

# Split household and smoking behavior of rural migrants in China

Zicheng Wang

Jinan university

Jiachun Liu

Jinan university

Juan Ming (✉ [mingjuan520888@126.com](mailto:mingjuan520888@126.com))

Guangdong University of Technology <https://orcid.org/0000-0002-2677-3402>

---

## Research article

**Keywords:** smoking behavior, smoking abuse, split household, rural migrants, Hukou constraints, China

**Posted Date:** February 3rd, 2020

**DOI:** <https://doi.org/10.21203/rs.2.22498/v1>

**License:**  This work is licensed under a Creative Commons Attribution 4.0 International License. [Read Full License](#)

---

## Abstract

**Background:** With Hukou constraints, a large proportion of rural migrants have to leave part of their family members stay at hometown, the split household may cause serious smoking abuse among rural migrants in destination cities.

**Objective:** This study aims to address the direct effect of split household on the smoking behavior, while sole migration, couple migration and family migration are incorporated to explore the concise effect of differentiated split household forms.

**Method:** A unique and comprehensive database named Rural Urban Migration in China (RUMiC-2009) is applied to explore the association between split household and the smoking amounts of rural migrants; Analyses are conducted using the Chi-square tests/ ANOVA tests and multiple Tobit regression.

**Results:** The amounts of cigarettes consumed for the family migrants ( $0.1751 \pm 0.3757$ ) are less than those sole migrants ( $0.2732 \pm 0.4218$ ) and couple migrants ( $0.1892 \pm 0.3745$ ). The couple migrants (Coefficient=  $-0.0575$ ; 95% CI=  $-0.1378, 0.022717$ ) and family migrants (Coefficient=  $-0.1313$ ; 95% CI=  $-0.2127, -0.0498$ ) smoke less than the sole migrants counterparts, but the coefficient of couple migrants is not significant.

**Conclusions:** Split household is associated with smoking abuse. Family migration has a significant effect on smoking control, while couple migration only produces insignificant negative influence on cigarettes consumption.

## Background

China is a high-burden tobacco-use country, where nearly one-third (28.1%) of the population smokes, including 52.9% of men and 2.4% of women[1], which has been linked to the chronic and often fatal diseases of the respiratory tract[2]. With rapid urbanization, about 288 million migrants move from rural to urban in 2018 [3], and they have become an indispensable force for China's industrialization and modernization [4]. However, a large part of them are highly susceptible to smoking [5–7]. A rich array of studies has explored the determinants of rural migrants' smoking prevalence [8]. Most previous researches have consistently concluded that life and work stress are main determinants for the smoking prevalence of rural migrants[9, 10], where the life and work stress include but not are limited to low-quality employment, poor living conditions, unequal public service, maladaptation to urban life and so on [9, 10, 12–14]. The rural migrants with high stress are more prone to trigger and aggravate smoking to obtain temporarily release [7]. Beyond that, there is also a consistent conclusion that the rural migrants' smoking prevalence is associated with age, gender, education attainments, income, occupation and migration durations[6–7, 15].

However, the existing studies neglect a fact that the rural-urban migration is not a one way street, and most of rural migrants are temporary or circular [16–17]. Rural migrants can move to a new place but are not easy to enjoy the equal public welfare as local urban citizens with Hukou constraints [14, 18]. Thus, a large proportion of them have to choose sole migration or couple migration, which leave part of their family members stay at hometown [19–22]. The split household is usually accompanied with solitude or psychological stress [23], which may induce to serious smoking abuse among rural migrants. Nevertheless, previous studies pay little attention to the association between spit household and smoking behavior. Chen et al. (2004) found a negative correlation between living with relatives and the smoking prevalence [7], but their conclusion was drawn only through Pearson chi-square tests, without regression applied to conduct more robust results. Otherwise, Chen et al. (2004) use the smoking prevalence instead of the smoking amounts as proxy for smoking behavior, and it is insufficient to assess the effect of split household on smoking abuse of rural migrants.

The present study aims to fill those gaps by using a unique survey named RUMiC to extend the discussion of association between spilt household and smoking behavior among rural migrants in China. Three issues are addressed as follows:

- (1) Does the split household induce to abuse smoking?
- (2) Are there any differential effect among three split-household forms?

(3) Does the effect of split household on smoking behavior vary by gender?

This research contributes to the literature in three distinct ways. First, the present study emphasizes the direct effect of split-household on the rural migrants' smoking behavior in China context, and it presents new evidence to understand the nexus between the smoking abuse and solitude due to household split. Second, a unique and comprehensive database named RUMiC is used to explore the direct effect of split household, and the amount of smoking instead of the smoking prevalence is incorporated to discuss the association between split household and smoking abuse. Third, this research applies the Tobit regression to verify the relationship between split household and rural migrants' smoking abuse, the gender differential is further addressed to explore the heterogeneity effect.

## Method

### Data and sample

This study used data from Rural Urban Migration in China (RUMiC), which is initiated by a group of researchers at the Australian National University, the University of Queensland and the Beijing Normal University and supported by IZA Institute of Labor Economics. RUMiC consists of three independent surveys: the Urban Household Survey (UHS), the Rural Household Survey (RHS) and the Migrant Household Survey (MHS). The data we applied in the present study is derived from MHS, which collects rich information on household roster and personal characteristics, education and training backgrounds, employment situation, household income and expenditure during migration period. RUMiC covers 15 cities within nine-largest provinces sending and receiving migrants in China (see Fig. 1). About 5000 migrant households were collected in each wave, and the sampling frame of MHS was conducted by RUMiC team to overcome the problem of under-coverage [24]. They established a list of 550,000 migrant workers, from which 5,000 samples were randomly selected for face-to-face interview [25]. RUMiC was launched in 2008, and three waves RUMiC-2008, RUMiC-2009, and RUMiC-2010 are available to apply. But only the wave of 2009 collects smoking-related information includes the amount of daily smoking and smoking history.

This study is limited to the rural migrants from nuclear family, which is only defined as a single family nucleus with married-couple and their young children (age  $\leq 16$ ). We also drop the incomplete nuclear family samples such as married-couple with no child and single parent family to ensure the specific split scenario portrayed as split between spouses as well as split between spouse and their children [22]. After deleting the missing samples and outliers, this study obtains 3520 valid migrant samples, which includes about 1892 males and 1628 females.

### Ethics Statement

This study is a secondary analysis based on the data from the RUMiC conducted by a group of researchers at the Australian National University, the University of Queensland and the Beijing Normal University and was supported by the Institute for the Study of Labor (IZA), all of which were subject to multiple stages of reviews by experts to address methodological, ethical and legal issues related to data collection. Final approvals of all RUMiC surveys were required from the Research Ethics Committee of National Bureau of Statistics of China to ensure that the data collection complied with ethical requirement according to the Statistics Act.

### Measures

Split household includes three forms: sole migration, couple migration and family migration. Following Fan (2001) [22], we define the sole migration as the rural migrants who migrate solely, while both their spouse and children are left behind their hometown. Couple migration refers to migrants who migrate with their spouse but have no children migrating together. Family migration is the household with the couple and all the children migrating together.

Daily smoking amount is measured by pack of cigarettes consumed per day, which was calculated by the average cigarettes consumed per day / 20. The variable of average cigarettes consumed per day is directly collected from the questionnaire item "How many cigarettes on average do you smoke per day now?" To obtain a more specific smoking status, we also divide the

smoking addiction into five groups : Packet = 0,  $0 < \text{Packet} \leq 0.5$ ,  $0.5 < \text{Packet} \leq 1$ , Packet > 1. The smoking prevalence is defined as a dummy variable, which is set equal to 1 if migrants smoke at least 1 cigarette per day and 0 otherwise.

According to previous studies, controlled variables incorporate age (years), gender (ref = female), educational attainment (years), health status (ref = poor), industry (ref = others), job status (ref = others), smoking history (years), life satisfaction (Likert scale).

## Modeling strategy

All the Analyses are conducted using the Stata 15.0. The Pearson chi-square tests and ANOVA tests are applied to examine the association between gender, split household and smoking behaviors, which include pack of cigarettes consumed per day, smoking addiction and smoking prevalence.

Tobit regression analyses are performed to explore the direct effect of split household on the smoking amounts of rural migrants, while the demographic variables, employment traits as well as the smoking history and life satisfaction are incorporated as the controls. Two Tobit regressions also are separately conducted to discuss the heterogeneity effect by gender.

## Results

### Baseline characteristics

Table 1 presents the descriptive statistics, most of the rural migrants are young males, while the average age is about 35 years old, and 53.75% of them are males. The average educational attainment is nearly 9 years, which implies that most of them have completed the nine-year compulsory education. 79.6% of rural migrants report a good health status, and most of them are satisfied with the present life status. As for the employment status, half of them work in the retail and hotel industry, whereas 16.08% and 8.86% of them engage in manufacture and construction. 27% of them are self-employed, and the average income reached to 1902.8 one month.

Table 1  
Baseline characteristics

Characteristic		Full sample	Split household		
			Sole migration N(%)	Couple migration N(%)	Family migration N(%)
Age(years)	Mean ± SD	35.18 ± 5.94	34.87 ± 6.05	35.74 ± 5.94	34.98 ± 5.87
Gender	Male	1892(53.75)	549(68.54)	514(49.38)	829(49.40)
	Female	1628(46.25)	252(31.46)	527(50.62)	849(50.60)
Educational attainment(years)	Mean ± SD	8.74 ± 2.39	9.15 ± 2.48	8.51 ± 2.28	8.68 ± 2.39
Health status	Good	2802(79.60)	661(82.52)	798( 76.66)	1343(80.04)
	Poor	718(20.40)	140(17.48)	243(23.34)	335(19.96)
Income	Mean ± SD	1902.8 ± 1173.8	1862.6 ± 1048.2	1782.0 ± 994.5	1997.0 ± 1317.2
Industry	Construction	312(8.86)	16(15.73)	104(9.99)	82(4.89)
	Manufacture	566(16.08)	172(21.47)	211(20.27)	183(10.91)
	Retail	1217(34.57)	173(21.60)	313(30.07)	731(43.56)
	Hotel	516( 14.66)	128(15.98)	164(15.75)	224(13.35)
	Others	909( 25.82)	202(25.22)	249(23.92)	458(27.29)
Job status	Self-employed	1312(37.27)	112(13.98)	313(30.07)	887(52.86)
	Others	2208(62.73)	689(86.02)	728(69.93 )	791(47.14)
Smoking history(years)	Mean ± SD	4.24 ± 8.43	5.45 ± 8.49	4.01 ± 8.28	3.81 ± 8.45
Life satisfaction(Likert scale)	Mean ± SD	3.47 ± 0.69	3.46 ± 0.71	3.48 ± 0.65	3.46 ± 0.70
n		3520	801	1041	1678

The baseline characteristics by split household also reveal that migrants from different split household forms may show differentiated traits. 68.54% of sole migrants are males, while only about half of the couple migrants and family migrants are males. 52.86% of the family migrants are in self-employment, which is higher than the couple migrants (30.07%) and sole migrants (13.98%). The family migrants are more likely to engage in the retail (43.56%) comparing with the sole migrants (21.6%) and couple migrants (30.07%) counterparts. Sole migrants have a longer smoking history ( $5.45 \pm 8.49$ ) than couple migrants ( $4.01 \pm 8.28$ ) and family migrants ( $3.81 \pm 8.45$ ).

## Univariate analysis

As show in Table 2, the average packet of cigarettes consumed per day is 0.2016, whereas 72.61% of the migrants are non-smoker. Among those smokers, only 1.42% of them smoke more than one packet daily, while 25.86% of them smoke within one packet.

Table 2  
Univariate analysis

	Full sample	Gender			Split household			
		Male N(%)	Female N(%)	p-Value	Sole migration N(%)	Couple migration N(%)	Family migration N(%)	P-Value
Smoking amounts Packet number consumed per day <sup>a</sup> (Mean ± SD)	0.2016 ± 0.3881	0.3662 ± 0.4636	0.0103 ± 0.0893	< 0.001*	0.2732 ± 0.4218	0.1892 ± 0.3745	0.1751 ± 0.3757	< 0.001*
Smoking addition <sup>b</sup>								
Packet = 0	2556(72.61)	955(50.48)	1601(98.34)	< 0.001*	497(62.05)	776(74.54)	1283(76.46)	< 0.001*
0 < Packet ≤ 0.5	433(12.30)	417(22.04)	16(0.98)		140(17.48)	119(11.43)	174(10.37)	
0.5 < Packet ≤ 1	481(13.66)	470(24.84)	11(0.67)		148(18.48)	134(12.87)	199(11.86)	
Packet > 1	20(1.42)	50(2.64)	0(0)		16(2.0)	12(1.15)	22(1.31)	
Smoking Prevalence <sup>b</sup>								
Smoker	2556(72.61)	955(50.48)	27(98.34)	< 0.001*	304(37.95)	265(25.46)	395(23.54)	< 0.001*
Non-smoker	964(27.39)	937(49.52)	1601(1.66)		497(62.05)	776(74.54)	1283(76.46)	
n		1892	1628		801	1041	1678	
Note: <sup>a</sup> P-value were calculated using ANOVA tests,;								
<sup>b</sup> P-value were calculated using Pearson chi-square tests								
*significant (p ≤ 0.05)								

The Chi-square tests and ANOVA tests also indicate that the males have more probability to smoke than females (50.48% vs 1.66%), meanwhile the average packet number of cigarettes consumed per day is 0.3662 ± 0.4636 for males, which is more than the females(0.0103 ± 0.0893). The smoking prevalence of family migrants (23.54%) is lower than the sole migrants (37.95%) and couple migrants(25.46%) , while the amounts of cigarettes consumed among the family migrants(0.1751 ± 0.3757)are less than those sole migrants(0.2732 ± 0.4218) and couple migrants(0.1892 ± 0.3745) .Additionally ,among all the smokers, family migrants with one packets daily smoking(22.23%) is less than the couple migrant(24.30%) and sole migrant(35.96%) counterparts.

## Multivariate analysis

Multivariate analysis with Tobit regression model is applied to identify independent variables associated with amounts of current cigarette smoking, from which coefficient and 95% confidence intervals (CI) are calculated.

Table 3  
Multiple Tobit regression analysis: full sample

	Coefficient	CI(95%)	p-value
Split household			
Sole migration*	0		
Couple migration	-0.0575	(-0.1378,0.0227)	0.1600
Family migration	-0.1313	(-0.2127,-0.0498)	0.0020
Age	-0.0178	(-0.0243,-0.0113)	0.0000
Gender			
Female*	0		
Male	1.0644	(0.9393,1.1895)	0.0000
Educational attainment(years)	-0.0078	(-0.0220,0.0063)	0.2790
Health status			
Poor*	0		
Good	0.0818	(0.0052,0.1583)	0.0360
Income(Logarithm)	-0.0104	(-0.0770,0.0563)	0.7610
Industry			
Others*	0		
Construction	0.1060	(-0.0014,0.2135)	0.0530
Manufacture	-0.0259	(-0.1253,0.0735)	0.6090
Retail	0.0500	(-0.0443,0.1443)	0.2980
Hotel	0.0586	(-0.0402,0.1573)	0.2450
Job status			
Others*	0		
Self-employed	0.0476	(-0.0377,0.1329)	0.2740
Smoking history(years)	0.0532	(0.0476,0.0588)	0.0000
Life satisfaction(Likert scale)	-0.0956	(-0.1394,-0.0517)	0.0000
Intercept	-0.3655	(-0.9126,0.1816)	0.1900
* Reference group			

As shown in Table 3, the Tobit estimations reveal that age (Coefficient= -0.0178; 95% CI=-0.0246,-0.0110) and education attainments (Coefficient= -0.0078; 95% CI= -0.0220,0.0063) are negative related with the amounts of daily cigarette smoking, but the latter isn't statistically significant at 95% confidence level. Migrants of males (Coefficient = 1.0644; 95% CI = 0.9393, 1.1895) and being in good health status (Coefficient = 0.0818; 95% CI = 0.0052,0.1583) smoke more. Rural migrants engaged in the construction (Coefficient = 0.1060; 95% CI= -0.0014, 0.2135), self-employed rural migrants (Coefficient = 0.0476; 95% CI= -0.0377, 0.1329) and workers with higher income (Coefficient= -0.0104; 95% CI= -0.0770, 0.0563) are likely to smoke more, but all these coefficients are not significant. A significant positive effect are shown between smoking history (Coefficient = 0.0532;

95% CI = 0.0476, 0.0588) and the amounts of daily smoking, while the life satisfaction (Coefficient= -0.0956; 95% CI= -0.1394,-0.0517) is negative associated with the daily smoking packets.

As for the effect of split household, the results show that the couple migrants (Coefficient= -0.0575; 95% CI= -0.1378, 0.022717) and family migrants (Coefficient= -0.1313; 95% CI= -0.2127,-0.0498) smoke less than the sole migrants counterparts, but the coefficient of couple migrants is not significant.

Considering the difference of daily smoking behavior between males and females, the Tobit regression model is stratified by gender. The results are shown in Table 4. The Tobit estimations for males reveal that age (Coefficient= -0.0178; 95% CI=-0.0246,-0.0110) and life satisfaction (Coefficient= -0.0960; 95% CI= -0.1419,-0.0501) have a significant negative effect on the amounts of daily smoking, while the health status(Coefficient = 0.0800; 95% CI = 0.0006,0.1595) and smoking history(Coefficient = 0.0512; 95% CI = 0.0455,0.0569) are positive significantly related with the packet number of cigarettes consumed per day. In the female sample estimation, only smoking history (Coefficient = 0.1144; 95% CI = 0.0747, 0.1541) produces a significant impact on the amount of daily smoking.

Table 4  
Multiple Tobit regression analysis by gender

	Male(N = 1892)			Female(N = 1628)		
	Coefficient	CI(95%)	p-value	Coefficient	CI(95%)	p-value
Split household						
Sole migration(Reference group)	0			0		
Couple migration	-0.0450	(-0.1274,0.0374)	0.2850	-0.2108	(-0.6412,0.2197)	0.3370
Family migration	-0.1117	(-0.1958,-0.0275)	0.0090	-0.4062	(-0.7805,-0.0320)	0.0330
Age	-0.0178	(-0.0246,-0.0110)	0.0000	-0.0237	(-0.0541,0.0066)	0.1250
Educational attainment(years)	-0.0092	(-0.0241,0.0056)	0.2240	-0.0073	(-0.0685,0.0539)	0.8140
Health status						
Poor(Reference group)	0			0		
Good	0.0800	(0.0006,0.1595)	0.0480	0.0898	(-0.2764,0.4561)	0.6300
Income(Logarithm)	0.0003	(-0.0692,0.0699)	0.9920	-0.3175	(-0.6618,0.0268)	0.0710
Industry						
Others(Reference group)	0			0		
Construction	0.1114	(0.0029,0.2200)	0.0440	-0.2642	(-1.4261,0.8976)	0.6560
Manufacture	-0.0335	(-0.1345,0.0674)	0.5150	0.1696	(-0.2972,0.6365)	0.4760
Retail	0.0653	(-0.0341,0.1647)	0.1980	-0.1443	(-0.5594,0.2707)	0.4950
Hotel	0.0712	(-0.0319,0.1743)	0.1760	-0.0844	(-0.5941,0.4252)	0.7450
Job status						
Others(Reference group)	0			0		
Self-employed	0.0337	(-0.0560,0.1233)	0.4610	0.2715	(-0.1445,0.6874)	0.2010
Smoking history(years)	0.0512	(0.0455,0.0569)	0.0000	0.1144	(0.0747,0.1541)	0.0000
Life satisfaction(Likert scale)	-0.0960	(-0.1419,-0.0501)	0.0000	-0.1316	(-0.3113,0.0482)	0.1510
Intercept	0.6459	(0.0765,1.2153)	0.0260	1.5184	(-1.0964,4.1331)	0.2550

More importantly, the estimations of split household from the two sub-group sample models are robust with the full sample regression(As shown in Table 4). The results demonstrate that the family migrants smoke less than the sole migrant counterparts (male model: Coefficient= -0.1117; 95% CI= -0.1958,-0.0275; female model: Coefficient= -0.4062; 95% CI= -0.7805,-0.0320).Additionally, the estimations also show that couple migrants are also likely to smoke less than the sole migrants((male model: Coefficient= -0.0450; 95% CI= -0.1274,0.0374; female model: Coefficient=-0.2108; 95% CI= -0.6412,0.2197),but the effect is not significant at 95% confidence level.

## Discussion

The estimations from Tobit regression for full samples and subgroups both confirm that family migrants smoke less than sole migrants, which imply that family migration is beneficial for smoking control. The results in the full samples shows that the predicted value of smoking amounts is 0.1313 packets less for family migrants than for sole migrants, while in the male

model, the estimation still demonstrates that the predicted value of smoking amounts is 0.117 packets less for family migrants than for sole migrants. The potential reason may be that migration pattern is significantly associated with loneliness [26], that is, migration with the whole family members together, especially migrated with their children together would boost their well-being [27]. Those would release the work and life stress, which may induce to a decrease of smoking addiction. Another possible reason is that with migrated children in the family, the male smokers would reduce the smoking abuse to maintain a good living environment for their children. The results also confirm that couple migration has a negative effect on amounts of smoking, but it is not significant. This may be because the incomplete family migration can partly weaken the smoking behavior, while leaving children stay behind has a depressing impact [28], which would induce to abuse smoking to relieve loneliness for couples migrants.

In addition, the estimations also reveal that males smoke more than females, which is consistent with the previous studies confirming that rural male migrants are more likely to be smokers than females [7, 15]. For the rural male migrants, with a one-year increase in smoking history, there is a 0.0512 packets increase in the predicted value of smoking amounts. With one unit increase in life satisfaction of males is associated with a 0.096 packets decrease in the predicted value of smoking amounts. This finding is consistent with Liu Z, Florkowski WJ and Chen H (2019) who also confirmed that migrants with higher life satisfaction are less likely to smoke [12]. The male migrants engaged in construction smoke more than the reference group, the predicted value of smoking amounts is 0.1114 packets more for family construction workers than for reference migrants. It is consistent with the general conclusion that smoking behavior is more prevalent among the construction rural workers [8].

## Conclusion

This study discusses the direct effect of split household on rural migrants' smoking behavior in China context by using a unique and comprehensive database named RUMiC. The results from Pearson chi-square tests and ANOVA tests show that males have more probability to smoke than females, while the average packet number of cigarettes consumed per day is more than females. The amounts of cigarettes consumed for the family migrants are less than sole migrant and couple migrant counterparts. The estimations from Tobit regression confirm that family migrants and couple migrants smoke less than sole migrants, but the latter is not significant. The potential reason may be that family migration can improve the well-being of migrants, meanwhile the family responsibility also encourages the father to control smoking.

This study also sheds insight into current smoking control policy in urban China. Family migration is a valid way to weaken smoking addiction, thus it should be highly highlighted to attach importance to harmony and combination of all kinds of migration policy tools to encourage family migration.

## Abbreviations

Rural Urban Migration in China (RUMiC); Odds ratios (OR); Confidence interval (CI)

## Declarations

### Ethics approval and consent to participate

Not applicable

### Consent for Publication

Not applicable.

### Availability of data and material

The RUMiC is available from the IZA upon reasonable research request. RUMiC can be requested from the website of IZA: <https://datasets.iza.org/dataset/58/longitudinal-survey-on-rural-urban-migration-in-china>

## Competing interests

The authors declare that they have no competing interests.

## Funding

This article is funded by the National Social Science Fund of China (Granted number 17BJY044&18ZDA081)

## Authors' contributions

Zicheng Wang took leadership and responsibility for the research activity planning and made substantial contributions to the conception and design of the Programme. Jiachun Liu worked on the statistical analysis of the data. Juan Ming drafted the concept of the paper as well as participated in finalizing the manuscript. All authors read and approved the final manuscript.

## Acknowledgements

Not applicable.

## References

1. Chinese Center for Disease Control and Prevention: Global Adult Tobacco Survey (GATS) .China 2010 Country Report. Beijing: China Sanxia Press; 2011:94–95
2. Gu D, Kelly TN, Wu X, Chen J, Samet JM., Huang JF,et al. (2009). Mortality attributable to smoking in China. *New England Journal of Medicine*. 2009; 360(2):150-159.
3. China Labour Bulletin. Migrant Workers and Their Children. 2019. Available from: <https://clb.org.hk/content/migrant-workers-and-their-children>.
4. Chan KW (2012). Migration and development in China: Trends, geography and current issues. *Migration and Development*. 2012; 1(2):187-205.
5. Wu J, Yang T, Rockett IR, Xing R, Karalic S, Li Y, Zhang Y. Nicotine dependence among rural-urban migrants in China. *BMC public health*. 2011; 11(1): 296.
6. Wan X, Shin SS, Wang Q, Fisher RH, Liu H, Ding D, Yang G, Novotny TE: Smoking among young rural to urban migrant women in China: a cross-sectional survey. *PLoS One*.2011; 6(8):e23028.
7. Chen X, Li X, Stanton B, Fang X, Lin D, Cole M , et al. Cigarette smoking among rural-to-urban migrants in Beijing, China. *Preventive Medicine*. 2004; 39(4): 666–673.
8. Liu Y, Gao J, Shou J, Xia H, Shen Y, Zhu S, Pan Z. The prevalence of cigarette smoking among rural-to-urban migrants in China: a systematic review and meta-analysis. *Substance use & misuse*.2016; 51(2), 206-215.
9. Chen X, Stanton B, Li X, Fang X, Lin D. Substance use among rural-to-urban migrants in China: a moderation effect model analysis. *Subst Use & Misuse*.2008; 43(1):105–24.
10. Cui X, Rockett IR, Yang T, Cao R. Work stress, life stress, and smoking among rural–urban migrant workers in China. *BMC Public Health*.2012; 12(1):979.
11. Yang T, Wu J, Rockett IR, Abdullah AS, Beard J, Ye J: Smoking patterns among Chinese rural–urban migrant workers. *Public Health* 2009, 123(11):743–749.
12. Liu Z, Florkowski W J, Chen H. Gender Differences, Social Isolation and Rural Migrants' Cigarette Smoking. In: 2019 Annual Meeting, July 21-23, Atlanta, Georgia (No. 290964). Agricultural and Applied Economics Association.
13. Wong, DFK, Li CY, Song HX. Rural migrant workers in urban china: living a marginalised life. *International Journal of Social Welfare*.2007; 16(1):32-40.
14. Wang Z. Social security for China's migrant workers. *International Labour Review*. 2011; 150(1-2):177-187.

15. Liu Y, Song H, Wang T, Wang T, Yang H, Gong J, et al. Determinants of tobacco smoking among rural-to-urban migrant workers: a cross-sectional survey in Shanghai. *BMC Public Health*.2015; 15(1): 131.
16. Shen J. A study of the temporary population in Chinese cities. *Habitat International*.2002; 26(3): 363-377.
17. Du H, Li SM, Hao P. 'Anyway, you are an outsider': Temporary migrants in urban China. *Urban Studies*. 2018; 55(14):3185-3201.
18. Wu F. Urban poverty and marginalization under market transition: the case of Chinese cities. *International Journal of Urban and Regional Research*.2004; 28(2): 401-423.
19. Wang C, Zhang C, Ni J, Zhang H, Zhang J. Family migration in China: Do migrant children affect parental settlement intention?. *Journal of Comparative Economics*.2019; 47(2): 416-428.
20. Wu W. Migrant housing in urban China: choices and constraints. *Urban Affairs Review*. 2002; 38(1):90-119.
21. Jingzhong Y, Lu P. Differentiated childhoods: impacts of rural labor migration on left-behind children in China. *The Journal of peasant studies*. 2011; 38(2): 355-377.
22. Fan CC, Sun M, Zheng S. Migration and split households: a comparison of sole, couple, and family migrants in Beijing, China. *Environment and Planning A*. 2011; 43(9): 2164-2185.
23. Hutchings K, McNulty Y. (2018). Split family expatriation: Perspectives from expatriates and their career spouses. In: McNulty Y (Ed.).*Research Handbook of Global Families: Implications for International Business*. Cheltenham, UK: Edward Elgar; 2018.p.1-28.
24. Akgüç M, Giulietti C, Zimmermann KF. The RUMiC longitudinal survey: Fostering research on labor markets in China. *IZA Journal of Labor & Development*.2014; 3(1): 5.
25. Tang, Z. (2012). The great migration: Rural-urban migration in China and Indonesia. *Canadian Studies in Population*, 39(3-4), 129-130.
26. Zhong B, Xu Y, Jin D, Zou X, Liu T. Prevalence and correlates of loneliness among Chinese service industry migrant workers: A cross-sectional survey. *Medicine (Baltimore)*. 2016 Aug 07;95(24):e5074. PMID: 27310992; PMCID: PMC4998478..
27. Démurger S, Li S, Xu H. Internal migration, family living arrangements and happiness in China. In : 6th Annual Joint Workshop on Socio-Economics, FERDI, Fudan University, Paris 1 University and SHUFE, 26-27 juin 2014, Paris, France.
28. Knight J, Gunatilaka R. (2010). Great expectations? The subjective well-being of rural–urban migrants in China. *World development*. 2010; 38(1):113-124.

## Figures



**Figure 1**

Sampling map. Note: The designations employed and the presentation of the material on this map do not imply the expression of any opinion whatsoever on the part of Research Square concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. This map has been provided by the authors.