among people who use refrigerators for storage, with 250-499 grams of food being wasted per week. **Conclusions:** Household food waste is the main cause of food waste, and consumers' purchasing behavior and food storage mode are significant influencing factors of household food waste.

Keywords: Household food waste; Advent food; Purchasing patterns; Food storage mode

1. Background

At present, the problem of food waste is increasingly serious, involving the whole food life cycle, from agricultural production, transportation, manufacturing and processing to retail and household consumption [1], which can cause serious economic losses and environmental degradation. In terms of economy, the FOOD and Agriculture Organization of the United Nations issued a statement in 2012, pointing out that the world wastes 1.3 billion tons of food every year. By 2030, 33 percent of food will be waste, reaching 2.1 billion tons, or \$1.5 trillion in economic terms, according to The Boston Consulting Group. In terms of environment, food waste brings great pressure to the environment [2]. Deforestation, excessive water pumping and destruction of forest habitats resulted from food production leads to biodiversity loss.

As a result of these growing social, economic and environmental problems, food waste is increasingly a pressing issue for governments, businesses, NGOs (non-governmental organizations), academia and the public. As the world's most populous country, the Chinese government attaches great importance to food waste. Reducing food waste is one of the most important goals of the Chinese government promoting ecological civilization and green consumption. Food waste exists in all links of the food supply chain [3]. In addition to harvesting, storage, transportation, processing and other links, the consumer end is an important link causing food waste. It is reported that about 35% of food loss and

waste occurs in the consumption link [4]. Data from China Agricultural University showed that from 2006 to 2008, the total value of food wasted on Chinese people's dining tables reached 200 billion yuan each year, and the food thrown away was equivalent to the annual grain rations of more than 200 million people [5]. According to a survey by the Chinese Academy of Sciences, from 2013 to 2015, China's catering industry wasted 17 million to 18 million tons of food every year, equivalent to the annual rations of 30 to 50 million people.

Household food waste is a major part of food waste. With the increase of GDP per capita, food waste per household also increases [6]. In 2014, urban households wasted 3 million tons of food, while rural households wasted 1.55 million tons [7]. Therefore, to strengthen the research on household food waste, this paper will explore the key factors affecting household food waste from the perspective of consumers and put forward suggestions.

2.Purpose and significance of research

2.1 Purpose of research

On one hand, food waste has a great impact on China's economy and environment, and on the other hand, it runs counter to the green consumption pattern advocated by China, which is an important problem to be solved urgently in China. As the main body of family food consumption, consumers face a wide range of commodities and promotional activities, resulting in increased storage, food waste and other problems. In order to more accurately grasp the future trend of household food waste in China, and further analyze its influencing factors, this paper starts from practice, through the form of questionnaire survey of people with family food management experience, screening indicators affecting household food waste, statistically analyze of the characteristics of food waste. It also researches on key influencing factors, combined with interdisciplinary research on Chinese socioeconomics and history, providing recommendations for consumers to reduce food waste.

2.2 Significance of research

Sustainable development of food consumption is one of the basic prerequisites for sustainable development in China and even the world. With the rapid development of society and economy, the concept of reducing food waste should be advocated in the face of materialistic and consumption-oriented society. We should advocate dining table civilization and oppose waste. We should not only focus on restaurants and other public places, but also the food waste at home.

3.Definition of related concepts

3.1 Household food waste

Household food waste is when the edible portion of food in a household is thrown away for subjective or objective reasons. This includes discarded food on plates and food that is not consumed in time. It generally includes six links: planning, purchasing, storage, cooking, consumption and leftovers disposal [8].

3.2 Advent food

Advent food refers to food that is about to reach its sell-by date, but is still within its sell-by date.

3.3 Research contents and methods

According to the characteristics of household food waste in China, a questionnaire was designed and distributed to people with family food management experience. The questions include purchasing patterns in consumers' households, research on food storage methods, waste frequency of major foods, causes of food waste, measures to prevent food waste, statistical characteristics of respondents, etc. SPSS 23.0 software was used for statistical analysis. Descriptive statistical analysis and correlation test were used to obtain the degree and main influencing factors of household food waste, and put forward specific suggestions and measures.

4. Results of the study

5.1 Descriptive statistical analysis of respondents

5.1.1 Analysis of basic characteristics of respondents

In this paper, an electronic questionnaire was generated by the APP Wenjuanxing, and the paper questionnaire was printed at the same time. The study population was investigated through circle of friends or face to face. The formal survey was carried out from April 2022 to May 2022. In this survey, 112 questionnaires were distributed, and 105 valid questionnaires were acquired, with an effective rate of 93.8%. Basic characteristics of respondents are shown in Table 1.

Tab.1 The basic statistical characteristics of respondents

Variable	Classification	Number	Percentage (%)
Gender	male	48	45.7%
	female	57	54.3%
Age(years)	19-29	18	17.1%
	30-39	32	30.5%
	40-49	33	31.4%
	50-59	13	12.4%
	≥60	9	8.6%
Education	high school degree or less	43	41.0%
	bachelor degree or above	62	59.0%
Place of residence	urban	75	71.4%
	rural areas	30	28.6%
Marriage	single	22	21.0%
	married	83	79.0%
Have children	yes	92	87.6%
	no	13	12.4%
Annual household	< 100,000	25	23.8%

income(yuan)			
	100,000-190,000	37	35.2%
	200,000-290,000	31	29.5%
	≥300,000	12	11.4%
Total		105	

Among the 105 respondents, males accounted for slightly less than females (45.7% vs.54.3%), most of them were 30-49 years old (61.9%), most of them had bachelor degree or above (59.0%), most of them were married (79.0%), and most of them had children (87.6%). 71.4 percent of the respondents living mainly in cities, with an annual household income of 100,000-190,000 yuan (35.2%).

5.1.2 Descriptive statistical analysis of respondents' consumption patterns

Figure 1 shows the analysis of eating out of the respondents. The results show that 21.9% of respondents have no eating out experience, 44.8% of them eat out 1-3 times per week, and 33.3% of them eat out 4 times or more per week. It may be related to the fact that most respondents are between 30 and 50 years old, so they have more opportunities to eat out for work or other reasons.

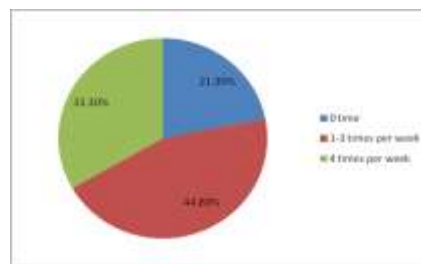


Fig.1 The situation of eating out of the respondents

Figure 2 shows the analysis of purchasing frequency mode of respondents. The results show that 47.6% respondents buy once or twice a week, 35.2% respondents buy 3-5 times a week, and 17.1% respondents buy 6-7 times a week. This may due to the fact that the respondents are mostly 30-50 years old working class, usually busy with work. And due to the northern weather, they can buy a lot of food at one time.

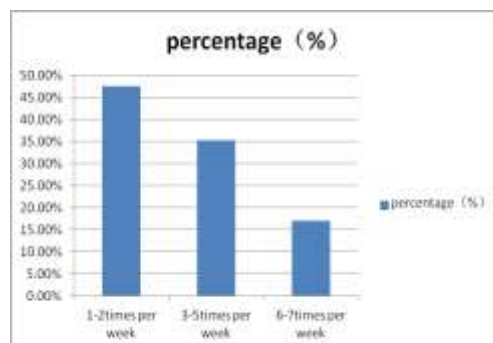


Fig.2 The shopping frequency of the respondents

Table 2 shows that 62.9% of respondents have a shopping list when buying food, which can be purchased as needed to minimize the possibility of waste. Of the 105 respondents, 61.9% had the habit of buying food in large packages, 55.2% had the habit of buying food with gifts, and only 28.6% had the habit of buying advent food. It shows that when people buy food in large packages and food with gifts, they fall into the vicious circle of marketing, which may cause unnecessary food waste.

Tab.2 The shopping patterns of respondents

Variable	Classification	Number	Percentage (%)
Shopping habits	Advent food	30	28.6%
	Food in large package	65	61.9%
	Food with gifts	58	55.2%
Shopping list	Yes	66	62.9%
	No	39	37.1%
Total		105	

Table 3 shows that respondents have different ways of storing food. Most of them (78.1%) choose time-saving refrigerators, 42.9% of them choose room temperature storage, and a small number (21.9%, 39.0% and 32.4% respectively) of them choose traditional storage methods, such as cellar, curing and smoking, and air-drying. It shows that refrigerator is still the main way of food storage in the family, but some people still choose two or more ways of storage, and master some traditional ways of food storage, such as pickled cabbage, bacon, preserved fish, noodles and so on. Preserved and smoked food is accepted by 39% of the population, which may extend the storage time of food and may be related to its unique taste. Cellar as a rural characteristic storage method, which is subject to regional restrictions, has small audiences.

Tab.3 Food storage modes of respondents

Variable	Classification	Number	Percentage (%)
Food storage mode	Refrigerator	82	78.1%
	Room temperature	45	42.9%
	Cellar	23	21.9%
	Preserved and smoked food	41	39.0%
	Air-dried food	34	32.4%
Total		105	

5.1.3 Analysis of household food waste

Table 4 shows that vegetables and fruits are the main types of food waste, accounting for 60%, followed by staple food, accounting for 53.3%. It shows that if there is no suitable storage temperature, fruits and vegetables and staple foods are prone to deterioration. It may be due to the bulk-buying of fruits and vegetables and incorrect storage. Also, there are quite a few people whose health idea renewed. In order to reduce carbohydrate intake, which results in staple food waste more. Of the 105 respondents, 35.2% and 31.4% wasted 100-249 grams and 250-499 grams of food per week,

respectively.

Tab.4 The situation of household food waste of respondents

Variable	Classification	Number	Percentage (%)
Variety of food waste	Meat	7	6.7%
	Eggs	10	9.5%
	Milk	22	21.0%
	Vegetables and fruits	63	60.0%
	Staple food	56	53.3%
Amount of food waste (grams per week)	<100	16	15.2%
	100-249	37	35.2%
	250-499	33	31.4%
	≥500	19	18.1%
Total		105	

5.2 Difference analysis of household food waste

The overall difference analysis of the respondents' general situation and household food waste behavior showed that there was no significant difference between different genders in food waste behavior. In terms of age difference, middle-aged people were busy with work and used to buy a large amount of food at one time. Moreover, due to different reasons, they had more opportunities to eat out, which disrupt family meal plan and caused more waste. In terms of education and annual income differences, people with a bachelor's degree or above generally had a higher income level, and it was easier to obtain food, so they were more likely to waste food. When it come to differences in marital status and the presence or absence of children, on the one hand, single people wasted less due to eating irregularly. On the other hand, people who were married and had children had a stronger sense of family responsibility, and had more purchasing power and desire to buy, and tended to make more food, resulting in waste. In terms of the difference of living places, urban consumers had higher economic level, which was more convenient for them to buy food, resulting in more food waste.

The difference analysis of respondents between purchasing patterns and household food waste behavior found that people who eat out 1-3 times a week and who buy things 1-2 times a week wasted more food. It may be related to the population characteristics. They often bought a large number of foods one time, but eating out may disrupt family meal plan, caused unnecessary waste. People who have shopping lists and have a plan to buy advent food can consume rationally and bought as needed to avoid unnecessary waste. However, people who were used to buying large packages and goods with gifts would buy unnecessary goods even though the unit price of goods is cheaper, resulting in waste.

Based on the analysis of food storage methods and household food waste behaviors of respondents, it was found that food waste still occurred in people who stored by refrigerators, mainly 250-499 grams per week, which may be caused by over-reliance on the preservation and freezing functions of

refrigerators, resulting in food spoilage. People who store food at room temperature wasted more than 500 grams of food per week, which may be due to the spoilage of stored food caused by weather changes. Furthermore, people who use such traditional storage methods as pickling, smoking, drying and cellar had less food waste, and the amount of food waste was less than 100 grams per week, which showed that these traditional storage methods had Chinese characteristics and condense the crystallization of people's wisdom, and had its advantages. But due to its potential food safety problems, it needs to be further studied and discussed.

6. Discussion

Food waste is a widespread concern in China and even around the world. The Chinese government has issued a number of laws and regulations to establish a scientific view of environmental resources and advocate green consumption mode. Eating at home is still the lifestyle of most consumers, so food waste at home is an important part of the food waste chain. Despite a growing body of research, little is known about the determinants of household food waste or the underlying factors that encourage or discourage food-wasting behavior. From the perspective of consumers, this paper found that in addition to the impact of consumers' general situation on household food waste, consumers' purchase mode and food storage mode are important factors.

With the change of consumers' concept and the entry of young people into the field of advent food, advent food is gradually recognized and accepted by everyone. However, some people still do not understand and think that advent food is expired food. The so-called advent food, is about to expire food. Generally, the shelf life of advent food ranges from 15 days to half a year. Advent food is cheap and good, and consumption before the expiration date can further reduce food waste. Therefore, dealers should cancel the label of the best consumption period and only keep the shelf life label, so as to eliminate consumers' concerns, guide them to buy advent food and to eat it as soon as possible, and reduce the occurrence of waste. It is suggested that supermarkets or shopping malls reduce promotion activities such as buy one get one free and large packages of goods, but directly lower the price of goods, so as to avoid unnecessary waste caused by consumers who buy goods beyond their edible capacity in pursuit of low prices.

For individuals and governments: Use social platforms such as TikTok to strengthen the publicity of advent food and guide people to correctly understand advent food; Set up special stores, form brand effect, and refuse businesses to use deadlines to create a sense of urgency and anxiety. Set up special stores to sell advent food in places with large population flow. For young people and white-collar workers, set up stores around the business district and choose unmanned selling or unmanned supermarkets to save time and cost. For the elderly, set up stores around densely populated communities and parks, conduct tying free on to enhance publicity, and use direct price reduction to attract consumers; Donate advent food to the charity organization or homeless.

For merchants and supermarkets: Control the purchase quantity from the source; Replace buy one get one free and large package sales with directly reducing the price; Change the purchase per share to weighing sales; Change the usage of food due to different situations. For example, damaged vegetable should be use for salad or steamed stuffed bun and dumplings, etc; Fruit with defective appearance

should be used for jam; Rotten food should be used for feed and fertilizer.

With the improvement of people's living standards, refrigerators and freezers have entered ordinary people's homes and become a common way of food storage. However, people tend to rely too much on the preservation and freezing function of the refrigerator and do not pay attention to the setting temperature of the refrigerator. If the setting is not reasonable, vegetables, meat and other perishable food are prone to deterioration [9]. Therefore, it is necessary to popularize tips of food storage through media, network and other channels to reduce food spoilage and waste. And pickled cabbage, bacon, preserved meat, dried vegetables and fruits, dried noodles and other specially processed foods tend to have less spoilage, can be preserved for a long time, indicating that China's traditional food storage methods such as curing, smoking, air drying and other means are effective. However, there are different opinions about these traditional processes. Some people believe that processed food loses some nutrients and even has cancer risk. The others think that specially fermented and prepared foods increase probiotics intake and are better for human health. So the safety of food stored by traditional method needs further study.

7.Outlook

This study preliminarily analyzed the impact of consumers' shopping patterns and food storage patterns on household food waste, and suggested that everyone understand the harm caused by food waste and reduce the occurrence of food waste with families as the smallest unit, in response to the state's First Central Document 2021, "Carry out food saving actions to reduce food loss and waste in the links of production, circulation, processing, storage and consumption". As a preliminary analysis, this paper has some limitations. The distribution of respondents is uneven, the sample size is small, and the interaction between variables is not considered, which needs to be improved in the later research.

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