

# Off the Epicenter: COVID-19 Quarantine Controls and Employment, Education, and Health Impacts in Rural Communities

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## Introduction

The purpose of this article is to document the disease control measures enacted in rural areas of China during the spread of COVID-19 and empirically examine the economic and social impacts of these measures on rural communities over time. More specifically, we first examine the efforts that local governments and communities implemented to control the spread of the virus. Second, we examine how many individuals in rural villages across China contracted and died from COVID-19 during February and March. Finally, we examine the consequences of disease control measures on rural villagers, including their access to employment, education, and healthcare during and after quarantine.

In pursuance of these objectives, we analyze data that we collected from a longitudinal survey of 726 random selected villages in seven provinces outside of the pandemic epicenter in China. To eliminate reporting-bias, we selected and interviewed ordinary villagers rather than local officials or village doctors. During approximately one-hour phone calls in each round of survey, these village informants sought to characterize the nature of the disease control measures and their consequences for their villages in general.

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# **Off the Epicenter: COVID-19 quarantine controls and employment, education and health impacts in rural communities**

## **Introduction**

*“For the past 15 years, my husband and I have returned to the village once every year for the Lunar New Year. We spend five days with family, then go back to the city to make money for 360 days. Why would not this year be the same? When we arrived home [in rural Henan] on January 20th, we did not think we would be stuck at home for such a long time with no work.”*

*–Village informant from Henan.*

In late January 2020, China’s government initiated its first aggressive measures to combat COVID-19 by forbidding individuals from leaving their homes, radically limiting public transportation, cancelling or postponing large public events, and closing schools across the country.<sup>1</sup> The rollout of these measures coincided with China’s Lunar New Year holiday, during which more than 280 million people had returned from their places of work to their home villages in rural areas.<sup>2</sup> The disease control policies remained in place until late February and early March, when they were gradually loosened to allow for more free movement of people.<sup>3</sup> Among those that were allowed to move again were the hundreds of millions of migrant workers who originally (before the COVID-19 outbreak) had expected to return to China’s urban and industrial centers to continue working in the nation’s factories, construction sites and service sector.<sup>4</sup>

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<sup>1</sup> National Health Commission of the People’s Republic of China 2020

<sup>2</sup> National Bureau of Statistics of China 2019

<sup>3</sup> The State Council of The People’s Republic of China 2020a

<sup>4</sup> National Health Commission 2020

While social media and official news outlets have provided coverage of the spread of COVID-19 in the Hubei Province epicenter and large cities throughout the country, little is known about how the disease control policies were implemented in rural communities and how they affected the lives of the roughly 759 million<sup>5</sup> people living in these rural areas.<sup>6</sup> In particular, it is unclear what actions were taken to control the spread of the disease in rural villages outside of Hubei and if they were successful at limiting the spread of COVID-19. There is also a shortage of information on what the impacts of those disease control measures have been on the ability of rural people to continue to access employment, healthcare, and schooling. In the period following the lifting of the restrictions, little research has focused on the degree of economic recovery in rural areas and the remaining impacts the restrictions have on rural life.

To our knowledge, no survey has followed the same villages over time from the quarantine period to the post-quarantine period. Such research is important because the social safety net for low-income households in China<sup>7</sup>—who are predominantly located in rural area—is limited, raising fundamental questions about how some of the country’s most vulnerable have fared during the quarantine period and its aftermath. Lessons from these rural villages may be particularly valuable as the COVID-19 pandemic spreads to other middle- and low-income countries around the world, as well as for guiding responses to future epidemics inside China.

The purpose of this article is to document the disease control measures enacted in rural areas of China during the spread of COVID-19 and empirically examine the economic and social impacts of these measures on rural communities over time. More specifically, we first examine the efforts that local governments and communities implemented to control the spread of the

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<sup>5</sup> According to National Bureau of Statistics in 2019, there were 784 million rural people in China, 25 million of them live in Hubei.

<sup>6</sup> National Bureau of Statistics of China 2020a

<sup>7</sup> Jalan and Ravallion 1999; Morduch 1999

virus. Second, we examine how many individuals in rural villages across China contracted and died from COVID-19 during February and March. Finally, we examine the consequences of disease control measures on rural villagers, including their access to employment, education, and healthcare during and after quarantine.

In pursuance of these objectives, we analyze data that we collected from a longitudinal survey of 726 random selected villages in seven provinces outside of the pandemic epicenter in China. To eliminate reporting-bias, we selected and interviewed ordinary villagers rather than local officials or village doctors. During approximately one-hour phone calls in each round of survey, these village informants sought to characterize the nature of the disease control measures and their consequences for their villages in general.

## **Methods and Approach**

### **Sampling Procedure**

We randomly selected and interviewed 726 village informants (who were not village officials or doctors) residing in 726 randomly-sampled villages in seven provinces across China: Ningxia, Shaanxi, Gansu, Jiangxi, Henan, Yunnan, and Sichuan. The seven provinces in total account for over 25% of China's overall rural population.<sup>8</sup> On average, the income per capita of rural residents in these provinces was 1,683 USD in 2018 (ranging from 1,127 USD per capita to 2,185 USD per capita), slightly below the national rural average of 2,209 USD per capita.<sup>9</sup>

We recruited village informants that took part in previous unrelated studies conducted by the research team across seven provinces in China. Previous studies covered 2069 villages in 540

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<sup>8</sup> National Bureau of Statistics of China 2010

<sup>9</sup> National Bureau of Statistics of China 2019

townships across 60 counties (see Appendix A for more sample information on these data sets). We included all 540 townships in this study. Within each sample township, we created a list of 10 randomly selected households. Finally, we made phone calls to the households on the list to complete the interview with the goal to include 100 villages per province. Individuals were excluded if they were living in the local urban centers or county seats at the time of our survey, leaving only those households living in rural villages. The sampling approach is summarized in a flowchart (Figure 1).

The number of counties, townships and village informants for each province are listed in Table 1. In total, the research team surveyed 726 informants in 726 villages, 540 towns and 60 counties. We estimate that the total number of rural residents covered by the estimates of the village informants was around 726,000.

### **Data Collection**

Data were collected from two rounds of phone call surveys. By design, each survey sought to cover around 30 days of time (the first month of quarantine, from January 24 to February 24; and the first month during which disease control measures were gradually lifted, from February 24 to March 24).

In the first round of the survey, we interviewed all 726 village informants. In the second round, we randomly selected and interviewed approximately half (349) of the village informants from each county. For the 12 village informants who had left the village for work by the time of our second survey, we asked them to refer us to a friend or family member who still lived in the village for interview. With this methodology, there was no attrition in the second round of the survey.

Each round of survey contained four sections. The first section collected information on disease control measures including transportation measures and travel restrictions, both within the village and those taken by the government. The second section collected information about COVID-19 infections and deaths in the village and surrounding townships. The third section of the survey asked about general impacts of disease control measures on employment and income. The fourth section of the survey asked about impacts of disease control measures on education for children, and healthcare in the village.

This study was approved by the Stanford University Institutional Review Board (protocol #55168). All participants provided informed verbal consent and were guaranteed confidentiality for this study.

## **Results**

We divide our results into several subsections and report each subsection by two survey periods: during and after the implementation of disease control measures. The first subsection details the types of disease control measures reported by village informants. The second subsection includes the reported incidence of the virus, including the number of people that contracted the disease and the number of people that died of COVID-19. The fourth subsection reports the impact of the disease control measures on access to employment and effects on income, education and healthcare.

### **Types of Disease Control Measures**

*“The coronavirus outbreak was reported on TV in late January, it was mainly in Hubei, there were no infections in our county, so we did not think much of it. Then all of the sudden, the government said we were “fighting a war” against the coronavirus. We were told to “contribute to the country by staying home.” Now, everyone is being asked to stay at home. No one is*

*allowed to meet anyone from outside the household. Even our Spring Festival family dinner had to be cancelled. The roads are all blocked. Everyone has to wear a mask. People in my village are all supportive of all these measures, and we are so afraid to go out for fear of getting sick. It is hard to stay at home all day long, but we understand.”*

*– Village informant from Jiangxi Province*

There were two particularly salient findings from the first round survey in February: a.) an array of draconian disease control measures were implemented across almost all villages; and b.) there was a high degree of compliance with the disease control measures. The first round survey indicated that multiple restrictions on the movement and assembly of villagers were in place (Table 2). In 631 villages (87%), the informants reported that they were unable to leave the village and outsiders were not permitted to enter the village, even if they were relatives or friends from nearby villages. In 471 villages (65%) villagers were not permitted to leave the village to buy food or other supplies. In many cases, both adults (72%) and children (88%) were not permitted to go for walks outside. Local authorities in 699 villages (96%) required that villagers wear face masks to go outside, while only 119 village informants (16%) reported that masks could be bought in the village or a local market. Authorities in 716 villages (99%) did not permit villagers to gather in public for activities such as dancing or exercise; 714 villages (98%) did not permit villagers to convene for weddings or funerals; and 707 villages (97%) did not permit villagers to visit neighbors to play cards or have meals together.

We also asked informants to describe the disease control enforcement measures and the related village environment during that first month of quarantine. Informants detailed that village party committee members and village “volunteers” worked together as “epidemic prevention and control teams” to enforce the measures. Stay at home orders and COVID-19 awareness were broadcasted using loudspeakers in the village. Roadblocks were set up at the entrance of the



village. Everyone who went in and out of the village had to register at the check station, where body temperature was checked. Most of the villagers were understanding and followed these measures seriously. Villager who violated the rules such as walking around without wearing a mask, would receive verbal warning or even a small fine from the epidemic prevention and control team.

The results in Table 2 from our second round survey show that by late March, the quarantine barriers at the individual level were almost uniformly less strict, although restrictions on large gatherings were still largely present. The share of villages banning visitors from outside the village dropped from 86% in February to 17% in March. Few villages (0.3%) reported that residents were not permitted to leave the village to buy supplies. The percentage of villages reporting restrictions on walks outside also dropped for both adults (down to 14%) and children (down to 21%). Although wearing face masks was still required to go outside (90%), more masks were available for purchase at the local market (74%). Despite the reduction of many control measures, restrictions limiting group activities remained strict in most villages. For example, weddings and funerals were still temporarily banned in most villages (74%). Public gatherings for activities such as dancing or exercise were not permitted (66%).

The findings of both surveys suggest widespread enforcement and compliance with disease control measures. When all restrictions were in place in February, virtually no one reported being able to move freely. By March, after China had announced a nationwide loosening of restrictions that allowed individuals to resume movement to go in and out villages,<sup>10</sup> most villages reported that individuals were moving more freely. However, local governments kept certain restrictions in place, including limits on large gatherings.

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<sup>10</sup> The State Council of The People's Republic of China 2020

The high level of compliance reflects a comprehensive capacity on the part of China's government to impose and enforce limits on movement and gathering. Even if it were known that these measures were effective in containing the spread of the virus (see next section), the example is of limited utility to other developing nations aiming to protect their rural populations unless those states have a similarly pervasive capacity to enforce the restrictions.<sup>11</sup>

According to the February survey, infection rates in the sample area were clearly low (Table 3). Only four village informants out of 726 reported any COVID-19 infections in their villages. In all four cases, the village informant stated that all infection cases were being isolated and treated in locally-designated hospitals. When extrapolating to the sample of all of those rural residents inside the sample villages, of the nearly 726,000 residents represented in the sample, only 10 were reported to have contracted the virus. No one in any surveyed village reported deaths from the virus.

So how does this implied infection rate of 0.001% (or about 13 infections for every one million people) compare to other parts of China and to other countries in the world? While clearly low, the infection rate for the sample's 726 villages is actually almost exactly the same as the rate of infection reported across China (12 infections per million population) excluding the Hubei province. According official data as of end of May 2020, the infection rate inside Hubei province was much higher (1154 infections per million).<sup>12</sup> However, this infection rate is still significantly less than many other countries as of the end of May 2020, such as the US (5174/million);<sup>13</sup> the UK (3992/million);<sup>14</sup> and Italy (3827/million)<sup>15</sup>.

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<sup>11</sup> Kupferschmidt and Cohen 2020

<sup>12</sup> Chinese Center for Disease Control and Prevention 2020

<sup>13</sup> Centers for Disease Control and Prevention 2020

<sup>14</sup> Department of Health and Social Care 2020

<sup>15</sup> Italian Civil Protection Department 2020

For several reasons, we believe the low infection rates reported in our survey are accurate and not a result of underreporting. First, information spreads quickly in villages in China.<sup>16</sup> If an infection was present, close family members, relatives inside the village, and neighbors in the village would certainly know. With nearly ubiquitous cell phone and social media use, word would likely spread fast, despite restrictions on physical movement in the village. Furthermore, efforts to make sure villagers stay informed on infection cases enhanced the speed of communication. Contact tracing information is available on social media and official websites.<sup>17</sup> In many villages, if an individual became infected, a prominent banner or sign would hang on that person's home, warning villagers to stay clear. Our data are also less likely to be biased by political motivation because we rely on ordinary villagers rather than village officials as informants. Finally, the willingness of the informants to talk in nearly every village that we randomly sampled to call suggests that authorities did not issue any type of order to avoid reporting cases to outsiders (in which case the informants may have been less willing to speak to the enumerator). In fact, in the several villages in which there were infections, the village informants were open and willing to discuss their village's experience in detail.

Furthermore, the nature of migration in China and the rapidness and strictness of the disease control measures supports the general finding that infection rates were low in the sample villages. Specifically, long-distance migration for work in developing countries, in general, is often characterized by "chain migration," where migrants from a particular urban target-destination are often from a relatively small subset of rural source-communities.<sup>18</sup> The literature has repeatedly shown that this type of migrant network is also common in China,<sup>19</sup> and suggests

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<sup>16</sup> Luo et al. 2007

<sup>17</sup> Liu et al. 2020

<sup>18</sup> Bastos and Greve 2003

<sup>19</sup> Zhao 1999; Rozelle et al. 1999; Zhao 2003

that a large share of rural workers find and work at jobs in their own county, prefecture or province.<sup>20</sup> What seems to have protected these villages from having large numbers of disease infections is that there were not heavily-travelled migration chains between the infection epicenter sites in Hubei and the sample villages. More than 70% of the migration out of the epicenter in Wuhan was limited to other parts of Hubei province rather than the rest of China's rural areas.<sup>21</sup>

While the measures to control the COVID-19 outbreak were indeed strict in rural communities outside the epicenter (as reported above), in the absence of a counterfactual, it is not possible to guarantee if those measures are directly responsible for the low rate of infection in our sample. It is possible to conclude from our survey, however, that the disease control measures coincided with the limited spread of COVID-19 virus in the sample areas. Given that the absence of similar control measures in the rest of the world has demonstrably increased infection rates, our intuition based on the findings of the current survey is that the measures were conducive to containing disease spread where cases did occur.

### **COVID-19, Employment and Income**

*“It is a hard time for people in my village, this coronavirus outbreak put almost all business activities on hold since the Lunar New Year holiday. People in the village used to work in the cities as housekeepers in hotels, waitresses in restaurants, delivery workers, manufacture and construction workers. Now we are all waiting to go back to work, but it's not easy to find a job.”*

*– Village informant from Shaanxi.*

*Access to Employment while Disease Control Measures were in Effect*

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<sup>20</sup> L. Zhang et al. 2018; Guang and Zheng 2005

<sup>21</sup> Zhou et al. 2020

Among the most striking findings of the first round of survey was the widespread impact of disease control measures on rural employment (Table 4). In February, nearly three quarters (74%) of village informants reported that villagers had stopped working because their workplaces were closed due to the COVID-19 outbreak and related disease control measures. Across the provinces, the rate of workplaces closure reported by village informants in late February ranged from 51 percent in Jiangxi Province to 100 percent in Ningxia. There were no villages where everyone was back to work. In 59 percent of villages, respondents reported that 100% of the village's migrant and local workers were out of work.

The data in Table 4 also demonstrate that there were other reasons (beyond the shutting down of their places of employment) behind the high reported incidences of unemployment. Four out of every five village informants (81%) reported that local public transportation had ceased operating. Most village informants (64%) stated that villagers were not permitted to drive to the cities. Almost all informants (93%) indicated that rural individuals were not permitted to rent any place to live in a city due to restrictions given by urban governments and urban neighborhood community leaders. Thus, even when a villager's employer would have been willing and able to put the villager back to work, there were many barriers keeping this from happening. Interestingly, out of the 726 village informants, 487 (or 67%) of them stated that the fear of infection was so great that many villagers did not want to leave the village to find employment even if the hiring, transportation and rental barriers were not in effect. In conclusion, due to a combination of reasons, employment was close to zero for a full month after the start of the quarantine.

In normal times, China has 288 million migrant laborers that leave their counties for extended periods to work in distant cities.<sup>22</sup> There are an additional 93 million rural workers that live in their villages but work elsewhere within their own counties (so called, “leave in the morning and return home in the evening,” or, *zaochu wangui*, 早出晚归, workers).<sup>23</sup> Together, these two populations of rural workers amount to 381 million people. If it is assumed that 75% of these workers had stopped working (because their workplaces were closed due to the COVID-19 outbreak and related disease control measures), this indicates that 286 million workers were unemployed for that month. Rural migrant workers make an average of roughly 500 USD per month,<sup>24</sup> but they are only paid if they work. This means that lost wages of rural workers amount to as much as 143 billion USD per month. A loss of that magnitude in February alone would be higher than the highest estimate of the global economic impact of the SARS virus in 2003.<sup>25</sup>

*Access to Employment Following the Lifting of the Disease Control Measures.*

Even with the lifting of the restrictions on movement in March, a significant majority of villagers appeared unable or unwilling to find work (Table 4). When asked to estimate what share of workers were employed in cities in March 2019 versus March 2020, 59% of the village informants reported that at least half of the workers in the village were still unemployed after the lifting of the disease control measures. Only 12% of the respondents reported that more than three quarters of the workers in the village were back to work after the lifting of the barriers. This indicates that even after the quarantine was lifted, at least half—and potentially up to 60% to 70%—of the rural workers who had been working in the previous year were still not working.

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<sup>22</sup> National Bureau of Statistics of China (National Data). 2019

<sup>23</sup> Ministry of Human Resources and Social Security 2018

<sup>24</sup> National Bureau of Statistics of China 2020b

<sup>25</sup> Smith 2006

The March survey data yields some insight into why workers remained out of work. Government-mandated and voluntary workplace closures appeared to continue to prevent at least some village workers from seeking employment in 67% of the villages. A majority of villages (61%) also reported that some rural residents were unwilling to return to work for fear of being infected by the coronavirus. By late March, however, transportation and rental restrictions for outsiders did not appear to be one of the factors keeping people from work.

The findings of the February and March surveys differ from official statistics on the reopening of the China's economy in key respects. Data from the Ministry of Industry and Information Technology show that 29% of China's enterprises had resumed operation as of February 23.<sup>26</sup> While this is an aggregate number covering enterprises that employ primarily urban workers as well as rural workers, it roughly accords with our finding that 75% of the rural workers were confined to their villages in February. However, official data later showed that 71% of enterprises had opened by March 24,<sup>27</sup> sharply contrasting with the March survey results reporting widespread workplace closures and the absence of off-farm employment opportunities above 50 percent.

Disaggregated data on the rate of recovery may help explain the difference between official figures and the findings in our sample. A March survey by Peking University encompassing data from more than one million enterprises showed that job listings for lower salaried workers (below 4000 RMB per month) dropped by 44% compared to the same time last year.<sup>28</sup> The drop for higher salary (>15,000 RMB) postings was only 12%. This finding more closely accords with the results of our survey and suggests that the recovery may have been

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<sup>26</sup> Ministry of Industry and Information Technology 2020

<sup>27</sup> Ministry of Commerce 2020

<sup>28</sup> Peking University's Guanghua School of Management and Zhaopin 2020

slower for low-wage workers, the large majority of whom are rural and the least likely to have access to a safety net.

*Impacts of the Disease Control Measures on Income.*

The radical decline in employment during and after the quarantine was already impacting the livelihood of rural communities in our sample—especially by late March. Most of the village informants reported that disease control measures had reduced their income levels in both February (92%) and in March (85%). Over half of the villages surveyed (53%) reported that local workers had lost approximately two months-worth of income, or about 17% of their annual income. This fall in income was also exacerbated by a rise in the cost of living. The prices of common goods in 2020 were reported to be higher than in 2019 in both February (63%) and March (66%).

As a result, families—especially those with relatively limited savings—had to decide what commodities to cut down on to survive on their now-limited funds. Villagers in the survey villages reduced spending on food (55%), education (10%), and healthcare (9%). Ten percent of villagers borrowed money from relatives or friends to cope with the income loss. Of those villagers that did not have to give up essentials (like nutrition, schooling and healthcare), all expenditures were paid for out of savings. Our data show only 1-2% of village informants chose emergency plans, such as getting a loan from a bank or selling assets. Since this is just the beginning of the income decline, under the stagnated economy and global recession, rural workers might be reserving such emergency plans for the future.

Was there any assistance provided by the government to cushion the impact? The government in China, like most governments around the world, took several actions to minimize the impact of the disease outbreak on the economy. By early March, the government had rolled



out programs to provide subsidies for key enterprises, systematically allow for delayed debt repayment, and provide emergency loans to qualifying firms.<sup>29</sup> Local governments gave tax benefits to businesses and encouraged landlords to offer rent reductions.<sup>30</sup> To protect employment (especially in cities), firms were prohibited from laying off salaried employees.<sup>31</sup>

In contrast, there were almost no central government actions taken to directly address the plight of rural workers. Although the government announced relief measures and subsidies for households in poverty (not specifically in rural areas) to cope with COVID-19 in early March,<sup>32</sup> by the time of the second survey, village informants in only 17% villages reported COVID-19 relief policy had been carried out in their villages. Most of the relief were given in small quantities of grains and other foodstuff. This finding may not be surprising as research has shown that social spending in China has been long been disproportionately directed to urban rather than rural areas.<sup>33</sup>

As China entered the economy re-opening phase, government officials and economists, realizing the gravity of the situation in rural China, began to construct economic policy to support rural Chinese affected by disease control measures. However, these policies lacked in execution. For example, the central government planned to “ensure rural residents who return to their homes have a job and income” and encouraged local governments to transport migrant workers directly from rural villages to urban factories. However, only 2% of migrant workers (5 million out of 288 million) benefitted from this effort.<sup>34</sup> Academics have called for more direct transfers to be made,<sup>35</sup> but to date (late May 2020) there has been no policy response. Since in

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<sup>29</sup> The State Council of the People’s Republic of China 2020

<sup>30</sup> Shaanxi Provincial Government 2020

<sup>31</sup> Ministry of Human Resources and Social Security 2020

<sup>32</sup> The State Council of The People’s Republic of China 2020b

<sup>33</sup> Wong 1998; Gao et al. 2018; Croll 1999

<sup>34</sup> People.com 2020

<sup>35</sup> Paper.com 2020

the first two months of the disease outbreak, 10% to 25% of rural households are already suffering cutbacks in nutrition, schooling, and health, if the slow recovery in employment continues, the negative consequences to welfare will increase steadily.

### **COVID-19 and Rural Education**

*"I can't get back to work. Many parents are staying at home like me, because my kids need help with their online courses. Grandparents don't know how to get online for the courses. All I can do is to have my kids sit in front of my phone's tiny screen, I have no idea how much they are learning."*

*– Village informant from Ningxia.*

#### *Access to Education Under Disease Control Measures*

Respondents reported pervasive disruptions to regular schooling but also various efforts to mitigate these disruptions (Table 5). According to our first round of survey, in February all 726 village informants (100%) reported that school was not in session in their village, and no village informants knew when schools would reopen. However, 69% of the villagers reported that local teachers were in contact with the parents of students and provided daily homework assignments, mostly through WeChat, a social media application. In the case of the villages whose children were provided homework assignments, 83% of them also received grades and feedback from local teachers. Approximately 71% of villages had students attending classes online. In 40% of these villages, online courses were taught by local teachers. In the remaining 60%, students did not know the online instructor (i.e., the instructor was from the county or province). Furthermore, in 75% of the villages, students could see their teachers during their online classes. Teachers, however, could seldom see their students online (only in 19% of the villages). This indicates that lessons might have been conducted asynchronously, with students

watching their teachers through prerecorded videos and lectures and submitting their assignments at a later date without any videoconferencing follow-up.

### *Access to Education Following the Lifting of the Disease Control Measures*

In our second round of phone survey after the loosening of disease control measures, we found slightly improved results. The share of local teachers providing homework assignments (87%) increased. In the villages where children were provided homework assignments, a higher portion of them received grading on their homework (94%). In addition, more students (87%) attended online classes. The share of online classes taught by local teachers increased from 40% in February to 63% in March. However, none of the schools in our sample villages were in session and only 21% of the schools had set a date to reopen. The share of students that could see their teachers during their online classes (82%) and the share of teachers that could see their students (21%), both remained roughly the same in February and March.

With more than 270 million children and adolescents in China taking online classes due to school closure,<sup>36</sup> the quality of online classes is key for maintaining student learning. There are several reasons, however, to believe that the quality was not high. First, 92% of village informants reported that students primarily used smart phones to attend online classes. The small screens of smartphones were likely not ideal for student learning. Few of the rural students used tablets (9%) or computers (19%) for their online classes. Second, internet connectivity is spotty in parts of the countryside. 76% of students reported difficulties with their internet connection during online classes. 30% of students had to stay outdoors to maintain reception. Besides the issue of devices and the internet, only 50% of the village informants reported that students could

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<sup>36</sup> people.cn 2020

communicate with teachers during their online classes. This might explain why 84% of the village informants reported COVID-19 had a negative impact on student education.

In addition to the limitation on online classes and its perceived negative impact on human capital accumulation, three other concerns emerge. One major concern is that, although efforts have been made across China to mitigate disruptions to learning, prolonged school closure and home confinement during the COVID-19 outbreak may have had negative effects on children's physical and mental health.<sup>37</sup> Previous studies have shown that while educational technology (EdTech) can be an effective substitute for traditional instruction up to a certain extent, too much EdTech can be ineffective and even decrease the motivation of students for learning.<sup>38</sup> Having had little or no time to prepare for the lockdown, policymakers, school administrators and teachers across rural China were likely unable to balance traditional home-based learning activities (such as workbooks or home-based projects) with online learning activities.

Another major concern is the hidden opportunity costs of the time required for parents to support their children's online education. Parents in our sample reported spending about 60 minutes per day helping their children with their schoolwork. Concerned about their children's educational progress, parents may have partially foregone opportunities for work (on the farm, at home, and perhaps in local industries) that were still pressing or available. Indeed, there were many villagers—especially mothers—that told us during the interviews that they were unable to return to work because of the need to accompany their children and help on their schoolwork. Of course, this issue is related to both the negative effect on employment and associated gender inequities that the hukou system has inflicted on rural communities.<sup>39</sup>

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<sup>37</sup> Wang et al. 2020

<sup>38</sup> Bettinger et al. 2020; Ma et al. 2020

<sup>39</sup> Mao, Connelly, and Chen 2018

The third concern is that although the quality of distance education and its perceived impacts were low on average, there was also substantial variation across villages.<sup>40</sup> These differences in educational opportunity may lead to vastly unequal learning outcomes across rural China, an issue that has plagued China throughout the past 40 years and is becoming worse in recent years.<sup>41</sup>

### **COVID-19 and Rural Health Care**

*“Village doctors work with village authorities to check temperature and encourage hand washing in the village. There is a loudspeaker repeats quarantine rules every morning and in the afternoon. Every household can hear it. If a villager has a fever, he/she will be taken to designated hospital immediately.”*

*– Village informant from Gansu.*

#### *Access to Healthcare Under Disease Control Measures*

Most villages reported that healthcare remained accessible during and after quarantine. During the quarantine in February, 71% of the village clinics were open daily (Table 5). Almost all of village informants (95%) reported that they were able to leave the village to seek healthcare. Despite the potential for the pandemic and quarantine to affect supply chains, medicines were reported to be generally available in most of the sample villages in February (89%). Although healthcare was generally accessible, about 20% of the village informants reported people had delayed seeking routine healthcare due to COVID-19. This may have been due to people avoiding increased risk of contracting the virus or due to more difficulty traveling to seek care as a result of quarantine measures. Although telemedicine was promoted across the

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<sup>40</sup> Lancker and Parolin 2020

<sup>41</sup> Golley and Kong 2018; H. Zhang 2017

country as a way to provide easy access to medical consultations for people with potential symptoms of the virus and to alleviate strain on the health system,<sup>42</sup> very few (4%) villagers reported being aware of telemedicine services.

#### *Access to Healthcare Following the Lifting of the Disease Control Measures*

After the quarantine, the share of village clinics reported to be open daily increased to 91% in March (Table 5). A large share of village informants reported that they could seek healthcare freely (84%) and had good access to medicines (90%).

An important question is whether China's health system could have handled a major outbreak in remote rural areas and poor counties. While it seems that the virus was well-contained in rural areas during the initial outbreak, it is uncertain whether containment will be as successful in future outbreaks of COVID-19 and other diseases.

On the national level, there have recently been major efforts to expand access and improve the quality of the health system.<sup>43</sup> Beginning in the early 2000s, China launched an ambitious push for healthcare reform as a policy reaction from the 2003 SARS pandemic.<sup>44</sup> This began with the expansion of public health insurance schemes to improve access to care. In rural areas, this was through expansion of the New Cooperative Medical Scheme (NCMS);<sup>45</sup> by 2010 nearly all rural residents had coverage under the NCMS. This was effective in improving access and healthcare utilization (and spending on healthcare) increased as a result<sup>46</sup>. More recently, policy efforts have been focused on strengthening the quality of healthcare. Beginning with reforms launched in 2009,<sup>47</sup> and continuing under the so-called Healthy China 2030 Plan

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<sup>42</sup> Hollander and Carr 2020

<sup>43</sup> W. Yip et al. 2019; W. C.-M. Yip et al. 2012a

<sup>44</sup> "World Health Organization, People's Republic of China Health System Review" 2020

<sup>45</sup> W. Yip and Hsiao 2009; You and Kobayashi 2009

<sup>46</sup> Wagstaff 2007

<sup>47</sup> W. C.-M. Yip et al. 2012b

announced in 2016,<sup>48</sup> the government has put forth a wide-ranging set of policies and made significant investments in infrastructure in an attempt to strengthen the healthcare system. Between 2008 and 2018, government funding to primary care institutions increased by ten times, from 19 billion to 197 billion yuan.<sup>49</sup>

Despite these major reforms and investments, however, there remain major deficits in the quality of healthcare, particularly in rural areas—suggesting that if there had been a major outbreak in rural areas, the disease might have taken a much larger toll.<sup>50</sup> Recent research has shown, for instance, that village and township doctors in rural areas misdiagnose and mistreat patients at startlingly high rates.<sup>51</sup> A good litmus test for the pandemic preparedness of rural doctors may be their ability to diagnose and manage patients with symptoms of tuberculosis, another highly infectious respiratory disease that infects nearly 1 million people per year in China and at rates 3 times higher in rural compared to urban areas. One recent study that sent “mystery patients” (actors posing as patients and trained to present standard symptoms of tuberculosis) to village clinics and township health centers found that patients with “textbook” symptoms were only correctly referred for testing 41% of the time.<sup>52</sup> While diagnosis and treatment of COVID-19 would likely have been better given higher levels of awareness, the deficits of rural doctors in diagnostic ability hint at the inadequacy of the rural healthcare system in handling a large scale outbreak. As another outbreak of some type in the near/far future is a near certainty, efforts to improve China’s rural healthcare system, particularly in primary care, could be critical to thwarting catastrophic effects in the future.

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<sup>48</sup> Chen, Li, and Harmer 2019

<sup>49</sup> Li et al. 2017; X et al. 2020

<sup>50</sup> X et al. 2020

<sup>51</sup> Sylvia et al. 2015; Sylvia et al. 2017

<sup>52</sup> Sylvia et al. 2017

## Conclusion

The findings of both rounds of survey of 726 randomly-chosen villages across seven provinces suggest that strict disease control measures were successfully implemented in rural China and that compliance with disease control measures was high. In February, all villages in our sample implemented strict measures on movement. By March, the quarantine barriers at the individual level were almost uniformly less strict, although restrictions on large gatherings were still largely present.

These strict disease control measures likely helped contain the infection in rural China. According to our survey, the infection rate for the sample's 726 villages was 0.001%, about 13 infections for every one million people. This rate is almost exactly the same as the rate of infection reported across China with the Hubei province excluded. No surveyed villages reported deaths from the virus.

However, the cost associated with COVID-19 control measures in rural area was severe. For a full month during the quarantine the employment of rural workers was essentially zero. Even after the quarantine measures were lifted, near 70% of the villagers remained unable to work. During the quarantine in February, restrictions on local public transportation and access to rental spaces created barriers for employment in rural areas. In March, although the restrictions on transportation and renting were lifted, rural workers still decided not to leave the village to work due to fear of infection. The combination of loss of two months of income and increases in the prices of common goods resulted in rural households cutting down on education, nutrition, and health expenditures and borrowing money.



Of course, there have been actions taken to mitigate potential negative effects of control measures on education and health care. Local governments and school systems have made enormous efforts to minimize disruptions to learning by setup online classes. Most teachers are in touch with their students. However, there are several factors that might limit the quality of online learning, such as students primarily used smart phones to attend online classes, unstable internet connectivity, and lack of communication between teacher and students during online classes. Moreover, the health system remains functional in most rural areas, with most villagers still able to access healthcare during the outbreak.

In the context of rural communities in China, which are afflicted by deficits in social safety nets and healthcare access, aggressive measures to contain the spread of the virus may be warranted. Nevertheless, based on the findings of this research, it is not possible to conclude that nationwide quarantines (as opposed to targeted, local measures) are an advisable means of limiting the spread of the COVID-19, even for the relatively few countries able to enforce such measures.

As COVID-19 continues to spread across the globe, our findings have strong implications for other countries that have adopted similar lockdown policies. As governments implement COVID-19 control measures, they must also consider the needs of economically vulnerable communities. Rural communities and other economically vulnerable groups would be among the hardest-hit and face dramatic increases in economic hardship.

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