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Research on the willingness and influencing factors of urban residents to recycle medical masks under epidemic prevention and control

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Abstract

In response to the new coronavirus pneumonia, masks have become an indispensable protective tool. Behind the huge demand is a huge amount of use Behind the huge demand is a huge amount of use, which has become the destination of disposable masks after use, which has also brought a large amount of discarded mask waste. Under the epidemic prevention requirement that all people wear masks for travel, the harmless treatment of medical waste, including a large number of used masks, and the Under the epidemic prevention requirement that all people wear masks for travel, the harmless treatment of medical waste, including a large number of used masks, and the avoidance of secondary pollution have become the key to epidemic prevention. The survey uses the multiple linear r egression method to comprehensively evaluate the residents' willingness to recycle. In view of the above research, In view of the above research, relevant policy suggestions are put forward from multiple levels, in order to effectively promote the popularization and development of medical mask In view of the above research, relevant policy suggestions are put forward from multiple levels, in order to effectively promote the popularization and development of medical mask recycling.

Keywords

Medical masks ;Recycling willingness ;Multiple regression.

1. Research Background

During the epidemic, the use of a large number of medical materials has caused serious challenges to garbage classification and recycling. Due to people' s low awareness of environmental protection and garbage classification, used masks have not been effectively regulated and recycled. s low awareness of environmental protection and garbage classification, used masks have not been effectively regulated and recycled. This will greatly increase the cost of waste disposal, increase the burden of sanitation cleaning and slow down the process of recycling. Masks are just a microcosm of many discarded domestic wastes The way people deal with masks reflects the current situation of people's disposal of domestic wastes and reflects people's awareness of In order to have a deeper understanding of people's living reality of garbage disposal, and to better solve the problem of garbage classification and disposal, it is important to have a deeper understanding of people's living reality of garbage disposal. In order to have a deeper understanding of people's living reality of garbage disposal, and to better solve the problem of garbage classification and disposal, it is necessary to apply scientific and practical governance theories to the practice of ecological It provides important content for the research of creating a green ecological environment, promoting sustainable development, enriching waste management issues. It provides important content for the research of creating a green ecological environment, promoting sustainable development, enriching waste management issues, and improving people's awareness of prevention and safety responsibility.

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2. literature review

Li Songlin (2020) believes that the storage and storage of disposable masks themselves is relatively easy, and the cost is relatively low. In the disposal of disposable masks after use, people are prone to paralysis and trouble-free psychology. Chen Feipeng (2020) believes that standardizing the disposal of discarded masks is also a "social test". The test is the social governance ability of city managers and the execution ability to deal with major public health events.

3. Empirical Analysis

Factor selection

To investigate the degree of importance of each influencing factor on the willingness to use discarded masks for recycling, a multiple regression model was constructed:

Y = β1 X1 + β2 X2 + β3 X3 + β4 X4 + β5 X5 + β6 X6

Where X1 ~ X6 represent the awareness, disposal awareness, policy factors, social factors, economic factors and media factors, respectively, and Y represents the residents' willingness to recycle discarded masks.

Modeling

The correlation coefficients of each variable in the regression equation of intention to use are given. It can be seen that awareness, handling awareness, policy factors, social factors, economic factors, and media factors are all significantly and positively correlated with intention to use, which is generally consistent with the expectations of this paper. Overall, the results of the correlation analysis tentatively support the research hypothesis of this paper.

$$\hat{Y}_i = 39.390 - 0.625X_1 - 0.007X_2 - 4.573X_3 - 0.709X_4 + 0.784X_5 - 15.890X_6 + 0.233X_7$$
$$(7.233) \quad (0.142) \quad (0.011) \quad (0.617) \quad (0.118) \quad (0.372) \quad (3.621) \quad (0.261)$$
$$\mathrm{t} = (5.446) \quad (4.409) \quad (-0.639) \quad (-7.406) \quad (-5.990) \quad (2.110) \quad (-4.388) \quad (0.894)$$
$$\mathrm{R}^2 = 0.928 \quad \bar{R}^2 = 0.886 \quad F = 22.067 \quad n = 20$$

The results from the preliminary analysis show that the decidable coefficientR^2 is high, the joint significance test of the parameters of the F-test passes, while the t-test of some explanatory variables is not significant, indicating the possible existence of multicollinearity.

4. Model Preliminary Check and Correction

(1)Multicollinearity Test and Correction

From the above analysis, the model may have multicollinearity, and to prove the above conjecture, the correlation coefficients between the explanatory variables X1, X2, X3, X4, X5, X6, and X7 were calculated using software Eviews , as shown in TableI shown.

Table I Correlation coefficient table

Correlation coefficient	X1	X2	X3	X4	X5	X6	X7
X1	1.0000	0.8942	0.8100	0.0253	-0.4967	-0.1099	0.9299
X2	0.8942	1.0000	0.7538	-0.1313	-0.6131	-0.3037	0.9314
X3	0.8100	0.7538	1.0000	-0.3803	-0.7276	-0.4452	0.8931
X4	0.0253	-0.1313	-0.3803	1.0000	0.4172	0.7470	-0.2058
X5	-0.4967	-0.6131	-0.7276	0.4172	1.0000	0.6068	-0.6845
X6	-0.1099	-0.3037	-0.4452	0.7470	0.6068	1.0000	-0.3237
X7	0.9299	0.9314	0.8931	-0.2058	-0.6845	-0.3237	1.0000

From the correlation coefficient table, it can be seen that there is a strong correlation between the explanatory variables X1, X2, X3, and X7, and at this time the model has a more serious multicollinearity. When multicollinearity exists, the variance of the parameter estimates will be overestimated and their standard errors will increase, which will lead to larger confidence intervals for the estimated parameters, and the hypothesis test will easily make wrong judgments. It also leads to a higher coefficient of resolvability R^2 The joint significance of the parameters of the F-test is also high, while the t-test of some explanatory variables is not significant.

Table II Stepwise regression

Order	Variables	Variables	Variables	Variables	Variables	Variables	Variables	Correction of decidability factor$\overline{R}^2$	F-statistic
1						X6		0.153766	4.452410
2		X3				X6		0.249006	4.749896
3	X1	X3				X6		0.540608	8.453009
4	X1	X3		X4		X6		0.867557	32.11460

The stepwise regression method was used to correct for multicollinearity. First, a simple one-variable linear regression model was established with each explanatory variable separately for the explanatory variable Y. The determinable coefficients of each model were comparedR^2 The values of the coefficient of determination, the modified coefficient of determinationR^2 The best-fitting explanatory variable X6 was obtained by comparing the values of the coefficient of determination, the F-statistic, and the parametric t-test of each model, and then adding variables X1, X2, X3, X4, X5, and X7 on the basis of X6, and comparing the coefficient of determination and the modified coefficient of determination of each model again. R^2 The coefficients of each model were compared again.R^2 , F-statistics and the value of the parametric t-test, retain the variable X3, continue to add variables stepwise regression, and obtain the final regression model as.

$$\widehat{Y}_i = 51.8662 + 0.6785X_1 - 4.7845X_3 - 0.7703X_4 - 12.0441X_6$$
$$(3.9347) \quad (0.0792) \quad (0.4938) \quad (0.1211) \quad (3.3917)$$
$$t = (13.1816) \quad (8.5655) \quad (-9.6885) \quad (-6.3638) \quad (-3.5510)$$
$$R^2 = 0.8954 \quad \overline{R}^2 = 0.8676 \quad F = 32.1146 \quad n = 20$$

At this point, the model no longer suffers from severe multicollinearity.

(2) Heteroskedasticity test

To test whether there is heteroskedasticity in the model, a White test can be applied to test the number of tests obtained.

Its significance is 0.3261>0.05, so the test number is not significant, that is, there is no heteroskedasticity in the model and no correction for heteroskedasticity is required.

(3)autocorrelation test

The model was tested for autocorrelation using the partial autocorrelation coefficient with a 12-period delay, and the following partial autocorrelation table was obtained.

From the table, we can obtain that the biased autocorrelation coefficients of the model lagged 12 periods do not exceed the threshold at certain confidence level, the model does not have autocorrelation, the model autocorrelation test passes, and there is no need to correct the model for autocorrelation.

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Heteroskedasticity Test: White

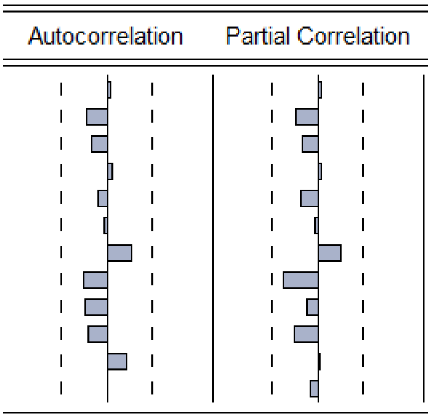
F-statistic	1.341478	Prob. F(14,5)	0.3974
Obs*R-squared	15.79491	Prob. Chi-Square(14)	0.3261
Scaled explained SS	9.699890	Prob. Chi-Square(14)	0.7838

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 12/31/20 Time: 15:34
Sample: 2000 2019
Included observations: 20

Variable	Coefficien...	Std. Error	t-Statistic	Prob.
C	373.3547	331.7856	1.125289	0.3116
X1^2	0.399886	0.176071	2.271159	0.0723
X1*X3	-4.821804	2.131011	-2.262683	0.0731
X1*X4	-0.406332	0.239524	-1.696418	0.1506
X1*X6	-15.36913	7.721490	-1.990436	0.1032
X1	22.86299	10.57757	2.161459	0.0830
X3^2	14.30723	6.618790	2.161608	0.0830
X3*X4	2.597700	1.736003	1.496368	0.1948
X3*X6	110.5853	54.40182	2.032751	0.0978
X3	-149.0133	79.94794	-1.863879	0.1214
X4^2	0.394191	0.277859	1.418674	0.2152
X4*X6	-14.83111	6.154481	-2.409807	0.0609
X4	-14.44388	16.84056	-0.857684	0.4303
X6^2	451.9834	163.8522	2.758482	0.0399
X6	-351.1552	206.9387	-1.696905	0.1505

R-squared	0.789745	Mean dependent var	3.465224
Adjusted R-squared	0.201032	S.D. dependent var	5.253493
S.E. of regression	4.695834	Akaike info criterion	6.044934
Sum squared resid	110.2543	Schwarz criterion	6.791733
Log likelihood	-45.44934	Hannan-Quinn criter.	6.190717
F-statistic	1.341478	Durbin-Watson stat	1.826262
Prob(F-statistic)	0.397440		

$$nR^2 = 15.79491$$



	AC	PAC	Q-Stat	Prob
1	0.040	0.040	0.0368	0.848
2	-0.203	-0.205	1.0459	0.593
3	-0.154	-0.142	1.6594	0.646
4	0.063	0.033	1.7677	0.778
5	-0.089	-0.160	1.9991	0.849
6	-0.029	-0.029	2.0262	0.917
7	0.244	0.231	4.0409	0.775
8	-0.226	-0.340	5.9142	0.657
9	-0.212	-0.105	7.7060	0.564
10	-0.175	-0.229	9.0534	0.527
11	0.205	0.026	11.102	0.435
12	0.006	-0.070	11.104	0.520

Figure 1 Partial autocorrelation coefficient (PAC) test

5. Model test

Economic significance test.

Through the preliminary test and correction of the model, the explanatory variables finally selected are the cognitive situation (X1), policy factor (X3), social factor (X4) and media factor (X6). From an objective point of view, the cognitive situation is positively correlated with residents' willingness to recycle discarded masks; the media factor is negatively correlated with residents' willingness to recycle discarded masks, and the economic significance of each parameter in the model is consistent with objective facts.

Statistical inference tests.

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The parameters of the model are obtained by estimating the sample observations of the variables, and the previous analysis has tests for model significance, goodness of fit, etc., which can prove the reliability of the model and the significance of its parameters. The modified decidable coefficient $\overline{R}^2 = 0.8954 > 0.85$, significantly correlated, and the F-statistic is32.1146 , the goodness of fit of the model equation and the test of significance of the equation can indicate the reliability of the model. At 95% confidence level, the t-tests of the model parameters have p-values less than 0.05, and the parameter significance tests also pass.

Econometric tests.

By performing autocorrelation test (PAC test) and heteroskedasticity test (White test) on the model, the results show that the model does not have heteroskedasticity and autocorrelation, and the previous discussion has been improved with a detailed discussion of model multicollinearity, and finally the model has no serious multicollinearity and the model econometric test is passed.

6. Recommendations

Technical aspects

Designing a smart recycling device for masks . During the epidemic, many cities and towns set up a large number of special recycling bins for discarded masks in order to recycle and dispose of the discarded masks. This initiative only collects the discarded masks, followed by operations such as transportation by sanitation workers and processing by professionals at a later stage. This is not much different from the traditional garbage recycling process, and the whole process costs a lot of manpower and material resources and is not very effective. In the mouthpiece processing and recycling and even the entire waste recycling industry, how to create an intelligent automatic waste recycling device through modern technology and technological innovation, so as to achieve green, fast and efficient recycling concept, has become the direction of the development of the waste disposal industry.

Policy

The government should issue relevant industrial policies and fiscal policies to guide joint mergers and acquisitions among mask enterprises, reasonably plan the layout of mask industry, and optimize the industrial organization structure. Introduce capital market to eliminate high capital barriers, increase the introduction of private capital, and increase the scale of capital subsidies to mask enterprises in terms of equipment costs. Strengthen the reserve of protective materials such as masks. Government departments can support mask production and sales by means of government procurement and reserves. The sharp increase in the production capacity of the mask industry is likely to cause a short-term overcapacity problem of masks, to actively and fully do the follow-up work. Increase the investment of scientific research funds, the government should formulate reasonable incentive policies to introduce high-tech talents and give certain financial funds to promote the innovation ability of China's mask industry.

Environmental aspects

Improve the recycling chain to reduce the risk of "secondary infection" . Discarded masks are likely to carry germs on their surfaces, so it is important to avoid a series of behaviors that may cause "secondary infection" while recycling discarded masks. For example, the unreasonable disposal of discarded masks, or the failure to close the bin after disposal, resulting in the spread of germs through the air, or the defective disposal of masks, may ultimately cause unnecessary "secondary infection". We should try to improve the whole waste mask recycling chain, so that the "secondary infection" and "secondary pollution" can be killed at the source. One of the current treatment methods, incineration of discarded masks, can also generate heat through incineration so as to achieve the recycling of discarded masks and achieve the purpose of saving resources.

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Social aspects

Add enough waste masks special trash bins

Based on the questionnaire survey, we found that the residential areas where some residents live do not provide enough recycling bins for discarded masks, and the discarded masks generated by some households can only be mixed with other types of garbage, and cannot be disposed of as they should. At the same time, the same problem exists in some public places with heavy traffic, and there are not enough bins for discarded masks in shopping malls. These external factors cause the discarded masks to be discarded in time, which greatly reduces the recycling efficiency and increases the risk of "secondary infection".

Raise public awareness of recycling

The root of improving the efficiency of mask recycling lies in the cultivation of the subjective awareness of the public. Through rich community activities and volunteer propaganda, the public can realize the necessity and benefits of waste mask recycling, take the initiative to cooperate with the waste recycling work and gradually develop good habits. For example, if residents can separate masks from other garbage when throwing out garbage at home, it will make the later recycling of masks more efficient. At the same time, consciously disposing of mask garbage at home in time can also reduce the risk of "secondary infection" caused by discarded masks.

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