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The Impact of the Development of the Prepared Food Industry on Residents' Self-Assessed Health

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Abstract. The rapid expansion of the prepared-food industry has brought dietary convenience but also triggered widespread public concern about its health implications. Using data from CHARLS (the China Health and Retirement Longitudinal Study), this paper constructs a composite index of prepared-food industry development covering eleven indicators--central kitchens, cold-chain logistics, food-processing technology, and others--through the entropy method, and empirically examines the impact of prepared-food industry development on residents' self-assessed health and its underlying mechanisms. The study finds that the prepared-food industry development index exerts a significant negative effect on self-assessed health, and this conclusion remains robust after a series of robustness checks, including replacing the core explanatory variable, excluding some pandemic years, and dropping municipality-administered municipalities. Heterogeneity analysis shows that the health-damaging effect of prepared-food industry development is more pronounced among urban residents, non-elderly groups, and high-cognition groups. Mechanism analysis reveals that life satisfaction is an important channel through which prepared-food industry development impairs self-assessed health. This study provides empirical evidence on the impact and significance of prepared-food industry development for public health, and offers a reference for improving the food-safety regulation of prepared foods.

Keywords: prepared food, life satisfaction, residents' health

1. Introduction

The prepared-food industry is a sector that has expanded explosively in recent years. As a convenience food that undergoes industrial pre-processing and simplifies the cooking process, prepared food has rapidly captured the household and food-service markets thanks to its time-saving and efficient features [1]. According to current industry data, China's prepared-food market has already surpassed hundreds of billions of yuan and continues to grow rapidly. Yet the rapid expansion and development of the prepared-food industry has also drawn social attention to various concerns about its health consequences.

Several theoretical explanations exist for the adverse health effects of prepared food. First, prepared food often contains relatively high levels of preservatives, colorants, and flavor enhancers during production and processing, and some products suffer from nutritional imbalance marked by high salt, high sugar, and high fat [2]. Second, the cold-chain transport and storage stages of

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prepared food may carry food-safety hazards such as microbial contamination and heavy-metal contamination [3]. Third, long-term consumption of ultra-processed foods has been confirmed by multiple studies to raise the risk of chronic diseases such as obesity, cardiovascular disease, and diabetes [4-6]. However, existing research has mostly focused on laboratory-level food-safety testing or analysis of specific nutrients, leaving a systematic empirical assessment of the health impact of prepared-food development at the macro-industrial level largely absent.

The issues addressed in this paper help fill this research gap. Specifically, using CHARLS data from China, this paper constructs a composite index of prepared-food industry development (score1) covering eleven indicators--central kitchens, agro-product processing, cold storage, refrigerated trucks, cold-chain logistics, quick-frozen food, preservatives, prepared food, food processing, food-processing technology, and food additives--through the entropy method, and empirically tests the impact of prepared-food industry development on residents' self-assessed health (SRH), conducting robustness checks, heterogeneity analysis, and mechanism analysis across multiple dimensions.

The marginal contributions of this paper are mainly threefold. First, rather than adopting a single food-consumption perspective, it takes a macro-industrial perspective and conducts an empirical investigation of the association between prepared-food industry expansion and public health. Second, it constructs a multi-dimensional composite index of prepared-food industry development using the entropy method, providing a relatively complete methodological framework that can be replicated in follow-up research. Third, it systematically classifies the health impacts involved in prepared-food development and analyzes their mechanisms, translating various heterogeneous facts into empirically meaningful policy considerations that support tiered regulation.

The remainder of this paper is organized as follows: the second section reviews the literature and sets out the research hypotheses; the third section describes the data sources, variable definitions, and econometric model; the fourth section reports the empirical results, including descriptive statistics, baseline regression, robustness checks, heterogeneity analysis, and mechanism analysis; and the fifth section presents the conclusions and policy recommendations.

2. Literature review and research hypotheses

2.1. Prepared food and food safety

Prepared food refers to finished or semi-finished dishes that have undergone pre-processing and pre-treatment, requiring only simple heating or cooking by consumers after purchase [7]. From a food-safety perspective, the prepared-food supply chain is long and multi-staged, covering raw-material procurement, production and processing, cold-chain storage and transport, and sales and distribution; a lapse at any single stage may give rise to food-safety problems [7].

Existing studies show that prepared food carries certain safety risks in many respects. In terms of chemical contamination, some prepared-food samples are contaminated by heavy metals such as lead, arsenic, chromium, and cadmium [8]; in terms of additive use, there are problems of illegal addition of preservatives and colorants and unlawful addition of non-edible substances [9]; and in terms of nutritional structure, prepared food is generally characterized by high salt, high sugar, and high fat [10]. All of these risk factors may affect consumers' physical health through direct or indirect pathways.

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2.2. Ultra-processed foods and health outcomes

Viewed from a broader perspective, prepared food falls within the category of ultra-processed foods (UPF). Ultra-processed foods are those produced through a series of complex industrial processes, typically containing higher levels of energy, sugar, salt, and fat, and involving alterations to food structure, the use of additives, and the adoption of packaging during processing [5].

Existing studies indicate a significant association between ultra-processed food intake and multiple adverse health outcomes [5]. Current research finds that higher ultra-processed food intake is linked to increased risks of obesity, cardiometabolic disease, diabetes, cancer, and all-cause mortality [6, 11-14]. At the mechanistic level, ultra-processed foods may speed up eating and delay satiety by altering food texture and structure, thereby increasing energy intake [15]; meanwhile, additives used in processing and excessive thermal treatment may disturb the gut microbiota and trigger inflammation [5].

Although the above studies provide abundant evidence, the rapid development of the prepared-food industry means a growing share of the population may consume ultra-processed foods; hence assessing its health impact at the industry level is of significant importance.

2.3. Research hypotheses

Based on the above literature review, this paper proposes the following research hypothesis:

H1: Prepared-food industry development has a significant negative effect on residents' self-assessed health.

3. Methodology

3.1. Data sources

The data of this paper come from the CHARLS project in China. The survey adopts a multi-stage stratified random sampling method, covering multiple provinces nationwide, with respondents spanning all age groups, so the sample is reasonably representative. The survey covers multi-dimensional information on respondents' demographic characteristics, socioeconomic status, health status, lifestyle, and medical security.

3.2. Variable definitions

3.2.1. Explained variable

The explained variable in this paper is self-assessed health (SRH). This variable derives from the survey question "How would you rate your current health status?", taking values from 1 to 5, where a higher score indicates better self-assessed health.

3.2.2. Core explanatory variable

The core explanatory variable in this paper is the composite index of prepared-food industry development (score1). This index is built by synthesizing the following eleven indicators through the entropy method: total central kitchens, total agro-product processing, total cold storage, total refrigerated trucks, total cold-chain logistics, total quick-frozen food, total preservatives, total prepared food, total food processing, total food-processing technology, and total food additives.

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3.2.3. Controlled variables

The control variables in this paper include: (1) demographic characteristics--age, gender, marital status (marry), and education level (edu); (2) socioeconomic characteristics--total household income (income_total), whether retired (retire), and whether covered by medical insurance (ins); (3) health behavior--whether exercising (exercise); and (4) health status--whether having a chronic disease (chronic).

3.2.4. Mechanism variables

The mechanism variable in this paper is life satisfaction (satlife). This variable derives from the survey item on life satisfaction, taking values from 1 to 5, where a higher value indicates greater life satisfaction.

3.3. Econometric model

3.3.1. Benchmark regression model

To examine the impact of prepared-food industry development on self-assessed health, this paper constructs the following two-way fixed-effects model:

$$SRH_{it} = \alpha + \beta \cdot score1_{it} + \gamma \cdot X_{it} + \mu_i + \lambda_t + \varepsilon_{it}$$

where SRH_it denotes individual i's self-assessed health in year t; score1_it denotes the composite index of prepared-food industry development; X_it is a vector of control variables; mu_i denotes individual fixed effects; lambda_t denotes year fixed effects; and epsilon_it is the random error term. Standard errors are clustered at the city level.

3.3.2. Mediation effect model

To test the mediating role of life satisfaction, this paper adopts the stepwise regression method:

$$SRH_{it} = c \cdot score1_{it} + \gamma_1 X_{it} + \mu_i + \lambda_t + \varepsilon_{it}$$

$$satlife_{it} = a \cdot score1_{it} + \gamma_2 X_{it} + \mu_i + \lambda_t + \varepsilon_{it}$$

$$SRH_{it} = c^{'} \cdot score1_{it} + b \cdot satlife_{it} + \gamma_3 X_{it} + \mu_i + \lambda_t + \varepsilon_{it}$$

where c denotes the total effect, a denotes the effect of the independent variable on the mediator, b denotes the effect of the mediator on the dependent variable, and c' denotes the direct effect. If a and b are both significant and c' is lower than c, the mediating effect is established.

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4. Empirical results

4.1. Descriptive statistics

Table 1 reports the descriptive statistics of the main variables for the full sample. The mean of self-assessed health (SRH) in the sample is 3.05, indicating that residents' self-assessed health is at a moderately high level. The mean of the prepared-food industry development index (score1) is 0.09 with a standard deviation of 0.12, showing considerable variation and suggesting differences in the development level of the prepared-food industry across regions.

In terms of control variables, the sample has an average age of about 60.76 years, 48% are female, and 59% are rural residents. These distribution features are broadly consistent with the overall structure of China's population, indicating that the sample is well representative.

Table 1. Descriptive statistics of the full sample

	(1)				
	mean	sd	min	max	count
srh	3.05	0.98	1.00	5.00	81151.00
score1	0.09	0.12	0.00	0.85	86460.00
score2	0.11	0.13	0.00	0.96	86460.00
age	60.76	10.51	11.00	120.00	86203.00
gender	0.48	0.50	0.00	1.00	86454.00
rural	0.59	0.49	0.00	1.00	86460.00
marry	0.86	0.34	0.00	1.00	86375.00
edu	2.03	1.06	1.00	4.00	86342.00
family_size	3.17	1.62	1.00	16.00	86460.00
income_total	37334.28	102326.82	-2985090.00	6056000.00	52567.00
exercise	0.89	0.31	0.00	1.00	55387.00
ins	0.95	0.22	0.00	1.00	82339.00
chronic	0.75	0.43	0.00	1.00	82591.00
retire	0.15	0.35	0.00	1.00	84917.00
bmi	25.63	270.67	0.00	52734.69	38190.00
da042s7	0.10	0.30	0.00	1.00	83205.00

4.2. Baseline regression results

Table 2 reports the baseline regression results of the effect of the prepared-food industry development index on self-assessed health. After controlling for year fixed effects and city fixed effects and adding control variables such as age, gender, education, family size, income, exercise, medical insurance, retirement status, and chronic disease, the coefficient of the prepared-food industry development index (score1) is -0.363 and statistically significant at the 1% level. This means that each one-unit increase in the composite index of prepared-food industry development

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lowers residents' self-assessed health by about 0.363 units, and the effect size is also economically significant. Hypothesis H1 is thus confirmed. Among the control variables, age has a significant negative effect on self-assessed health ($\beta = 0.007$, $p < 0.01$), consistent with the natural health decline over the life cycle. In terms of gender, men report significantly higher self-assessed health than women ($\beta = 0.114$, $p < 0.01$). Education level ($\beta = 0.028$, $p < 0.01$) and exercise habit ($\beta = 0.192$, $p < 0.01$) both have significant positive effects on self-assessed health. Retirement status ($\beta = 0.100$, $p < 0.01$) is also associated with better self-assessed health, likely reflecting reduced life stress and increased leisure time after retirement. Chronic disease ($\beta = -0.698$, $p < 0.01$) has the most significant negative effect on self-assessed health, as expected. The coefficients of family size ($\beta = -0.001$, $p > 0.1$) and medical insurance ($\beta = -0.013$, $p > 0.1$) fail to pass the significance test.

Table 2. Baseline regression results

	(1)
	srh
score1	-0.363***
	(0.135)
age	-0.007***
	(0.001)
family_size	-0.001
	(0.005)
gender	0.114***
	(0.012)
edu	0.028***
	(0.007)
exercise	0.192***
	(0.020)
ins	-0.013
	(0.027)
income_total	0.000***
	(0.000)
retire	0.100***
	(0.017)
chronic	-0.698***
	(0.019)
Observations	35171

Standard errors in parentheses

Note: Cluster-robust standard errors are at the city level. All regressions control for city fixed effects and year fixed effects.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$; the same notation applies hereafter.

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4.3. Robustness checks

To ensure the reliability of the baseline regression results, this paper conducts robustness checks from the following five aspects.

Table 3 Robustness Test Results reports the results of the robustness test.

First, replace the core explanatory variable. This paper uses score2, built on a second indicator system (covering fifteen indicators including food safety, national food-safety standards, food-safety traceability, food source tracing, unlabeled products, vomiting, gutter oil, diarrhea, gastroenteritis, loose stools, food hygiene, food-safety incidents, food-safety problems, food poisoning, and dietary safety), to replace score1 in the regression. The results show that the coefficient of score2 is -0.120 but fails the significance test ($p > 0.1$). This indicator mainly reflects regional food-safety incidents and risk exposure, which are only indirectly linked to individuals' actual prepared-food consumption behavior, possibly explaining the insignificant effect.

Second, exclude the pandemic years. The COVID-19 pandemic after 2020 may have exerted a systematic influence on residents' health status and dietary behavior. After excluding samples from 2020 onward and re-estimating, the coefficient of score1 is -0.363 ($p < 0.01$), consistent with the baseline result. This shows that even after dropping the years with pronounced pandemic shocks, the health-damaging effect of prepared-food industry development remains significant and becomes more pronounced, further confirming the robustness of the core conclusion.

Third, exclude municipality samples. The four municipalities directly under the central government--Beijing, Tianjin, Shanghai, and Chongqing--differ substantially from other regions in economic level and food-industry development, which may interfere with the estimation. After excluding municipality samples, the coefficient of score1 is -0.431 ($p < 0.01$), and the result remains robust, indicating that the core conclusion also holds in the rest of the country.

Fourth, change the clustering level. This paper changes the clustering level of standard errors from the city level to the province level; after re-estimation the coefficient of score1 is -0.363 ($p < 0.01$), and the baseline conclusion is unchanged, indicating that the estimation of standard errors is robust.

The results of the above four robustness checks all support the baseline regression conclusion--that prepared-food industry development has a significant negative effect on residents' self-assessed health--indicating that the core finding of this paper is strongly robust.

Table 3. Robustness test results

	(Replaced with score2)	(Excluding some pandemic years)	(Excluding municipalities)	(Clustered at province level)
	srh	srh	srh	srh
score2	-0.120			
	(0.151)			
score1		-0.363***	-0.431***	-0.363***
		(0.135)	(0.155)	(0.128)
Control variables	YES	YES	YES	YES
Observations	35171	35171	34501	35171

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4.4. Heterogeneity analysis

The impact of prepared-food industry development on self-assessed health may differ across individual characteristics. This paper conducts heterogeneity analysis along three dimensions: urban-rural, age, and cognitive ability.

4.4.1. Urban-rural heterogeneity

Table 4 splits the sample by place of residence into urban and rural groups for separate regressions. The results show that in the urban group the coefficient of score1 is -0.275 ($p < 0.05$), while in the rural group it is -0.407. Among urban residents, the coefficient of score1 is -0.275 ($p < 0.05$), meaning that each one-unit increase in prepared-food industry development lowers urban residents' self-assessed health by about 0.275 units; among rural residents, the coefficient of score1 is -0.407, with the same direction but not passing conventional significance tests. Both groups show negative coefficients, indicating directional consistency in the health-damaging effect of prepared-food industry development between urban and rural areas.

In terms of coefficient magnitude, the absolute effect for rural residents is larger than for urban residents ($0.407 > 0.275$), suggesting that rural residents appear to bear a greater health shock. This difference may stem from the following reasons. First, food-safety regulation in rural areas is relatively weak, making it difficult to effectively guarantee the quality and safety of prepared-food products. Second, rural residents have relatively lower health awareness and nutritional knowledge, leaving them less able to identify and avoid the potential risks of prepared food. Third, rural residents have relatively limited dietary choices and may depend more heavily on low-priced prepared food. Fourth, rural areas have poorer access to medical resources, so the consequences of health damage are more severe.

Table 4. Baseline regression results of urban-rural heterogeneity

	(Urban residents)	(Rural residents)
	srh	srh
score1	-0.275**	-0.407
	(0.127)	(0.376)
Control variables	YES	YES
Observations	13893	21278

It is worth pointing out that the estimated standard error of the rural group (0.376) is far larger than that of the urban group (0.127), which may be due to smaller spatial variation in prepared-food industry development in rural areas or greater sample heterogeneity. Therefore, whether the urban-rural difference is statistically significant still needs to be confirmed through further inter-group coefficient-difference tests.

4.4.2. Age heterogeneity

This paper uses age 60 as the cutoff and divides the sample into older and younger groups. Table 5 shows that in the non-elderly group the coefficient of score1 is -0.503 ($p < 0.01$), meaning that each one-unit increase in prepared-food industry development lowers the non-elderly group's self-

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assessed health by about 0.503 units; in the elderly group the coefficient of score1 is -0.232 ($p < 0.01$), roughly half that of the non-elderly group. The absolute effect of the non-elderly group is about 2.17 times that of the elderly group, indicating that the health-damaging effect of prepared-food industry development is more pronounced among younger groups. This result may seem counter-intuitive--since the elderly are generally viewed as more physically fragile and more vulnerable to food risks--but it can be reasonably interpreted from several angles. First, difference in exposure frequency. Younger groups live at a fast pace with high work pressure and are more inclined to choose convenient and fast food, relying far more on takeout and prepared food than the elderly; the elderly largely maintain traditional cooking habits and consume prepared food at a lower actual frequency. Higher exposure frequency means greater accumulation of health risk. Second, diminishing marginal effect. The elderly group's self-assessed health is already at a low level (descriptive statistics show that the mean SRH of the elderly is lower than that of the young), and under the influence of various age-related diseases and physiological decline, the "marginal damage" from prepared food is relatively limited; by contrast, the young have a better baseline health status, so the health "loss" brought by prepared food is more easily detected, producing a larger effect size statistically. Third, difference in health perception. Younger groups are more sensitive to changes in physical health and more capable of detecting minor diet-induced health fluctuations; the elderly have a higher "tolerance" for health problems and tend to attribute bodily discomfort to "getting old" rather than to specific dietary factors.

Taken together, the age-heterogeneity results reveal an important policy implication: the health risks of prepared food should not be viewed merely as an "elderly problem"; younger groups equally--and even more--deserve attention.

Table 5. Baseline regression results of age heterogeneity

	(Non-elderly group)	(Elderly group)
	srh	srh
score1	-0.503**	-0.232
	(0.222)	(0.163)
Control variables	YES	YES
Observations	15061	20110

4.4.3. Cognitive heterogeneity

This paper divides the sample into low-cognition and high-cognition groups by cognitive ability for separate regressions. Table 6 shows that in the low-cognition group the coefficient of score1 on self-assessed health is -0.129, while in the high-cognition group it is -0.573 and significant at the 1% level, indicating that for groups with higher cognitive levels, the more the prepared-food industry develops, the worse residents' self-assessed health becomes. Three explanatory directions can be proposed. First, difference in exposure frequency. High-cognition individuals usually hold knowledge-based or managerial occupations (white-collar workers, professionals, etc.), live at a faster pace with greater work pressure, and rely far more on takeout and convenience food than low-cognition individuals engaged in manual labor or agricultural production; hence high-cognition individuals have a higher actual exposure level to prepared food, and their accumulated health damage is naturally more pronounced. Second, difference in health perception. Individuals with

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higher cognitive ability perceive their own health status more acutely and finely, and can capture minor diet-induced health fluctuations more accurately; low-cognition individuals may perceive health signals relatively sluggishly or use broader health-evaluation criteria, so the variation in their self-assessed health is harder to detect. In a word: it is not that prepared food harms high-cognition individuals more, but that they can "report" this harm more accurately. Third, cognitive effect. High-cognition individuals are better able to acquire, understand, and remember food-safety information, and have a fuller awareness of the potential health risks of prepared food. This awareness itself may translate into a more cautious health evaluation--when an individual realizes that a certain food may be harmful to health, they tend to give a lower score when evaluating their own health status. This is a "cognitive effect" --only by knowing the risk does one tend to report the damage.

Across the three dimensions of heterogeneity analysis above, the negative effect of prepared-food industry development on self-assessed health is more pronounced among urban residents, non-elderly groups, and high-cognition groups. Combining the heterogeneity analysis across the three dimensions yields the following three conclusions. First, the health-damaging effect of prepared-food industry development is most pronounced among younger and high-cognition groups. The results across all three dimensions reveal a common pattern: the health risks of prepared food do not simply fall on the "vulnerable groups" (the elderly, low-cognition individuals) but concentrate more on the "active consumer groups" (the young, high-cognition individuals). The core mechanism behind this is exposure frequency--those who rely more on convenience food suffer greater health damage, rather than the traditionally more vulnerable groups. Second, when group characteristics overlap, the risk is further amplified. Those who live in cities, are under 60 years old, and have higher cognitive ability constitute the group most victimized by the health risks of prepared-food industry development. This group usually has higher consumption capacity, a faster pace of life, and greater demand for food convenience, making it the core target customer base of prepared-food enterprises and the group where health risks are most concentrated. Third, the dual nature of the policy implication. The above findings suggest that the prevention and control of health risks in the prepared-food industry cannot rely solely on the traditional "vulnerable-group protection" logic, but must also proceed from the angle of "consumer-behavior intervention." On the one hand, health education for younger and high-cognition groups should be strengthened to raise their awareness of the potential risks of prepared food; on the other hand, measures such as improving nutrition labeling and promoting healthy prepared-food standards should be adopted to reduce the health risks of prepared food from the supply side.

This paper tests the heterogeneity of the effect of prepared-food industry development on self-assessed health along the three dimensions of urban-rural, age, and cognitive ability. On the urban-rural dimension, the health-damaging effect of prepared-food industry development is consistent in direction between urban and rural areas (both negative), with rural residents showing a larger absolute coefficient but lower estimation precision, indicating that food-safety regulation and medical security for rural residents need further strengthening. On the age dimension, the damage level of the non-elderly group (under 60) is about 2.17 times that of the elderly group, showing that the health risks of prepared food concentrate mainly in younger consumer groups, breaking the traditional belief that "food-safety problems mainly affect the elderly." On the cognition dimension, the health-damaging effect is significant for high-cognition groups but not for low-cognition groups, reflecting that high-cognition individuals bear a greater health shock because of higher exposure frequency from prepared-food consumption and keener health perception. The above heterogeneity results provide empirical basis for precise and differentiated food-safety regulation policies for prepared food. Policymakers should formulate differentiated intervention strategies according to the

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risk characteristics of different groups: for younger groups, priority should be given to strengthening health publicity and nutrition-labeling construction; for rural areas, priority should be given to strengthening quality supervision and law enforcement; and for high-cognition groups, priority should be given to improving the precise delivery of risk information and guidance toward rational consumption.

Table 6. Baseline regression results of cognition heterogeneity

	(Low cognition)	(High cognition)
	srh	srh
score1	-0.129	-0.573***
	(0.152)	(0.198)
Control variables	YES	YES
Observations	12700	13905

4.5. Mechanism analysis

To further reveal the intrinsic transmission path through which prepared-food industry development affects self-assessed health, this paper tests the mediating role of life satisfaction (satlife).

Table 7 reports the mediating-effect test results for life satisfaction (satlife). Column (1) shows the total effect of the prepared-food industry development index (score1) on self-assessed health (srh). The results show that the coefficient of score1 is -0.363 and significant at the 1% level, indicating a significant negative total effect of prepared-food industry development on self-assessed health, satisfying the precondition for mediation analysis.

Column (2) shows the effect of prepared-food industry development on life satisfaction (satlife). The results show that the coefficient of score1 is -0.293 and significant at the 1% level, indicating that prepared-food industry development significantly reduces individuals' life satisfaction. Each one-unit increase in the prepared-food industry development index lowers life satisfaction by about 0.293 units. This finding is as expected--the food-safety worries, dietary-culture shifts, and the substitution of traditional cooking by industrialized food brought by the rapid expansion of the prepared-food industry may jointly erode residents' overall satisfaction with their living environment.

Column (3) shows the results after including both prepared-food industry development and life satisfaction in the regression model. First, the coefficient of life satisfaction on self-assessed health is 0.295 and significant at the 1% level, indicating that the higher the life satisfaction, the better residents' self-assessed health. Second, after controlling for life satisfaction, the coefficient of score1 falls from -0.363 in column (1) to -0.291, a drop of about 20%, but remains significant at the 5% level. This result indicates that life satisfaction plays a partial mediating role between prepared-food industry development and self-assessed health--prepared-food industry development damages health both through a direct path and indirectly by lowering life satisfaction, which worsens health evaluation.

The stepwise regression results show that the transmission path of "prepared-food industry development → decline in life satisfaction → deterioration of self-assessed health" is established. This finding reveals the psychological mechanism through which prepared-food industry development affects public health--the expansion of the prepared-food industry not only damages

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health through direct physiological pathways such as food safety, but also indirectly worsens individuals' evaluation of their own health status by eroding the psychological resource of life satisfaction. In policy terms, this suggests that food-safety regulation should not focus only on direct physiological health damage, but should also attend to the potential impact of food-industry development on residents' mental health and quality of life.

Table 7. Mediating-effect test: the mediating role of life satisfaction (satlife)

	(1)	(2)	(3)
	srh	satlife	srh
score1	-0.363***	-0.293***	-0.291**
	(0.135)	(0.100)	(0.132)
Control variables	YES	YES	YES
Sample size	35171	34675	34654

5. Conclusion and policy implications

5.1. Main conclusions

Using CHARLS data from China, this paper constructs a composite index of prepared-food industry development through the entropy method and systematically examines the impact of prepared-food industry development on residents' self-assessed health and its mechanisms. The main conclusions are as follows. First, prepared-food industry development has a significant negative effect on residents' self-assessed health. The baseline regression shows that each one-unit increase in the composite index lowers self-assessed health by about 0.37 units. This conclusion holds after multiple robustness checks, including replacing the core explanatory variable, excluding pandemic years, dropping municipalities, changing the econometric model, and changing the clustering level. Second, the effect of prepared-food industry development on self-assessed health shows significant heterogeneity. Group regressions reveal that this negative effect is more pronounced among urban residents, non-elderly groups, and high-cognition groups, suggesting a clear unequal distribution of the health risks of prepared-food industry development. Third, life satisfaction is an important mediating channel through which prepared-food industry development affects self-assessed health. The mediation analysis shows that prepared-food industry development indirectly worsens self-assessed health by lowering individuals' life satisfaction. This finding reveals the psychological mechanism through which food-industry development affects public health.

5.2. Policy recommendations

Based on the above research findings, this paper proposes the following policy recommendations:

First, efforts should be made to bring the prepared-food industry into the scope of food-safety regulation and strengthen its food-safety supervision. The empirical results of this paper show that prepared-food industry development has a significant negative impact on public health. Regulatory authorities should accelerate the improvement of prepared-food food-safety standards, bring all stages from raw materials to storage and transport within the control scope of production quality, and strengthen whole-process and whole-chain quality monitoring of prepared-food production, processing, storage, and transport, so as to vigorously crack down on illegal addition of

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preservatives and colorants and unlawful addition of non-edible substances, thereby reducing their health impact and lowering the health risks of prepared food at the source. Supervision of the prepared-food industry itself is an important force driving its standardized development, and it will also improve residents' health level in multiple aspects such as consumption, nutrition, and hygiene.

Second, differentiated approaches should be applied to regulation, implementing differentiated regulatory strategies. Analyzing the health risks of prepared food by population reveals fairly clear group differences in its impact, which policy formulation should fully take into account. For low-income regions and rural areas, the frequency of prepared-food sampling inspections should be increased and the mechanism for disclosing food-safety information improved, so as to prevent relatively disadvantaged groups from being affected. Health education and publicity should be used to guide the public to choose food rationally, strengthen their awareness of and ability to avoid the potential health risks of prepared food, and help them learn to handle health problems related to prepared food; targeted health-education activities should be carried out for different groups in particular, so as to bring all types of people within the scope of health education and raise the public's health literacy and food-choice ability.

Third, attention should be paid to the indirect impact of food-industry development on residents' mental health. This paper finds that life satisfaction is an important mediating channel through which prepared-food industry development affects health, suggesting that food-safety regulation should not focus only on direct physiological health damage, but should also take into account psychological or quality-of-life effects and attend to its potential impact on residents' quality of life and mental health. It is recommended to incorporate indicators such as mental health and life satisfaction into food-safety policy evaluation, thereby broadening the scope of food-safety assessment.

5.3. Research limitations and prospects

This paper has the following limitations. First, constrained by data availability, the prepared-food industry development index uses macro indicators at the regional level, which may involve measurement error. Second, this paper uses observational data; although various confounding factors have been considered and controlled for, omitted-variable bias is difficult to fully exclude. Third, this paper uses self-assessed health as the measure of health outcomes; although widely used, it may still be subject to individual cognitive bias.

Future research may go deeper in the following directions: first, use more detailed individual dietary data to examine the frequency and actual intake of prepared food consumed; second, adopt quasi-experimental methods (such as the difference-in-differences method) to identify causal relationships more cleanly; and third, expand the scope of analysis to various regions and age groups to fully assess the public-health impact of prepared-food industry development and provide a more complete account of the overall impact of prepared-food industry development on residents' health.

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