

Self-Rated Health Disparities between Chinese Urban and Rural Residents: Household Registration System Discrimination or Endowment Differences?

: Based on 2016 Chinese Family Panel Studies data

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Abstract: Objective: To explore the contribution of resident endowment and household registration system to residents' self-rated health disparities, and to provide empirical reference for narrowing the health disparities between Chinese urban and rural residents and promoting health equity policies. Methods: Based on self-rated health data from Chinese Family Panel Studies in 2016, the Blinder-Oaxaca decomposition method was used to analyze the reasons for the health disparities between urban and rural residents. Results: Under China's urban-rural dual system, health disparities still exist between urban and rural areas, and urban residents possess better health than rural residents. Health disparities are mainly caused by the difference in residents' endowment characteristics. Endowment of the urban residents further reduces the mitigation effect of household registration system on health disparities between urban and rural residents. Education contributes the most to the expansion of urban-rural health disparity, followed by age, exercise, and use of clean water. Income contributes the most to the narrowing of urban-rural health disparity, followed by work status and medical insurance. Conclusion: We must deepen the reform of the household registration system, promote rural revitalization, perfect the employment mechanism, and pay special attention to rural education development and increase of farmers' income. Also, there is need to optimize the supply of rural public services, achieve unified medical insurance benefits between urban and rural areas, strengthen the publicity of health education.

1. Question proposal and literature review

Health is an inevitable requirement for achieving all-round development of people, and also a basic prerequisite for a country's economic and social development. Improving residents' health is not only a direct manifestation of social progress, but also a strategic requirement of "Healthy China 2030", and also an important guarantee for promoting the high-quality development of China's health industry. With the rapid development of China's economy and the gradual improvement in the health service system, significant improvement has been made in residents' health conditions. With the main health indicators of the population continuously improved, China's average life expectancy has increased to 77.3 years [1], which has not declined during the COVID-19 epidemic [2]. The World Health Organization puts forward that health disparities are "avoidable gaps in the health of people with different social status and health-influencing factors". The objective of "Health for all by the year 2000" has initiated research on health disparities, which aroused the attention and research in various countries. Where, research "Black Report" in the United Kingdom has the most far-reaching impact, which points out that there are significant regional differences in mortality in the United Kingdom and higher social class groups have an advantage. It also puts forward four hypothetical explanations for health disparities [3, 6]. Living conditions and lifestyles are still recognized by the academic circles, but "artificial theory" and "selection theory" have been

questioned by academic circles [4, 5]. Due to the rural-urban dualization in Chinese population, in the process of improving people's health, health equity issues have gradually appeared, such as the uncoordinated health development of urban and rural residents and the uneven distribution of health resources. Previous studies were based on population health indicators such as Chinese average life expectancy, mortality, and morbidity [7], finding that there are obvious health disparities between urban and rural areas in China, urban residents possess better health than rural residents and the gap continues to widen [8]. There are plenty of researches on mechanism of health disparities between urban and rural residents, and the main impacts are summarized as the endowment characteristics of residents' socioeconomic status, regional environment, and lifestyle. On the one hand, income and education are important factors influencing health disparity between urban and rural areas, but there is no consensus on whether it expands or narrows the health disparity. Chen Dong believes that both income and education have exacerbated the health disparity between urban and rural elderly people, and higher education has increased the health disparity within cities and towns [9]. Feng Ke holds that the health effect of income narrows the urban-rural health disparity to a certain extent, and rural residents have more improvement in health status than urban residents as income increases [10]. Zheng Li considers that the return effect of education on health is not just reflected as a simple urban-rural binary opposition, but is the superimposed effect of household registration, gender and age. The return to education has further expanded the health disparity between urban and rural men in old age. Under the equal low level of education, rural women have aggravated health disadvantages with age [11]. Luo Nengsheng studied health disparities between urban and rural areas from a regional perspective, finding that the degree of health equity in eastern, central, and western China decreased in turn, and funding for new rural cooperative medical system promoted urban and rural health equity [12]. On the other hand, household registration factors and lifestyle are generally regarded as intermediate mechanisms affecting health disparities. Wang Fuqin found that people with higher socioeconomic status possess stronger motivation to persist in exercise, and physical exercise is the most proximal factor affecting health [13]. Gao Xingmin believes that drinking has the greatest impact on health, followed by smoking. Rural residents with lower income are more likely to choose this unhealthy lifestyle. However, the two studies do not explain the mechanism by which smoking, drinking, exercise and other lifestyles affect health disparities [14]. Tang Di views that the impact of medical security on newborn health disparities is mainly due to the welfare differences derived from the dual household registration system, but fails to thoroughly investigate the impact of household registration factors on health disparity [15].

Since residents' personal endowment characteristics exert a significant impact on urban-rural health disparities, while household registration system is a political factor of urban-rural differences, which of the two exerts greater impact on urban-rural health disparities? Zhang Wenling analyzed the health status of 1264 inpatients with type 2 diabetes in a level a tertiary hospital. Household registration factors can only explain 23.86% of the health disparity between urban and rural patients, while the personal endowment contributes the most to this disparity. Patient residence and income account for the main reason of expanding health disparity, while difference in economic conditions and medical service levels at the place of residence hinders health equity [16], but the research samples are mainly inpatient who have lived in urban areas, while the proportion of rural samples is not high. In view of this, we choose Oaxaca-Blinder decomposition to analyze the contribution of the endowments and household registration system to residents' self-rated health disparities, based on 37,562 data from the 2016 Chinese Family Panel Studies, in order to provide empirical reference for narrowing the urban-rural health disparity and promoting health equity policies.

2. Research methods, data and variables

2.1 Research methods

The Blinder-Oaxaca decomposition method is used to explain the variable differences between urban and rural residents. First, suppose that Y represents residents' health status, X represents the explained variable, and variable a represents urban residents while variable b represents rural

residents. So two logit regression models are established:

$$Y^a = \alpha^a X_i + \mu_i^a, \quad Y^b = \alpha^b X_j + \mu_j^b \quad (1)$$

The health disparity: $D = Y^b - Y^a$.

Secondly, through the formula deformation and Neumark weighting method, the disparity is decomposed into two parts, one is the explainable part E, which is personal endowment characteristics, and the other is the unexplainable part R, which is caused by discrimination. And the formula is:

$$D = Y^b - Y^a = [(\alpha^b - \alpha^p) \cdot X^b + (\alpha^p - \alpha^a) \cdot X^a] + \Delta X \cdot \alpha^p = R + E \quad (2)$$

2.2 Data source

The data derives from the 2016 Chinese Family Panel Studies provided by the Chinese Social Science Survey Center of Peking University. This study uses self-rated health, education level, employment status, medical insurance status, exercise status, drinking status, smoking status, cooking fuel status, use of clean drinking water in the adult database, as well as per capita household income in the household database.

2.3 Variable description

The explained variable in this paper is health status indicator of urban and rural residents, and self-rated health is set as a binary variable. The explanatory variables in this paper include factors such as population, social economy, regional environment and living habits (see Table 1).

Table 1 Variable definition description

| variable | definition description |
|--------------------------------------|--|
| Self-rated health | 0=normal, unhealthy, 1=very healthy, quite healthy, relatively healthy |
| Urban households | 0=rural residents, 1=urban residents |
| Log of household income per capita | log value of household income per capita |
| Medical insurance classification | 0=no medical insurance, 1=public medical care, 2=urban employee medical insurance, 3=urban resident medical insurance, 4=supplementary medical insurance, 5=new rural cooperative medical system |
| Age | continuous variable, 16 years old and above |
| Gender | 0=female, 1=male |
| Marriage | 0=unmarried, divorced and others, 1=married |
| Whether clean drinking water is used | 0=no clean drinking water, 1=with clean drinking water |
| Cooking fuel | 0=use firewood, coal, biogas, and other fuels, 1=use electricity, coal gas, liquefied gas, natural gas |
| Do you exercise | 0=no exercise, 1=with exercise |
| Do you smoke | 0=not smoking, 1=smoking |
| Do you drink alcohol | 0=don't drink alcohol, 1=drink alcohol |
| Work status | 0=unemployed, 1=employed, 3=withdraw from the labor market |
| Education level | 1=primary school and below, 2=junior and senior high school, 3=college, undergraduate and above |
| Regional distribution | 0=western region, 1=central region, 2=eastern region |

3. Empirical analysis results

3.1 Descriptive analysis

The total sample size is 37,562 persons, including rural sample size of 18,679 persons and urban sample size of 17,083 persons. Rural residents have significantly lower health level than urban residents, and rural residents have significantly less income, higher education, medical insurance, physical exercise, use of clean water, and use of electric gas than urban residents, but significantly higher age, more male population, low education, new rural cooperative medical system, smoking and drinking than the latter. Rural residents in the western region have a higher proportion, while urban residents in the central and eastern regions have a higher proportion, indicating to a certain extent that urbanization coverage of the population gradually increases from west to east (see Table 2). The difference in marital status is insignificant between urban and rural residents. Comparatively speaking, the urban sample has a larger proportion of advantageous resources, and the higher socioeconomic status, better lifestyles, and more abundant endowments of urban residents may be a possible explanation for the higher health level of urban residents than rural residents.

Table 2 Descriptive statistics table

| Variable | Total sample | Rural sample | Urban sample | Mean t-test | t-value |
|---|--------------|--------------|--------------|-------------|---------|
| Self-rated health | 0.664 | 0.649 | 0.680 | -0.031*** | 0.005 |
| Urban households | 35762 | 18679 | 17083 | — | — |
| Age | 46.203 | 46.369 | 46.022 | 0.347* | 0.187 |
| Gender | 0.498 | 0.504 | 0.492 | 0.012** | 0.005 |
| Marriage | 0.763 | 0.766 | 0.760 | 0.006 | 0.004 |
| Logincome | 9.417 | 9.103 | 9.760 | -0.657*** | 0.010 |
| Education level | | | | | |
| 1=Primary school and below | 0.481 | 0.626 | 0.391 | 0.235*** | 0.005 |
| 2=junior and senior high school | 0.379 | 0.343 | 0.473 | -0.130*** | 0.005 |
| 3= college, undergraduate and above | 0.076 | 0.031 | 0.136 | -0.105*** | 0.005 |
| Medical insurance classification | | | | | |
| 0= No medical insurance | 0.089 | 0.076 | 0.105 | -0.029*** | 0.005 |
| 1= Public medical care | 0.021 | 0.007 | 0.036 | -0.029*** | 0.002 |
| 2= Urban employee medical insurance | 0.127 | 0.038 | 0.225 | -0.187*** | 0.003 |
| 3= Urban resident medical insurance | 0.077 | 0.015 | 0.145 | -0.129*** | 0.003 |
| 4= Supplementary medical insurance | 0.006 | 0.004 | 0.008 | -0.004*** | 0.008 |
| 5= New rural cooperative medical system | 0.679 | 0.860 | 0.482 | 0.378*** | 0.005 |
| Work status | | | | | |
| 1= Employed | 0.639 | 0.801 | 0.684 | 0.116*** | 0.005 |
| 0= Unemployed | 0.010 | 0.008 | 0.015 | 0.007*** | 0.004 |
| 3= Withdraw from the labor market | 0.211 | 0.191 | 0.301 | -0.109*** | 0.005 |
| Regional distribution | | | | | |
| 0= Western Region | 0.304 | 0.381 | 0.219 | 0.162*** | 0.005 |
| 1= Central region | 0.290 | 0.286 | 0.295 | -0.009** | 0.005 |
| 2= Eastern Region | 0.406 | 0.333 | 0.485 | -0.152*** | 0.005 |
| Whether clean drinking water is used | 0.679 | 0.482 | 0.859 | 0.3778*** | 0.005 |
| Do you have cooking fuel | 0.644 | 0.473 | 0.830 | -0.357*** | 0.005 |
| Do you exercise | 0.416 | 0.326 | 0.509 | -0.182*** | 0.005 |
| Do you smoke | 0.277 | 0.290 | 0.264 | 0.026*** | 0.005 |
| Do you drink alcohol | 0.144 | 0.145 | 0.142 | 0.002* | 0.561 |

Note: The mean value is tested by T-statistics, significance: *p<0.10, **p<0.05, ***p<0.01.

3.2 Logit regression analysis on resident health

Regardless of urban or rural residents, endowment characteristics such as gender, income, education level, regional distribution, and use of clean water are significantly positively correlated

with residents' health status ($p < 0.05$), while marital status, age are significantly negatively correlated with residents' health ($P < 0.05$), indicating that the socio-economic environment and social resources possessed by residents significantly impact health. Work status exerts varying effects on the health of urban and rural residents. Employment is significantly positively proportional to urban residents' health, but is insignificantly inversely proportional to the health of rural residents ($p > 0.1$). Withdrawal from the labor market is significantly inversely proportional to the health of rural residents, but is significantly positively proportional to the health of urban residents ($p > 0.1$). The health choice effect of the labor market further weakens the health of rural residents. The better economic conditions in cities and towns determine the availability of better jobs and greater demand for employment in cities and towns. The talent market favors labor with good health, urban residents with health advantages thus have more job opportunities to better improve health. Therefore, rural residents who withdraw from the labor market have worse health than urban residents. The economically developed areas in the east have a significant positive effect on the health of urban residents, but have insignificant positive effect on the rural residents. The difference in the constant term is 1.501 and is significant at 1%, reflecting that the interaction between personal endowments and household registration system plus other influences will reduce the health disparity between urban and rural residents (see Table 3). Based on this, it is inferred that the differences in residents' endowment characteristics mainly explain the health disparity between urban and rural residents, which will be further confirmed in the next section.

Table 3 Logit regression analysis of urban and rural residents' health

| | Rural residents' health | | Urban residents' health | | Comparison of the difference in health regression coefficients between rural and urban residents | |
|---|-------------------------|---------|-------------------------|---------|--|---------|
| | coef. | std.Err | coef. | std.Err | Difference | p-value |
| Gender (control group: female) | 0.3019*** | 0.0476 | 0.2524*** | 0.0484 | 0.050 | 0.21 |
| Marriage (control group: other) | -0.1987** * | 0.0547 | -0.2222*** | 0.0544 | 0.023 | 0.43 |
| Age | -0.0389** * | 0.0014 | -0.0360*** | 0.0015 | -0.003** | 0.05 |
| Logincome | 0.0961*** | 0.0209 | 0.1425*** | 0.0228 | -0.046* | 0.09 |
| Education level (control group: primary school and below) | | | | | | |
| Junior and senior high school | 0.3089*** | 0.0429 | 0.2287*** | 0.0454 | 0.080 | 0.12 |
| College, undergraduate and above | 0.7197*** | 0.1615 | 0.4680*** | 0.0788 | 0.252*** | 0.01 |
| Work status (control group: unemployed) | | | | | | |
| Employed | -0.1018 | 0.2525 | 0.3465** | 0.1309 | -0.448** | 0.05 |
| Withdraw from the labor market | -0.5062** | 0.2556 | 0.0436 | 0.1642 | -0.550** | 0.02 |
| Medical insurance (control group: no medical insurance) | | | | | | |
| Urban employee medical insurance | 0.1178 | 0.1317 | -0.0314 | 0.0774 | 0.149 | 0.13 |
| Urban resident medical insurance | -0.1229 | 0.1689 | -0.1269 | 0.0810 | 0.004 | 0.47 |
| New rural cooperative medical system | -0.0359 | 0.0752 | 0.1324 | 0.0704 | -0.168** | 0.04 |
| Supplementary medical insurance | -0.4884 | 0.3145 | 0.2444 | 0.2864 | -0.733** | 0.05 |
| Public medical care | 0.2235 | 0.2559 | 0.3014* | 0.1246 | -0.078 | 0.37 |
| Regional distribution (control group: western region) | | | | | | |

| | | | | | | |
|---------------------------------------|-----------|--------|-----------|--------|----------|------|
| Central region | 0.1620** | 0.0470 | 0.1972*** | 0.5450 | -0.035 | 0.27 |
| Eastern region | 0.0571 | 0.0461 | 0.1433** | 0.0510 | -0.086* | 0.09 |
| Exercise (control group: no exercise) | 0.1387*** | 0.0406 | 0.2321*** | 0.0401 | -0.093* | 0.07 |
| Smoking (control group: no smoke) | 0.0822 | 0.0505 | 0.0524 | 0.0538 | 0.030 | 0.32 |
| Drinking (control group: no drink) | 0.1712** | 0.0561 | 0.1914*** | 0.0591 | -0.020 | 0.37 |
| Use of electric gas | 0.0186 | 0.0405 | 0.0015 | 0.0554 | 0.017 | 0.37 |
| Use of clean water | 0.1061** | 0.0381 | 0.1745** | 0.0563 | -0.068 | 0.13 |
| Constant term | 1.501*** | 0.3249 | 0.2627 | 0.2795 | 1.238*** | 0.00 |

Note: Comparison of the difference in health regression is tested by SUR, significance: *p<0.10, **p<0.05, ***p<0.01.

3.3 Blinder-Oaxaca decomposition of residents' health disparities

The total difference in health status is -0.0357 between rural and urban residents, and the health level of rural residents is lower than that of urban residents by -0.0357, which is significant at the 1% level (see Table 4). The constant term is positive and significant, indicating that differences in household registration and endowments do not separately affect health disparities between urban and rural residents, and their interaction has a certain mitigation effect on health disparities between urban and rural areas. Health disparity mainly derives from the explainable part. The explainable part is -0.0457, which is significant at the 1% level. The endowment difference of residents further expands the urban-rural health disparity. The unexplainable part is positive and insignificant ($p>0.1$), suggesting that household registration system has no significant effect in reducing the health disparity between urban and rural areas. It is inferred that the adequate endowment of urban residents has further reduced the mitigation effect of household registration system on health disparity between urban and rural residents, and the degree by which household registration system reduces health disparity between urban and rural areas is far insufficient to bridge the health gap widened by resident endowment.

Table 4 Blinder-Oaxaca decomposition of health disparity between urban and rural residents

| | coef. | std.Err |
|------------------------|------------|---------|
| Rural health | 0.6341*** | 0.0039 |
| Urban health | 0.6698*** | 0.0039 |
| Total health disparity | -0.0357*** | 0.0056 |
| Explainable part | -0.0457*** | 0.0048 |
| Unexplainable part | 0.0101 | 0.0061 |
| Constant term cons | 0.1193* | 0.0643 |

Note: significance: *p<0.10, **p<0.05, ***p<0.01.

The health disparity between rural and urban residents mainly originates from the irrational distribution of residents' endowments. Seen from the decomposition (see Table 5), endowment characteristics such as marriage, age, education level, regional distribution, exercise, and use of clean water significantly widen the health disparity between urban and rural areas. Older residents have lower health level and higher demand for medical services, and urban areas have higher medical level and medical service accessibility than rural areas. Therefore, urban health is significantly higher than rural health with age ($p<0.01$). Higher education level widens health disparity between urban and rural areas, residents who have got higher level of education are more likely to choose to stay in cities and have lower willingness to return to the countryside, which leads to bigger gap in health level between urban and rural ($p<0.01$). From the west to the east, the urban-rural health disparity gradually widens ($p<0.1$). The siphon effect on high-quality human resources in developed areas has improved the health level of the eastern region, particularly urban

health level in the eastern region. The Matthew effect in allocation of health resources has widened the health disparity in the eastern region. The difference in exercise and clean water use has widened the residents' health disparity ($p < 0.01$), so it is possible to reduce health disparity by improving rural residents' health literacy and living environment.

Gender, income, work status, and medical insurance exert a significant mitigation effect on health disparity between urban and rural residents. With the increase in income, residents have more health investment in medical security and body nutrition, which plays a more obvious role in reducing the health disparity between urban and rural areas ($p < 0.01$). When residents withdraw from the labor market due to age limit or incapacity, both urban and rural residents are at a relatively low health level. Urban residents no longer have significant health advantage during their employment, which eases the health disparity ($p < 0.01$). As China tries to expand the coverage of the medical security system to cover the entire population, urban and rural residents can purchase urban resident medical insurance and new rural cooperative medical insurance (currently the two insurances are merged) at the seat of the registered permanent residence. In addition, employees with formal jobs can purchase urban employee medical insurance. Enrolling in medical insurance can not only reduce medical expenses, but also maintain the health level and families' anti-risk capability, which carries significant meaning for reducing the health disparity between urban and rural areas ($p < 0.05$).

Table 5 Blinder-Oaxaca factor decomposition of urban and rural residents' health disparities (rural health as the benchmark group)

| | Explainable part | | Unexplainable part | |
|-----------------------|------------------|---------|--------------------|---------|
| | coef. | std.Err | coef. | std.Err |
| Gender | 0.0006** | 0.0003 | 0.0078 | 0.0068 |
| Marriage | -0.0003** | 0.0002 | 0.0028 | 0.0120 |
| Age | -0.0075*** | 0.0014 | -0.0352* | 0.0189 |
| Logincome | 0.0177*** | 0.0029 | -0.0510 | 0.0554 |
| Education level | -0.0167*** | 0.0025 | 0.0240* | 0.0142 |
| Work status | 0.0073*** | 0.0011 | -0.0165* | 0.0094 |
| Medical insurance | 0.0060** | 0.0027 | -0.0286* | 0.0161 |
| Regional distribution | -0.0028* | 0.0015 | -0.0043 | 0.0067 |
| Exercise | -0.0081*** | 0.0015 | -0.0049 | 0.0035 |
| Smoking | 0.0004 | 0.0003 | 0.0012 | 0.0044 |
| Drinking | 0.0001 | 0.0002 | -0.0009 | 0.0024 |
| Use of electric gas | 0.0003 | 0.0039 | 0.0030 | 0.0065 |
| Use of clean water | -0.0072*** | 0.0027 | -0.0063 | 0.0083 |

Note: significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

4. Research conclusions and policy recommendations

This paper uses 2016 CFPS data to explore the different impact of residents' endowment characteristics and household registration on the self-rated health disparity of urban and rural residents. We found that as the urban-rural dual system, health disparities still exist between urban and rural areas, and urban residents possess better health than rural residents. Urban residents have significantly superior income, education and living environment than rural residents, and these factors have a significant positive correlation with health status, while rural residents favor unhealthy lifestyles of smoking and drinking. Such "Matthew effect" makes urban residents always have better health than rural residents. Through the Blinder-Oaxaca decomposition, it is found that health disparities between urban and rural areas are mainly caused by the difference in residents'

endowment characteristics. Sufficient endowment of the urban residents further reduces the mitigation effect of household registration system on health disparities. On the one hand, education contributes the most to the expansion of urban-rural health disparity. Seen from sample proportions, samples with education level of elementary school and below account for more than half of the rural samples, while samples with education level of junior and senior high school and above account for more than half, so there is a wide gap in education level between urban and rural residents. In addition, residents with higher education level have better health. It is inferred that the difference in education levels between urban and rural areas leads to health disparity, and health effects of education fail to play a significant role in rural areas. On the other hand, income contributes the most to the narrowing of urban-rural health disparity. Seen from the regression results, income has a significant positive correlation with residents' health. Compared with rural residents, increase in income of urban residents plays a greater role in improving health. However, the decomposition result shows that income has narrowed the health disparity between urban and rural areas. This contradiction shows that only considering the health effect of income alone is insufficient to explain its effect on health disparity. When the residents in rural areas have got salary, they may buy products to improve health, thereby narrowing the health disparity between rural and urban residents. From the results, some suggestions as follows:

First, it is necessary to promote the integration of urban and rural household registration, deepen the reform of the urban and rural household registration system, and guarantee the fairness of rural household registration residents in acquiring urban public services. Income helps to improve health equity and alleviate the health disparity between urban and rural areas. Therefore, we must promote rural revitalization, release the vitality of rural production factors, accelerate the adjustment of agricultural structure, tap the huge potential of the rural market, increase farmers' income through multiple channels, and increase farmers' income levels.

Second, the imbalance in education development between urban and rural areas leads to health disparities. Therefore, it is necessary to increase investment in rural education, optimize the allocation of rural education resources, improve the rural education level, and promote the integrated development of urban and rural education. We should continue to perfect the employment mechanism, effectively protect the legitimate rights and interests of migrant workers, regularly hold job fairs, provide labor positions for unemployed residents, and provide precise assistance to those with employment difficulties. There is necessary to strengthen the rural workers' skills and education, and provide targeted employment guidance to rural residents.

Thirdly, medical insurance plays a positive role in alleviating health disparities, but there is still a policy of differential treatment in medical insurance. It is necessary to speed up unification of the medical insurance system, so that urban and rural residents achieve unified medical insurance benefits. In addition, we must pay attention to the management of residents' health risk factors, and help improve residents' health quality. What's more, we should optimize the rural public service supply, pay more attention to improve the living environment and family facilities of rural residents in the process of the strategy for rural revitalization.

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