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Influence of Housing Resettlement on the Subjective Well-Being of Disaster-Forced Migrants: An Empirical Study in Yancheng City

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Abstract: As natural disasters have occurred frequently in recent years, disaster-induced migration has become inevitable. People normally attach great importance to the speed and results of post-disaster reconstruction while ignoring the subjective well-being (SWB) of disaster victims, which represents their quality of life and emotional conditions. Based on a questionnaire survey of 256 respondents from Yancheng's 17 centralised resettlement communities established after a hurricane in 2016, we used ordinal logistic regression models to discuss the SWB of disaster-induced migrants and its main influencing factors. We found that the SWB of disaster-induced migrants is influenced by resettlement housing conditions and community built and social environments. In light of the housing resettlement conditions, the findings show that disaster migrants are likely to feel happier if they are satisfied with the housing resettlement allocation mode, housing resettlement quality and the living space, and the more housing expenditure related to the resettlement is, the less happy they tend to be. In regard to the community environment, it is found that disaster migrants' evaluation of community facilities and participation does not have a significant impact on their happiness, but the more highly rated community hygiene and the cadre–mass relationship are, the happier they tend to be.

Keywords: housing resettlement; disaster-induced migrant; SWB; ordinal logistic model

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1. Introduction

As the spatial distribution of high-risk natural disaster-prone areas and population clusters tends to converge, an increasing number of people susceptible to natural disasters have become disaster-induced migrants. Due to the high incidence of geological hazards and extreme weather events, disaster-induced migrations are expected to increase [1]. Existing research has conducted in-depth studies on the social adaptation and integration of disaster migrants as well as their livelihood issues [2,3]. However, the emotional well-being and life quality of these disaster migrants are under-examined. Emotional conditions can be measured in terms of subjective well-being (SWB), which is also a crucial index to measure the healthiness of urban social governance [4]. With the increasing number of disaster-induced migrants, it is particularly important to explore how to increase their SWB in order to enhance the overall resettlement conditions [5].

SWB is an important index of quality of life, and it was initially developed in the middle of the 20th century [6]. SWB refers to individuals' self-evaluation of overall satisfaction about their living standards according to their own internalised criteria, including life satisfaction, positive emotions and negative emotions [7]. SWB studies mainly focus on determining the SWB values and corresponding influencing factors [8]. SWB is a psychological index that represents a personal feeling, meaning that it is mostly measured by self-report inventories [9]. Before the 1980s, SWB was mostly measured by single-item scales, including the Delighted-Terrible Scale (DT) compiled by Andrews (1976) [10] and

the Memorial University of Newfoundland Scale of Happiness translated and modified by Liu in 1999 [11]. As the methods of SWB measurement are increasingly diverse and have been improved for specific disciplines, researchers have developed a new measurement index system in which a questionnaire survey is combined with other measurement methods, and both positive and negative indices are used [12]. However, in most SWB studies, the sample size is relatively large, and the time span is relatively long. Therefore, a single-question method provides highly targeted independent questions, and the respondents are asked to report their overall well-being [13]. Existing studies show that a person's SWB is influenced by individual factors (e.g., gender [14,15], age [16,17], education level [18,19], income level [20,21], marital status [22,23], health status [24,25]), as well as exogenous social factors (e.g., social culture and social interaction [26]). In the case of disaster-induced migrants, the most significant impact of natural disasters to these people is the damage to their housing [27]. Henceforth, housing resettlement is a rudimentary guarantee for the survival of disaster-induced migrants, and it directly affects their quality of life [28].

Existing studies show that housing settlement has a significant influence on the SWB of people. For example, Kingston [29] argued that the self-ownership of housing can improve individual satisfaction and well-being. Zumbro [30] observed that housing ownership has a slight positive influence on individual SWB, and living spaces and community environments significantly influence the well-being of residents. Rudolf [31] reported that an increase in living space can improve the well-being of residents. In China, studies on the relationship between housing settlement and SWB are relatively new, and some of them focus on the influence of housing ownership on the well-being of residents. Lin [32] and Li [33] observed that the well-being of people who are house owners was significantly higher than that of tenants. Ning [34] and Xia [35] discussed the influence of living space on individual SWB, arguing that the larger the self-owned living space, the higher the SWB. In addition, some studies further examined living space from the perspective of bedroom number and found that the number of bedrooms was positively associated with the residents' well-being. For instance, the well-being of people who owned housing with multiple rooms was significantly higher than that of residents who owned a studio [36]. To summarise, apart from housing ownership, the housing settlement conditions embodied by per capita living space (bedroom numbers), community environments and public facilities also have significant influences on individual SWB [37].

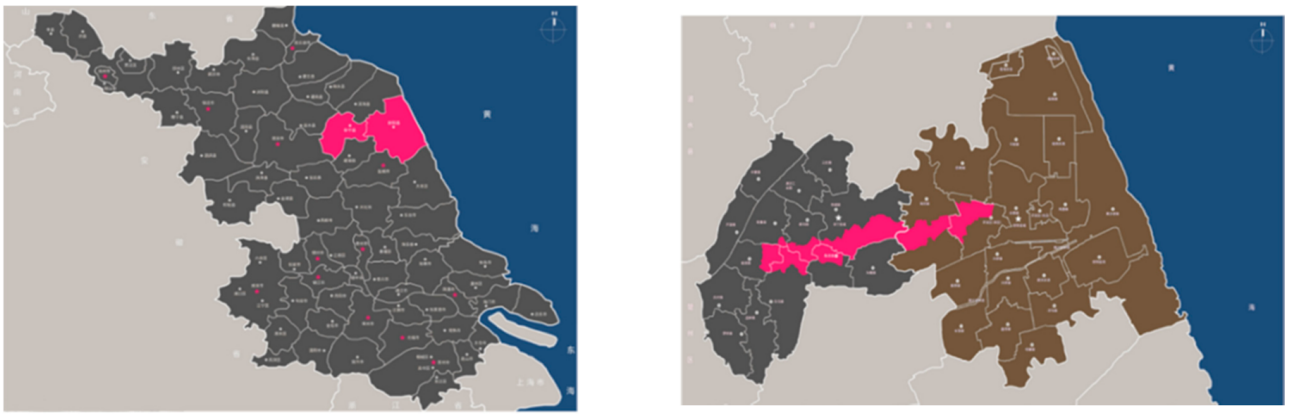
Against this backdrop, this article aims to measure the SWB of disaster-induced migrants and examine how housing resettlement affects individual SWB, using Yancheng's resettlement communities for hurricane victims as a case study area. Ordinal logistic regression models were used to investigate the mechanism through which the SWB of disaster-induced migrants is influenced by their housing resettlements. The findings of this study are expected to provide a reference for improving resettlement policies of disaster-induced migrants and constructing a service-oriented government.

2. Data and Methodology

2.1. Case Background

In June 2016, Yancheng City, Jiangsu Province, was hit by a major hurricane, resulting in a particularly significant disaster in terms of collapsed houses, damaged utilities, casualties and blocked roads. The hurricane's affected zone was distributed in a zigzag pattern, with a total affected area of approximately 269 square km. It affected 1,400,079 people in Yancheng City, involving 17 towns (streets) and 122 villages, with the main affected areas being in Funing and Sheyang Counties. The area where the hurricane passed through was rural and densely populated, and most of the houses were village dwellings, mainly of the one- or two-storey construction type, with low wind and earthquake resistance, meaning the direct loss to the victims of this disaster was the destruction of the housing settlement. A total of 4488 households were affected, 15,040 houses collapsed, 3044 households were severely affected, 12,819 houses were damaged, 4747 households were generally affected and 17,079 houses were damaged. Sheyang County has a concentrated population

of 178 people, with 1479 affected households and 4466 damaged houses, of which 216 households were particularly severely affected, 610 houses collapsed, 326 households were severely affected, 992 houses were damaged and 1070 households were generally affected, with 2864 damaged houses. The location map of the affected area is shown in Figure 1.



(**left**) (**right**)

Figure 1. The location of the hurricane-affected zone (**left**): the location of Funing and Sheyang Counties in Jiangsu Province; (**right**): the location of the affected zone within Funing and Sheyang).

A total of 21 centralised resettlement communities were built after the disaster. These communities were constructed by the government for those affected rural residents whose farmland and residential bases were severely damaged by the disaster. There are two types of dwellings in the resettlement areas, one is a four-storey high-rise building and the other is a two-storey townhouse. The floor area of the apartment or the townhouse varies from 30, 70, 90, 100 and 120 to 140 m^2. For fairness and equality, the housing resettlement is allocated according to each household's population, with 70 m^2 for 1–2 people, 100 m^2 for 3–4 people and 120 m^2 and above for more than 5 people; and for those resettled in the high-rises, the storey of their apartments is decided by drawing lots.

2.2. Data Sources

The data used in this study were acquired through field surveys on the resettlements of Yancheng's hurricane-forced migrants conducted in July 2019, January 2020 and October 2020 (For details of the questionnaire, please see the Appendix A). The questionnaire surveys were conducted on Yancheng's 17 centralised resettlement communities (14 in Funing County and 3 in Sheyang County). Using Sheyang County and Funing County in Yancheng City as the overall population and 17 resettlement communities as subgroups, the survey was drawn using the stratified sampling method, and respondents were randomly selected within the resettlement communities for the questionnaire survey. The respondents were all migrants who were centrally resettled to the communities as a result of the hurricane disaster. A total of 300 questionnaires were submitted, and 286 questionnaires were returned. After a preliminary analysis, 256 returned questionnaires were considered valid (85.33%). Table 1 describes the distribution of sample points along different survey routes.

Table 1. Sample distribution in the survey region.

Administrative Region	Resettlement Point	Frequency	Percentage	Cumulative Percentage
Sheyang County	Chenyang Community	18	7.03%	7.03%
	Wufen	8	3.13%	10.16%
	Xinhong	6	2.34%	12.50%
Funing County	Lixin	30	11.72%	24.22%
	Dalou	30	11.72%	35.94%
	Nanwan	11	4.30%	40.24%
	Chengjun	20	7.81%	48.05%
	Xintu	29	11.33%	59.38%
	Danping	5	1.95%	61.33%
	Chenliang	7	2.73%	64.06%
	Jiqiao	28	10.94%	75.00%
	Shuangqiao	7	2.73%	77.73%
	Dongcui	5	1.95%	79.68%
	Qiqiao	11	4.30%	83.98%
	Zhengzhu	10	3.91%	87.89%
	Kongdang	21	8.20%	96.09%
	Shaozhan	10	3.91%	100.00%

2.3. Variable Selection and Propositions

In this study, the SWB of disaster-induced migrants was measured using the single-item overall happiness scale. The question was 'Overall, do you think your life is happy?', and the variable was measured by a 5-point scale (from 'very unhappy' to 'very happy'), with a fixed-sequence and fixed-distance variable. Existing studies show that the question is stable and representative for the measurement of SWB [38–41].

Well-being is an individual's subjective feeling, and it can vary with individual characteristics even under the same external conditions. There are several studies concerning the influencing factors of SWB. In this study, control variables were used to reflect the influence of individual and household factors on the SWB of disaster-induced migrants. These variables included gender, age, education level, health status, marriage status and annual household income.

Post-disaster losses in rural areas mainly include direct economic losses arising from the destruction of houses, which account for more than 80% of the total post-disaster loss [42]. Therefore, housing resettlements directly affect the SWB of disaster-induced migrants. Before survey design, we conducted pilot studies by interviewing the disaster migrants about their ratings and opinions on how housing resettlement affected their SWB. As a result, housing resettlement conditions and community environment turned out to be the most concerning aspects. For the resettlement community environment, it includes both the built and the social environment. Overall, eight indicators were selected to represent these variables, including housing allocation mode, housing expenditure, housing quality, living space, community infrastructure, community hygiene, community participation and cadre–mass relationship.

The housing allocation mode was denoted by the evaluation of housing allocation conducted by the resettled migrants. Housing expenditure refers to the expenses of housing purchase, decoration and repair incurred by the purchase of resettlement housing, excluding the governmental subsidy of CNY 55,000. Housing expenditure was divided into five ranges. Housing quality was measured in terms of housing quality rated by the resettled migrants. There were six types of living space in the resettlement communities. Community facilities were measured in terms of local supermarkets, health services, kindergartens, elementary schools, playrooms for the elderly, gyms, chess and card rooms and quantity of bus stops within a 1 km walking distance. Community hygiene was measured in terms of the evaluation conducted by the migrants of the street or alley cleanliness, open space, stairway cleanliness and garbage collection. Community participation was measured

in terms of the frequency at which resettlement migrants participate in square dances, exercise activities, recreational activities and community online groups. The cadre–mass relationship was measured based on the resettled migrants' degree of trust in community cadres. Table 2 lists the values of these variables.

Table 2. Variable names and values.

		Variable Name	Variable Value
Explained variable	Variable category	SWB	1 = very unhappy; 2 = fairly unhappy; 3 = not sure; 4 = fairly happy; 5 = very happy
Explanatory variable	Resettlement housing conditions	Housing allocation mode	1 = very bad; 2 = fairly bad; 3 = average; 4 = fairly good; 5 = very good
		Housing expenditure	1 = 0; 2 = 0 to 20,000; 3 = 20,000 to 40,000; 4 = 40,000 to 60,000; 5 = more than 60,000 (unit: yuan)
		Housing quality	1 = very bad; 2 = fairly bad; 3 = average; 4 = fairly good; 5 = very good
		Living space	1 = 30 m^2; 2 = 70 m^2; 3 = 90 m^2; 4 = 100 m^2; 5 = 120 m^2; 6 = 140 m^2
	Resettlement community environment	Community facilities	1 to 8: indicating the existing quantity of various types of facilities
		Community hygiene	1 = very dirty; 2 = fairly dirty; 3 = average; 4 = fairly clean; 5 = very clean
		Community participation	1 = never participate; 2 = seldom participate; 3 = sometimes participate; 4 = often participate; 5 = always participate
		Cadre–mass relationship	1 = distrust very much; 2 = fairly distrust; 3 = averagely; 4 = fairly trust; 5 = trust very much
Control variable	Individual and household	Gender	1 = male; 0 = female
		Age	1 = 29 or below; 2 = 30 to 44; 3 = 45 to 59; 4 = 60 or above
		Education level	1 = primary school level or below; 2 = junior middle school level; 3 = senior middle school level; 4 = technical secondary school level or above
		Health status	1 = very unhealthy; 2 = fairly unhealthy; 3 = averagely; 4 = fairly healthy; 5 = very healthy
		Marriage status	1 = married; 0 = unmarried
		Annual household income	1 = less than 10,000; 2 = 10,000 to 20,000; 3 = 20,000 to 30,000; 4 = 30,000 to 40,000; 5 = more than 40,000 (yuan)

Based on our fieldwork, the following assumptions between the eight variables and their influence on SWB are presented:

1. As mentioned earlier, the housing resettlement is allocated by drawing lots and in line with household population. The policy is intended to be open, fair and just, but after our fieldwork, the migrants' evaluation of the housing allocation mode was mixed, which affects their SWB. In this study, this variable is represented by the evaluation of the housing allocation method by migrants in the resettlement community. Proposition 1: The housing allocation mode is significantly positively associated with the SWB of disaster-induced migrants.
2. Generally speaking, housing expenditure affects family savings and thus has a negative effect on the SWB of disaster migrants. In this study, housing expenditure includes the purchase cost, renovation cost and house repair cost that migrants have to spend when they purchase the resettlement dwellings. Proposition 2: Housing expenditure is significantly negatively associated with the SWB of disaster-induced migrants.
3. Housing quality affects the migrants' living experience and thus their well-being, while housing for migrants still resettled in the affected areas must strictly follow disaster preparedness and resilience requirements, improve wind and storm resistance and ensure construction quality. In this study, this variable is mainly examined through the migrants' rating of the construction quality of the houses. Proposition 3: Housing quality is significantly positively associated with the SWB of disaster-induced migrants.
4. The increase in living space helps to improve the well-being of migrants. As mentioned earlier, six different floor areas are planned dedicated to different sizes of households according to hukou status. However, the actual per capita living space may vary significantly as some hukou-registered people may not actually stay in the place but migrated to other places for a living. Proposition 4: Per capita living space is significantly positively associated with the SWB of disaster-induced migrants.
5. Community facilities are crucial because they can facilitate the life of migrants and improve their quality of life. The community facilities variables chosen for this paper are expressed in terms of the number of supermarkets, health rooms, kindergartens,

primary schools, elderly activity rooms, fitness squares, chess and card rooms and bus stops within a 1 km walk of the community. Proposition 5: Community facilities are significantly positively associated with the SWB of disaster-induced migrants.

6. Community hygiene is, on the one hand, the first impression that migrants have of the centralised resettlement community, and, on the other hand, it also has an impact on migrants' living environment and a significant impact on their subjective sense of well-being, which is expressed in this study by the migrants' self-assessment of community hygiene in terms of street hygiene, open space, buildings and rubbish collection. Proposition 6: Community hygiene is significantly positively associated with the SWB of disaster-induced migrants.
7. Community participation reflects the construction of the social environment in resettlement communities and is an important way for migrants to obtain social support and neighbourhood interaction, which can significantly affect their subjective well-being. This paper uses the frequency of migrants' participation in community square dance activities, fitness activities, recreational activities and community Weibo groups to indicate the level of community participation. Proposition 7: Community participation is significantly positively associated with the SWB of disaster-induced migrants.
8. Analysis of the cadre–mass relationship can, on the one hand, reflect whether the current governance capacity of community cadres is satisfactory to migrants; on the other hand, it can also help to understand whether community cadres are meeting the needs of migrants when implementing the resettlement policy from above. In this study, the cadre–mass relationship variable is expressed in terms of migrants' trust in community cadres. Proposition 8: The cadre–mass relationship is significantly positively associated with the SWB of disaster-induced migrants.

2.4. Study Methodology and Model Setting

Multicategorical logistic models are used for data where the dependent variable is multicategorical, including multivariate ordinal logistic regression models and multivariate unordered logistic regression models. If the dependent variable is a categorical variable, the multivariate unordered logistic regression model is applied. If the dependent variable is an ordered multicategorical variable with a certain rank or degree, then a multivariate ordinal logistic regression model is applied. In this study, the dependent variable in the questionnaire is the subjective well-being of disaster migrants, and the options are divided into five ordered multicategorical variables, meaning a multivariate ordinal logistic regression model was chosen for the empirical analysis in this study.

In this study, the SWB of disaster-induced migrants is a dependent variable with five ordinal polytomous variables, including 'not sure' as an option between 'fairly unhappy' and 'fairly happy'. According to the requirements for ordinal logistic regression modelling, the following model for the influence of SWB was built:

$$\text{happiness}^* = \beta_{0j} + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_i x_i \quad (1)$$

where happiness* denotes the SWB level; x_i denotes the i-th independent variable; $\beta_{0\,j}$ denotes the constant term of the regression equation when the SWB is j; and β_i denotes the regression coefficient.

The SWB of disaster-induced migrants has five grades from 1 to 5, in an increasing order of happiness. There are four functions corresponding to the ordinal logistic regression models. The cumulative probability of each model is as follows:

$$\mathrm{P}(\text{happiness} = \mathrm{j}|\mathrm{x}) = \frac{1}{1+\exp\left[-\left(\beta_{0\mathrm{j}}+\beta_1 x_1+\beta_2 x_2+\ldots+\beta_{\mathrm{i}} x_{\mathrm{i}}\right)\right]} - \frac{1}{1+\exp\left[-\left(\beta_{0\mathrm{j}-1}+\beta_1 x_1+\beta_2 x_2+\ldots+\beta_{\mathrm{i}} x_{\mathrm{i}}\right)\right]} \quad (2)$$

The probability of each SWB grade is as follows:

$$P(\text{happiness} = 1) = P(\text{happiness} \leq 1) \quad (3)$$

$$P(\text{happiness} = 2) = P(\text{happiness} \leq 2) - P(\text{happiness} = 1) \quad (4)$$

$$P(\text{happiness} = 3) = P(\text{happiness} \leq 3) - P(\text{happiness} = 2) \quad (5)$$

$$P(\text{happiness} = 4) = P(\text{happiness} \leq 4) - P(\text{happiness} = 3) \quad (6)$$

$$P(\text{happiness} = 5) = P(\text{happiness} \leq 5) - P(\text{happiness} = 4)$$
$$P(\text{happiness} = 1) + P(\text{happiness} = 2) + \ldots P(\text{happiness} = 5) = 1 \quad (7)$$

3. Results

3.1. SWB of Disaster Migrants

Among the 256 respondents, 156 were male (60.94%) and 100 were female (39.06%). The average age of the respondents was 59, and their age was mainly distributed from 50 to 70 years. In addition, 88.28% of the respondents were married, whereas 11.72% were unmarried. The overall education level of the respondents was relatively low. Respondents with a junior middle school level or below accounted for 92.97%; those with a primary school level or below accounted for 54.69%; and those with a senior middle school level or above accounted for 7.03%. Unhealthy respondents accounted for 10.94%, those with average health accounted for 33.59% and healthy respondents accounted for 55.47%. Respondents with an annual household income of less than CNY 10,000, CNY 10,000–20,000, CNY 20,000–30,000, CNY 30,000–40,000 and more than CNY 40,000 accounted for 25.39%, 26.18%, 33.20%, 14.06% and 1.17% of the respondents, respectively. Table 3 describes the profile of the migrants.

Table 3. Profile of migrants.

Type	Option	Number	Percentage	Type	Option	Number	Percentage
Gender	Male	156	60.94%	Health status	Very unhealthy	2	0.78%
	Female	100	39.06%		Fairly unhealthy	26	10.16%
Age	29 or below	2	0.78%		Average	86	33.59%
	30 to 44	18	7.03%		Fairly healthy	128	50%
	45 to 59	109	42.58%		Very healthy	14	5.47%
	60 or above	127	49.61%	Marriage status	Married	226	88.28%
					Unmarried	30	11.72%
Education level	Primary school level or below	140	54.69%	Annual household income	Less than CNY 10,000	65	25.39%
	Junior middle school level	98	38.28%		CNY 10,000 to 20,000	67	26.18%
	Senior middle school level	16	6.25%		CNY 20,000 to 30,000	85	33.20%
	Technical secondary school level or above	2	0.78		CNY 30,000 to 40,000	36	14.06%
					More than CNY 40,000	3	1.17%

Table 4 describes the SWB grades of the disaster-induced migrants. The respondents selected one option from: 1 = very unhappy; 2 = fairly unhappy; 3 = not sure; 4 = fairly happy; or 5 = very happy. The mean SWB was 3.24, and the standard deviation was 1.02, which indicates that the SWB of disaster-induced migrants was above average, with a low degree of dispersion.

Table 4. Overall SWB of disaster-induced migrants.

Meaning	Variable Name	Sample Size	Mean	Standard Deviation	Maximum	Minimum
SWB	Happiness	256	3.24	1.02	5	1

Among the respondents, 13 felt very unhappy (5.08%), 47 felt fairly unhappy (18.36%), 84 felt averagely happy (32.81%), 89 felt fairly happy (34.77%) and 23 felt very happy (8.98%). Therefore, the results show that the SWB of disaster-induced migrants was overall good, and many of them selected an above-average SWB (Figure 2).

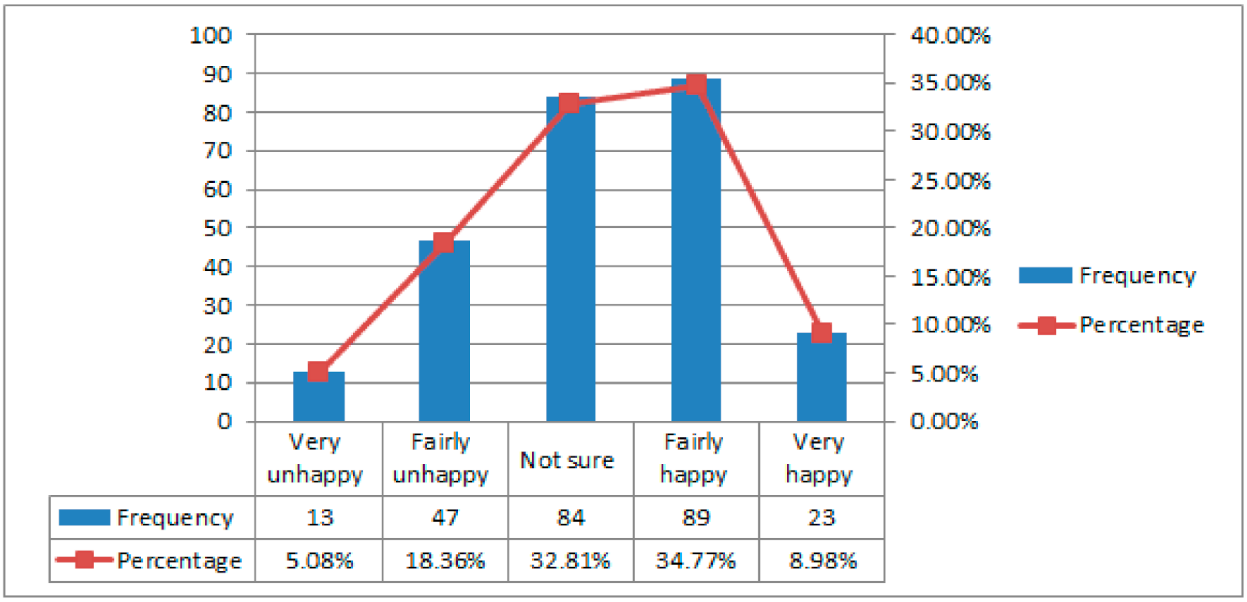


Figure 2. Descriptive statistics of SWB.

3.2. Model Testing and Selection

Based on the questionnaire survey, three models were constructed to study the relationship between housing placement and the SWB of disaster-induced migrants. Model 1 is a housing condition model in which variables about resettlement housing conditions are added, while individual and household variables are controlled. Model 2 is a community environment model in which variables regarding the resettlement community environment are added, while individual and household variables are controlled. Model 3 is a comprehensive model in which variables regarding resettlement housing conditions and the resettlement community environment are added, while individual and household variables are controlled. These three models were used to discuss the influence of housing resettlement on the SWB of disaster-induced migrants.

As the presence of multiple co-linearities among variables can affect the parameter estimates of the ordinal logistic regression model, multiple independent variables were tested for co-linearity, and the questionnaire variable data were tested for co-linearity using SPSS 19.0. The results of tolerance and the variance inflation factor obtained are shown in Table 5. The tolerance values in the test were all greater than 0.1, and the VIF values were all less than 5, indicating that there was no problem of multiple co-linearity between the variables, and the model constructed from the variables was more stable. In addition, for each model, parallel line inspections were conducted to ensure the validity of the model.

Model 1 analyses the impact of resettlement housing condition factors on the SWB of disaster migrants. By performing a model fit and a parallel line test on Model 1, it can be learned from Table 6 that the chi-square value of the model fit is 360.302, with a *p*-value of 0, which is less than 0.05, indicating that the model fits well. The parallelism test is used as a prerequisite to discern whether the study in question can use a multivariate ordered logistic regression model. The *p*-value of 0.884 in the Model 1 parallel line test, with a result greater than 0.05, indicates that the information provided by the independent variables can effectively account for the dependent variable.

Table 5. Results for testing the covariance of variables.

Variable Type	Variables	Covariance Statistics	
		Tolerance	VIF
Explanatory variables	housing allocation mode	0.628	1.593
	housing expenditure	0.305	3.283
	housing quality	0.439	2.275
	living space	0.247	4.044
	community facilities	0.727	1.376
	community hygiene	0.520	1.924
	community participation	0.563	1.775
	cadre–mass relationship	0.408	2.451
Control variables	gender	0.758	1.319
	age	0.371	2.692
	education level	0.630	1.588
	health	0.610	1.640
	marriage status	0.482	2.073
	household annual income	0.294	3.403

Table 6. Fitting information and parallel line test for Model 1.

Fitting Information			Parallel Line Test	
	Cut-off points	Final	Null Hypothesis	Generalised
−2 log likelihood	691.217	330.915	330.915	275.604
Chi-square		360.302		55.311
p-value		0.000		0.884

Model 2 analyses the impact of the resettlement community environment on the SWB of disaster migrants. From Table 7, we can learn that the chi-square value of the model fit was 327.939, with a *p*-value of 0, which is less than 0.05, indicating that the model fits well. The *p*-value in the parallel line test was 0.815, with a result greater than 0.05, indicating that the information provided by the independent variables can effectively account for the dependent variables and that the regression equations are parallel to each other.

Table 7. Fitting information and parallel line test for Model 2.

Fitting Information			Parallel Line Test	
	Cut-off points	Final	Null Hypothesis	Generalised
−2 log likelihood	690.585	362.646	362.646	312.532
Chi-square		327.939		50.115
p-value		0.000		0.815

Then, in Model 3, we conducted an overall analysis of the impact of housing resettlement on the subjective well-being of disaster migrants, where the resettlement housing condition variable, the resettlement community environment variable and the control variables were simultaneously added into Model 3 for regression. As shown in Table 8, the chi-square value of the model fit was 446.158, with a significance level of 0, which is less than 0.05, indicating that the model fits well. The significance value in the parallel line test was 1.000, and the result was greater than 0.05, indicating that the data met the conditions for using a multivariate ordered logistic regression model.

Table 8. Fitting information and parallel line test for Model 3.

Fitting Information		Parallel Line Test	
	Cut-off points	Final	Null Hypothesis	Generalised
−2 log likelihood	722.941	276.783	276.783	275.057
Chi-square		446.158		1.726
p-value		0.000		1.000

3.3. Logistic Regression Analysis and Results

As shown above, the three models were tested to be valid. By comparing the three models' analysis, as shown in Table 9, it is shown that the R^2 values in Model 3 were all higher than those in Models 1 and 2, indicating that the explanatory power of Model 3 was better.

Table 9. Logistic regression results considering the influence of housing resettlement on the SWB of disaster-induced migrants.

		Model 1		Model 2		Model 3	
Variable (reference group)		Beta Regression Coefficient	Odds Ratio Value	Beta Regression Coefficient	Odds Ratio Value	Beta Regression Coefficient	Odds Ratio Value
Housing allocation mode (very good)	Very bad	−2.833 **	0.059			−3.169 **	0.042
	Fairly bad	−2.468 ***	0.085			−2.477 **	0.084
	Average	−1.934 ***	0.145			−1.943 **	0.143
	Fairly good	−2.211 ***	0.110			−1.793 **	0.166
Housing expenditure (more than CNY 60,000)	0	4.166 **	64.457			3.919 *	50.350
	CNY 0 to 20,000	3.160 **	23.571			3.196 *	24.435
	CNY 20,000 to 40,000	2.326 **	10.237			2.217 *	9.180
	CNY 40,000 to 60,000	1.173	3.232			0.836	2.307
Housing quality (very good)	Very bad	−11.816 ***	0.000			−10.395 ***	0.000
	Fairly bad	−9.860 ***	0.000			−9.070 ***	0.000
	Average	−7.292 ***	0.001			−6.821 ***	0.001
	Fairly good	−4.733 ***	0.009			−4.412 *	0.012
Living space (140 m^2)	30 m^2	−9.079 ***	0.000			−6.525 **	0.001
	70 m^2	−3.845 ***	0.021			−3.231 **	0.040
	90 m^2	−3.318 ***	0.036			−3.391 ***	0.034
	100 m^2	−2.308 **	0.099			−2.114 *	0.121
	120 m^2	−1.130	0.323			−0.691	0.501
Community facilities (6)	3			0.542	1.719	1.469	4.345
	4			−0.235	0.791	0.174	1.190
	5			1.139 *	3.124	1.574 *	4.826
Community hygiene (very clean)	Very dirty			−2.751	0.064	0.338	1.402
	Fairly dirty			−4.374 ***	0.013	−2.029	0.131
	Average			−3.821 ***	0.022	−1.538	0.215
	Fairly clean			−2.021 *	0.133	0.226	1.254
Community participation (always participate)	Seldom participate			−1.676	0.187	−2.969	0.051
	Sometimes participate			−2.342	0.096	−2.104	0.122
	Often participate			−2.501 *	0.082	−2.644	0.071
Cadre–mass relationship (trust very much)	Distrust very much			−22.597 ***	0.000	−18.338 ***	0.000
	Fairly distrust			−20.023 ***	0.000	−16.294 ***	0.000
	Average			−17.814 ***	0.000	−14.743 ***	0.000
	Fairly trust			−14.851 ***	0.000	−11.346 ***	0.000
Pseudo R^2		0.803	0.768		0.877		

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

In Model 1, the reference group was as follows: housing allocation mode = very good, housing expenditure = more than CNY 60,000, housing quality = very good, and living space = 140 m^2. Therefore, the SWB of disaster-induced migrants was significantly influenced by the housing allocation mode, housing quality, housing expenditure and

living space. The regression analysis results show that the housing allocation mode is significantly positively associated with SWB, but this relationship is not linear. When 'very good' housing allocation was used as the reference, the SWB of respondents of the 'fairly good' housing allocation mode was significantly higher than that of respondents of 'very bad', and the SWB of respondents of 'average' was the highest, followed by the SWB of respondents of 'fairly good'. The SWB of respondents of the 'very bad' housing allocation mode was 0.059 times that of respondents of 'very good', and the SWB of respondents of 'average' was 0.145 times that of respondents of 'very good'. Therefore, the higher the evaluation of the housing allocation mode, the higher the SWB of respondents. These results corroborate Proposition 1. Compared with the SWB of respondents with housing expenditure of 'more than CNY 60,000', the SWB of respondents with '0′ housing expenditure was significantly higher, with an odds ratio value of 64.457. That is, the SWB of the latter was 64 times higher than that of the former, and such results indicate that the higher the housing expenditure, the lower the SWB of disaster-induced migrants. Therefore, Proposition 2 is corroborated. Housing quality influenced the SWB of respondents at the confidence level of 1%, with a low odds ratio value. Housing quality presented a significant and strong association with SWB, which corroborates Proposition 3. The SWB of respondents with a living space of 70, 90, 100 and 120 m^2 was, respectively, 0.021, 0.036, 0.099 and 0.323 times that of respondents with a living space of 140 m^2, and the SWB of respondents with a living space of 30 m^2 was very low. Therefore, resettlement living space was significantly positively associated with SWB, which corroborates Proposition 4.

In Model 2, the reference group was as follows: community facilities = 6, housing cleanliness = very clean, community participation = always participate, and cadre–mass relationship = trust very much. The regression analysis showed that community hygiene and the cadre–mass relationship significantly affected the SWB of disaster-induced migrants, whereas community facilities and community participation did not present a significant influence. Specifically, community facilities had no significant influence and were not positively associated with SWB. The SWB of respondents with 'community facilities = 5′ was three times higher than that of respondents with 'community facilities = 6′. Therefore, Proposition 5 is not corroborated. Community participation did not significantly affect SWB. Only 'community participation = often participate' influenced the SWB at the confidence level of 10%, and the SWB of respondents with 'community participation = often participate' was 0.082 times that of respondents with 'community participation = always participate'. Therefore, Proposition 7 is not corroborated. Community hygiene significantly affected SWB. When 'very clean' was used as the reference, 'fairly dirty and average' and 'fairly clean' were associated with SWB at the confidence levels of 1% and 10%, respectively. The SWB of respondents of 'fairly dirty' was 0.013 times that of respondents of 'very clean'; the SWB of respondents of 'average' was 0.022 times that of respondents of 'very clean'; and the SWB of respondents of 'fairly clean' was 0.133 times that of respondents of 'very clean'. Therefore, the higher the community hygiene, the higher the SWB of disaster-induced migrants, which corroborates Proposition 6. The cadre–mass relationship influenced the SWB of disaster-induced migrants at the confidence level of 1%. The more the disaster-induced migrants trusted community cadres, the better the cadre–mass relationship, and the higher the SWB. Therefore, Proposition 8 is corroborated.

The regression analysis results of Model 3 show that the housing allocation mode was associated with SWB at the confidence level of 5%. The SWB of respondents of 'very bad' housing allocation was 0.042 times that of respondents of 'very good', and the SWB of both was lower than that of other respondents. Housing expenditure was associated with SWB at the confidence level of 10%. The SWB of respondents with the housing expenditure of CNY 0, CNY 0–20,000, CNY 20,000–40,000 and CNY 40,000–60,000 was, respectively, 50, 24, 9 and 2 times higher than that of respondents with housing expenditure of more than CNY 60,000. The higher the housing expenditure, the lower the SWB of disaster-induced migrants. Housing quality and the cadre–mass relationship were associated with SWB at the confidence level of 1%, with a low odds ratio value (close to 0). Housing quality and

the cadre–mass relationship presented a very significant influence on SWB. Living space was associated with SWB at the confidence level of 5%. When a living space of 140 m^2 was used as the reference, living space was positively associated with SWB.

4. Conclusions and Discussion

Based on the questionnaire survey applied to Yancheng's 17 resettlement communities established after hurricanes, we used ordinal logistic regression models to investigate the SWB of disaster-induced migrants and discussed the mechanism through which the SWB of disaster-induced migrants is influenced by resettlement housing. The conclusions are summarised as follows.

1. The original housing of disaster victims is mostly self-made and commonly lacks repairs, which poses a certain safety risk. In addition, their original village infrastructure is underdeveloped, causing inconvenience to their daily lives. After they move to centralised resettlement communities, their housing conditions and community environment tend to improve to some extent, and their SWB slightly increases. Overall, the SWB of disaster-induced migrants was good, and most self-evaluated SWB values were above average. The ordinal logistic regression model showed that housing resettlement has a significant influence on the SWB of disaster-induced migrants. The main finding concurs with existing studies which indicate that housing plays a significant role in the SWB of people [29–33].
2. Regarding the resettlement housing conditions, SWB was significantly influenced by the housing allocation mode, housing expenditure, housing quality and living space. The SWB was negatively associated with housing expenditure and positively associated with the housing allocation mode, housing quality and living space. That is, the findings show that disaster migrants are likely to feel happier if they are satisfied with the housing allocation mode, housing quality and the living space, and the more housing expenditure related to the resettlement is, the less happy they tend to be. In this way, our study enriches the perceived association between housing and SWB. While the dominant studies show that the per capital living space tends to positively affect SWB [34–36], our finding further points out that the housing allocation mode can have a strong impact on SWB. This is especially relevant to resettlement, in which the process of replacement requires serious attention to housing allocation policy design. In China, it is the government which takes the lead, and it allocates the housing by drawing lots and in line with household population for fairness. However, from our finding, it shows that drawing lots and allocation in accordance with household size is too rigid to account for more diverse needs.
3. Among the resettlement community environment, SWB was not significantly associated with community facilities or community participation, but it was significantly positively associated with community hygiene and the cadre–mass relationship. This is an interesting finding that is distinct from existing studies which suggest that the community environment and public facilities have a positive relationship with SWB [37]. This somehow reflects the social change of the resettled community, in which social interactions become less intense in the urban style housing and hence community facilities and community participation have little impact on the happiness of disaster migrants. In contrast, the cadre–mass relationship accounts for a big role in China, which vividly reflects the social structure of China. This is because Chinese society is more reliant upon the government than civic organisation to resolve daily affairs such as the concerns with housing quality and community hygiene.

To summarise, the resettlement of rural disaster-induced migrants involves diverse tasks, including land allocation, transitional housing resettlement, housing reconstruction and infrastructure reconstruction, and it entangles different aspects, such as housing, livelihood and spiritual consolation. In China, the outstanding role of the government helped immensely in coordinating the multiple tasks. However, the present governmental attention is mainly focused on physical resettlement and livelihood restoration [2,3], leaving

disaster migrants' emotional needs unattended to. In this way, it is not sustainable since emotional healthiness is also a prerequisite for socio-economic growth. According to our findings, disaster migrants are likely to feel happier if they are more satisfied with the government resettlement policies such as the housing allocation mode and the choices of the size of the apartments. Therefore, our studies provide implications for future policy making. It is suggested that a more embedded resettlement policy should be formulated to better suit local conditions. In this case, it is particularly useful to encourage public participation, account for the comments and suggestions of migrants, understand their resettlement willingness, implement the resettlement policy in a fair and transparent manner and increase the trust between migrants and grassroots cadres. Second, more options and information of housing layouts should be provided, and migrants should be allowed to select the size of the apartments best suited for their actual needs. During housing reconstruction, it is not advisable to blindly follow the construction pattern of urban housing. Instead, construction plans should comprehensively consider the actual needs of rural areas and farmers (for example, an excessive building height is not recommended, whereas storage rooms or courtyards are favourable). Last, efforts should be taken to strengthen the community connection by holding more public cultural activities and to encourage migrants to participate in community activities to make more use of the community facilities, in order to create a good social communication environment for migrants to enjoy the achievement of community participation.

Despite the findings, some limitations should be addressed in future studies. First, the subject of this study was hurricane-induced migrants, and the study case was limited to Yancheng's centralised settlement communities, meaning that the models and regression analysis were particular to this situation. Therefore, further studies should be conducted to confirm whether the conclusions drawn in this study are applicable to other types of disaster-induced migrants. Subsequent studies should investigate resettlement communities related to other types of disasters in order to increase the scope of the study and thus increase the applicability and reference value of the findings. Second, in the questionnaire design and variable selection, a diversity of indices was selected because the operation of variables involves diverse practical problems. Consequently, the conclusions of the relationship between housing resettlement indices and the SWB of disaster-induced migrants represent only part of the reality. Whereas this study encompasses only resettlement SWB, which represents a subjective feeling, future studies should explore quantitative indices, conduct a comparative analysis between the SWB before and after resettlement and perform a long-term SWB follow-up survey. Last, the ordinal logistic models used in this study might simplify or overlook certain complex issues, thus resulting in a certain degree of deviation between the regression analysis results and reality.

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Appendix A

Table A1. Emotional survey of disaster migrants induced by Yancheng Hurricane.

A.Personal Information		
A01 Sex of the interviewee	[1] Male	
	[2] Female	
A02 Name of the interviewee		
A03 Respondent's phone number		
A04 Respondent's age (weeks old)		
A05 Your education level is.	[1] Elementary school and below	
	[2] Junior high school	
	[3] High school	
	[4] Secondary school	
	[5] College and above	
A06 Your political affiliation is	[1] Communist Party member	
	[2] Communist Party member	
	[3] Democratic Party member	
	[4] Non-party member	
	[5] Masses	
A07 What is the nature of your current household registration?	[1] Non-agricultural	
	[2] Agricultural	
A08 When did you move into your new community? (specific year and month)		
A09 Where did you move from? (including county, village)		
A10 How do you think your health is now?	[1] Very unhealthy	
	[2] Less healthy	
	[3] Not sure*	
	[4] Healthier	
	[5] Very healthy	
B Family Information		
B01 What is your marital status?	[1] Married	
	[2] Unmarried	
B02 What is the type of your family?	[1] One person living alone	
	[2] Couple (nuclear family)	
	[3] Couple and unmarried children (nuclear family)	
	[4] Father (mother) and married children living together (immediate family)	
	[5] Married siblings living together (joint family)	
	[6] Father (mother) and married children and married siblings living together (direct joint family)	
	[7] Grandchildren living together (including grandchildren)	

Table A1. *Cont.*

	[8] Family members living with non-relatives	
	[9] Others (please specify):	
B03 How did the total annual income of your household change before and after the relocation?	[1] Increased	
	[2] (Before relocation ____; After relocation _____)	[1] Less than 10,000 RMB
		[2] 1–2000 RMB
		[3] 20–30,000 RMB
		[4] 30–40,000 RMB
		[5] More than 40,000 RMB
B04 What is the change in your family's income source before and after relocation?	[1] Income from farmland mainly changed to non-farm income	
	[2] Income from farmland mainly changed to government subsidies	
	[3] Income from non-farm mainly changed to income from farmland workers	
	[4] Income from non-farm mainly changed to government subsidies	
	[5] No change before and after relocation, still mainly income from farmland	
	[6] No change before and after relocation, still mainly income from non-farm	
B05 What is the change of your family's cultivable land area before and after relocation?	[1] Increased	
	[2] Decreased	
	[3] No change	
B06 What is the change in your family's total annual expenditure before and after relocation?	[1] Increased	
	[2] Decreased	
	[3] No change	
	(Before relocation _____; After relocation _____)	[1] Less than 5000
		[2] 5000–10,000
		[3] 10–20,000
		[4] 20–30,000
		[5] More than 30,000
	C Housing Information	
C01 What is the damage level of your house?	[1] Generally damaged	
	[2] Generally repairable	
	[3] Seriously repairable	
	[4] Seriously unrepairable	

Table A1. *Cont.*

	[5] Collapsed
C02 Are you satisfied with the assessment result?	[1] Very dissatisfied
	[2] Dissatisfied
	[3] General
	[4] Satisfied
	[5] Very satisfied
C03 How much was the subsidy for your house?	
C04 Are you satisfied with the result of this subsidy?	[1] Very dissatisfied
	[2] Unsatisfied
	[3] Generally
	[4] Satisfied
	[5] Very satisfied
C05 How is the land acquired for this centralized resettlement site?	
C06 What is the site selection method of this centralized resettlement site?	[1] Occupy good land
	[2] Rebuild in situ on damaged houses
	[3] Other ways
C07 Are you satisfied with the site selection method?	[1] Very unsatisfactory
	[2] Unsatisfactory
	[3] Not sure *
	[4] Satisfactory
	[5] Very satisfactory
C08 What kind of land is this house of yours built on?	[1] State land
	[2] Collective land
C09 Are you satisfied with the ownership of this land?	[1] Very unsatisfied
	[2] Unsatisfied
	[3] General
	[4] Satisfied
	[5] Very satisfied
C10 Do you think this house belongs to you now?	[1] Belong
	[2] Do not belong
C11 Are you satisfied with the ownership of this house?	[1] Very dissatisfied
	[2] Dissatisfied
	[3] General

Table A1. *Cont.*

	[4] Satisfied
	[5] Very satisfied
C12 How was your new house built?	[1] Construction
	[2] Self-built
	[3] Other ways
C13 Are you satisfied with this way of building your house?	[1] Very unsatisfactory
	[2] Unsatisfactory
	[3] Not sure *
	[4] Satisfactory
	[5] Very satisfactory
C14 How is the house of centralized living divided?	
C15 Are you satisfied with this way of house sharing?	[1] Very dissatisfie
	[2] Dissatisfied
	[3] Not sure *
	[4] Satisfied
	[5] Very satisfied
C16 In the process of relocation and resettlement, are you aware of the policy on resettlement compensation?	[1] Never heard of it
	[2] Don't know
	[3] Know some
	[4] Know
	[5] Know very much
C17 In the process of relocation and resettlement, has anyone surveyed or interviewed to get your opinion?	[1] Yes
	[2] No
	[3] Don't know, not at that time
C18 In the process of relocation and resettlement, did you reflect your opinion?	[1] Yes
	[2] No
C19 Were your reflected opinions handled by anyone?	[1] Yes
	[2] No
C20 Are you satisfied with the results of the treatment?	[1] Very dissatisfied
	[2] Dissatisfied
	[3] General

Table A1. *Cont.*

	[4] Satisfied	
	[5] Very satisfied	
C21 What type of housing did you live in before and after the relocation?	[1] Yes	Type of house Before relocation After relocation
	[2] No	C21.1 Detached bungalow
	[3] Not applicable	C21.2 Two-story and above houses
		C21.3 Other types
C22 Are you satisfied with this type of housing now?	[1] Very dissatisfied	
	[2] Dissatisfied	
	[3] Not sure *	
	[4] Satisfied	
	[5] Very satisfied	
C23 Did the size of your house change after the new community before and after you moved? (Before relocation _____; After relocation _____)	[1] Changed, got bigger	
	[2] Changed, got smaller	
	[3] No change, about the same as before	
C24 Are you satisfied with the size of your house now?	[1] Very dissatisfied	
	[2] Dissatisfied	
	[3] Not sure *	
	[4] Satisfied	
	[5] Very satisfied	
C25 Did the number of rooms change before and after you moved? (Before moving _____; after moving _____) (three rooms and one hall/two rooms and one hall)	[1] Changed, more	
	[2] Changed, less	
	[3] No change, more or less the same as before	
C26 Are you satisfied with the number of rooms you have now?	[1] Very dissatisfied	
	[2] Not satisfied	
	[3] Not sure *	
	[4] Satisfied	
	[5] Very satisfied	
C27 Which do you think is more promising than the original location where your family lives now?	[1] Before	
	[2] Now	

Table A1. *Cont.*

	[3] Same	
C28 Which house do you think is more valuable than the original one?	[1] Before	
	[2] Now	
	[3] The same	
C29 Which house do you think is more convenient for your family to live in now compared to the original one?	[1] Before	
	[2] Now	
	[3] The same	
C30 Does the house you live in have the following facilities?	[1] Yes	Facility item Before moving After moving
	[2] No	C30.1 Separate kitchen
	[3] Not applicable	C30.2 Separate bathroom/toilet
		C30.3 Shower facilities
		C30.4 Electricity
		C30.5 Running water
		C30.6 Cable TV
		C30.7 Broadband Internet
		C30.8 Drainage
		C30.9 Liquefied piped gas
		C30.10 Air conditioning/heating equipment
	D Community Environment	
D01 How far is your home from the market town _____Km?		
D02 How far is your home from the county town _____Km?		
D03 How far is your home from the railway station _____Km?		
D04 Are any of the following facilities within a 10-min walk of your home?	[1] Yes	Facility Item Before Relocation After Relocation
	[2] No	D04.1 Hospital/health room
	[3] Not applicable	D04.2 Supermarket/mall
		D04.3 Kindergarten
		D04.4 Elementary school
		D04.6 Senior Activity Room
		D04.5 Park
		D04.7 Highway
		D04.8 Bus stops
D05 How is the convenience of traveling in your home before and after moving?	[1] More convenient than before relocation	

Table A1. *Cont.*

	[2] More difficult than before relocation	
	[3] About the same as before relocation	
D06 How did the distance between your home and the production site change before and after the relocation?	[1] Closer than before the relocation	
	[2] Farther than before the relocation	
	[3] About the same as before the relocation	
D07 Do you agree with the following statements about neighborhood relations in the community?	[1] Strongly disagree	Statements Before relocation After relocation
	[2] Disagree	D07.1 If problems occur in the community, community residents can get together to deal with them together
	[3] Generally agree	D07.2 In the community, people are willing to help each other
	[4] Agree	D07.3 If I have to go away someday, I can count on other people in the community to help me collect packages, registered mail, newspapers, etc.
	[5] Strongly agree	D07.4 People in the community who know each other generally get along well with each other
		D07.5 People in the community have very different views and opinions about what is happening in the community
		D07.6 People in the community basically know each other
D08 Do you trust the following organizations and people?	[1] Very distrustful	Institutions and people Before moving After moving
	[2] Not very trusting	D08.1 Resident committee
	[3] Generally	D08.2 Village committee/collective economic development company
	[4] More trusting	D08.3 Street office
	[5] Very trusting	D08.4 Community neighbors
	[6] Not applicable	
D09 How often do you participate in community activities?	[1] Never participate	
	[2] Rarely participate	
	[3] Sometimes participate	
	[4] Often participate	
	[5] Always participate	

Table A1. *Cont.*

E Community Satisfaction							
E01 How satisfied are you with the housing, community facilities and services in the community where you currently live?[Note to surveyors]: [99998] The "Not applicable" option means that the respondent does not have this facility or service in the community where he/she lives							
Item	Very Satisfied	Satisfied	Fairly Unsatisfied	Very Unsatisfied	Not Applicable		
E01.1 Type of housing	5	4	3	2	1	99998	
E01.2 Housing structure	5	4	3	2	1	99998	
E01.3 Housing area	5	4		2	1	99998	
E01.4 Housing support	5	4	3	2	1	99998	
E01.5 Housing quality	5	4	3	2	1	99998	
E01.6 Neighborhood relations	5	4	3	2	1	99998	
E01.7 Community integration	5	4	3	2	1	99998	
E01.8 Community services	5	4	3	2	1	99998	
E01.9 School childcare	5	4	3	2	1	99998	
E01.10 Shopping and commercial facilities	5	4	3	2	1	99998	
E01.11 Transportation conditions	5	4	3	2	1	99998	
E01.12 Community security	5	4	3	2	1	99998	
E01.13 Health conditions	5	4	3	2	1	99998	
E01.14 Recreational facilities	5	4	3	2	1	99998	
E01.15 Community greening	5	4	3	2	1	99998	
E01.16 Property management	5	4	3	2	1	99998	
E01.17 Overall satisfaction with the	5	4	3	2	1	99998	
F Happiness							
F01 Do you think your current life is happy?	[1] Very unhappy						
	[2] Less happy						
	[3] Not sure *						
	[4] Happier						
	[5] Very happy						
F02 Do you agree with the following statements about your satisfaction with your life situation? (Please check the corresponding box).	Life situation						
	F02.1 My life is close to my ideal in most ways	7	6	5	4	3	2 1
	F02.2 My living conditions are good	7	6	5	4	3	2 1

Table A1. *Cont.*

	F02.3 I am satisfied with my life	7	6	5	4	3	2	1
	F02.4 So far, I have gotten the important things I wanted in	7	6	5	4	3	2	1
	F02.5 If I could live again, I would basically not change anything	7	6	5	4	3	2	1

* We use 'not sure' in our questionnaire as a moderate option between the worst and the best situation due to an aspect of Chinese culture to express moderation.

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