Stimulation and Early Child Development in China: Caregiving at Arm's Length

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ABSTRACT: ***Objective:*** **To provide an empirical overview of the parenting landscape in rural China, focusing on 18- to 30-month-old children and their caregivers in rural Shaanxi province.** ***Methods:*** **We collected unique data on 1442 caregiver-toddler dyads in rural areas of Shaanxi province and examined caregiver attitudes toward parenting, sources of information about parenting, and interactive parenting practices, and how each of these differed across generations. We measured how parenting attitudes and sources of information informed parenting practices. Finally, we measured levels of child development in our sample and the association between parenting practices and children's developmental outcomes.** ***Results:*** **Most of the caregivers did not engage with children in a way that encouraged early development. Caregivers rarely told stories, sang, or used toys to play with their children. Grandmothers were more stressed by the children in their care and engaged significantly less than mothers did in the 3 stimulating interactions. Professional sources of information about parenting were underutilized by all caregivers. We found high rates of developmental delay in our sample and showed that these delays were associated with the lack of caregiver engagement.** ***Conclusion:*** **Our findings suggest that the major economic and social shifts occurring in rural China have not led to a widespread prevalence of stimulative parenting practices. Although caregivers report positive attitudes toward child-rearing, reliable sources of scientific information are lacking. Our results show a troubling generational disconnect between the information-seeking behaviors and parenting practices of rural caregivers.**

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Parenting and caregiver-child interactions play an essential role in shaping a child's early development.[1] When caregivers engage interactively with their child in their first years, providing a high level of stimulation, the child's cognitive and motor functions develop more fully. In the absence of such stimulation, children are at risk of sustaining developmental delays, with consequences that can hinder their future education, productivity, and overall well-being.[2]

With the growth in early childhood development, scholarship has become an increasing focus on caregiver-child interaction in developing countries, where almost 43% of children younger than 5 years do not develop to their full potential.[3] Equally valuable has been the spread of randomized studies with a focus on the caregiver's role in early child development.[4] This body of work has presented concerning evidence that early parenting in low-resource settings often lacks stimulating interactions because caregivers wait until their children are older before they begin talking or engaging interactively with them.[5,6] Using data from UNICEF's Multiple Indicator Cluster Surveys (MICS) from 37 countries, Nonoyama-Tarumi and Ota[7] estimate that only one-third of caregivers (or fewer) in the developing world engage in stimulating parenting practices with their young children. Even stimulating activities that do not require literacy or a high education level, such as storytelling, are uncommon.

There is a reason to believe that despite its official standing as a middle-income country, rates of parent-child engagement in China remain low. Vast disparities exist between urban and rural areas in both local economy and access to resources.[8,9] Per capita disposable income in areas such as rural Shaanxi (where we conduct our study) is roughly one-sixth (1400 USD) of that in urban locales such as Beijing (8400 USD). Yet these vulnerable rural areas account for a vast share of the world's children: every year, approximately 10 million

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babies are born in rural China,[10] accounting for at least 6% of the world's annual births.[11,12]

We know of only 2 large-scale surveys of caregiver-child interaction in rural China, but both point to low levels of stimulating engagement. Wei et al.[13] found that a majority of rural caregivers do not engage in parenting behaviors that support learning. However, because their study uses a composite indicator to represent parenting behaviors, it is difficult to discern exactly how caregivers engage with their children and/or to compare the frequency of this engagement with caregivers in other regions. A more recent study documented low rates of rural caregivers reading to, singing to, or using toys to play with their children younger than 3 years.[14] Moreover, the same study finds a significant link between these specific parenting behaviors and children's cognitive development.[14]

Beyond these findings, however, little is known about the underlying factors that may be contributing to the problem of limited caregiver-child engagement in rural China. Owing to rapid economic growth over the last several decades and major government investment in rural infrastructure,[15] China has undergone a major social transformation in the course of a single generation. Whereas rural China's older generation (today's grandparents) grew up in traditional agrarian households with limited resources and were expected to help with farm work from a young age, the younger generation (today's mothers and fathers) grew up with ready access to free education and ample off-farm job opportunities.[15] Yet, few studies have considered how these social trends and rapid economic changes may be shaping the landscape of child development. Like other traditionally agrarian societies, in rural China, 3 generations often live under a single roof. As such, young mothers frequently live with their own mother or mother-in-law and rely on them for childcare support. However, because of generational differences caused by decades of rapid rural development, the older women may not be able to provide scientifically based information on stimulating parenting practices.[16] For example, the older generation may be more likely to embrace China's traditional mode of child-rearing, epitomized by the common credo: "get enough to eat, wear warm clothes" (*chi bao chuan nuan*). At the same time, ever-expanding access to the Internet and television may be challenging—or reinforcing—traditional parenting attitudes and practices.

Heavy government investment in the rural public health system may also be shaping parenting attitudes and behaviors. Rural China has a well-established system of increasingly well-trained health workers and resources, including doctors, women's representatives, and family planning bureaus.[17] Given that a typical township-level rural health worker in rural China has well over 12 years of education,[18] these professional sources may have more scientifically based information on parenting and child development than a typical rural caregiver; however, it is unclear whether they are used and whether using them is associated with more stimulating parenting practices.

In this study, we aim to study the links among these different aspects of the parenting landscape and how they work together to shape the status quo of parenting behavior and child development in rural China. More specifically, we want to better understand caregivers' attitudes toward child-rearing, which may be shaped by China's recent institutional, cultural, and economic changes; parenting behavior, which may vary across generations and be shaped by caregivers' parenting knowledge and attitudes; sources of parenting information, which may be shaped by institutional access and cultural norms; and finally, the link between parenting behavior and child development outcomes. It is our hypothesis that caregiver attitudes, parenting behavior, and sources of information about parenting may have each been uniquely affected by the tumultuous political, cultural, and economic changes that have transformed China over the last several decades, and that taken together, they form a unique, and hitherto unstudied, background for understanding early childhood development in rural China.

Using cross-sectional survey data from 1442 rural households, this study aims to provide an empirical overview of the modern parenting landscape in rural China, focusing on 18- to 30-month-old children and their caregivers in rural Shaanxi province. Four questions guide this study: First, how do rural Chinese caregivers perceive their parenting responsibilities? We seek to observe the attitudes that rural Chinese caregivers exhibit regarding child-rearing—i.e., indifference toward their children on 1 end of the spectrum or extreme care and concern on the other end. Moreover, how do these attitudes differ across generations? Second, do caregivers engage with their children through stimulating interactive practices, such as storytelling or engaging in learning activities? Building on the work of Luo et al.,[14] we consider generational differences in caregiver engagement as well. Third, we examine the sources of parenting information used by caregivers in rural Shaanxi to understand the nature of these sources (i.e., are they professional sources such as doctors or nonprofessional such as family, friends, books, the Internet?) and whether this choice is associated with the way caregivers engage with their children. Again, we consider intergenerational differences in sources of information. Finally, are the levels of caregiver-child engagement that we observe related to early child development outcomes? Again, we build on the work of Luo et al.[14] to consider a wider range of engagement indicators and both cognitive and motor development. Although our study is descriptive and exploratory in nature, it provides the first stepping stone toward understanding the parenting challenges faced by a society in transition.

METHODS

Sample Selection

We conducted our study in 11 nationally designated poverty counties in Shaanxi province. From each of these 11 counties, all townships (the middle level of administration between county and village) were selected to participate in the study, with 2 exceptions: we excluded townships with only small villages (less than 800 residents per village) and the township in each county that hosts the county seat (which are typically wealthier than the average rural township). We then randomly selected 1 village from each township to participate in the study and obtained a list of all registered births from the local family planning official in each village. If a village had fewer than 5 toddlers in our desired age range (18–30 months), we randomly selected an additional village from the same township until we had selected 5 children per township. If a village had more than 5 toddlers in our desired age range, we included all of them. In total, we included 1442 toddlers from 351 villages. Our enumerators visited the households of the selected children in October 2014 and obtained verbal consent from all caregivers in the visited households. The data reported in this study were collected as part of a baseline survey for a large interventional study, the results of which are reported elsewhere.[19]

Data Description

From each caregiver-toddler dyad, we collected caregivers' responses to a general survey on parenting and the results from a direct assessment of child development which we administered to the toddler. The general survey of parenting practices was administered one-on-one in the household using a paper survey form. Survey enumerators read each survey question and the answer choices aloud to the caregiver respondent, answered any questions the caregiver had about interpretation of the questions and choices, and filled in the appropriate response on the form. In this section, we describe the different types of variables we generated using these 2 sources.

Assessing Parenting Attitudes

To assess caregivers' attitudes about their parenting responsibilities, we asked caregivers how strongly they agreed or disagreed with a series of statements expressing different attitudes toward parenting; for example, "I enjoy spending time with my child" or "I find interacting with my child stressful." The answer choices followed a 7-point Likert scale, with 1 being "completely disagree," 4 being "unsure," and 7 being "completely agree." (Responses were simplified for the purpose of data analysis to "Agree," "Unsure," or "Disagree.") The questions were designed to be broad with the goal of eliciting the caregiver's general attitudes about parenting. Questions in this module of the survey were carefully selected and adapted from the Incredible Years Project (n.d.). The internal consistency of this module is 0.55.

Assessing Stimulative Practices

To assess caregivers' stimulative practices, we asked caregivers about their engagement in 3 focal practices: telling stories to the child, singing to the child, and playing with the child on the day before the survey. The questions had only 2 possible options: yes or no. These 3 practices were chosen based on their inclusion in the Multiple Indicator Cluster Survey (MICS) (discussed above) and the fact that the World Health Organization (WHO) has shown these 3 activities to be linked with child development.[20] Talking to one's child increases both cognitive and early language development.[21] Singing to infants has been shown to increase responsiveness,[22] capture attention,[23] and elicit positive cognitive behavior. Children whose caregivers engage with them in interactive play and pretend play are more likely to have better cognitive development, even when verbal interaction is controlled for.[24]

We selected 2 additional indicators that describe caregivers' stimulative practices: the average daily time that the child spends playing alone (referred to henceforth as *solitary play*) and the average daily time that the child spends watching TV or videos (referred to henceforth as *screen time*). The solitary play indicator points to the absence of interactive caregiver-toddler behavior exemplified by the 3 focal practices. The screen time indicator does a similar job because watching TV is associated with inhibiting caregiver-toddler interaction.[25] Experts increasingly acknowledge, however, that watching TV also embeds within it the varying effects of exposure to different content types and engaging in sedentary behavior.[26] As such, interpreting results involving this variable should consider such effects.

All survey questions about stimulative practices were carefully adapted from 2 primary sources: the parenting module of the MICS surveys and the National Survey of Early Childhood Health, developed by the U.S. Centers for Disease Control and Prevention.[27,28]

Measuring Child Development

All toddlers were administered the Bayley Scales of Infant Development (BSID), an internationally recognized method of assessing cognitive and motor development.[29] More specifically, we administered the BSID-I, which at the time of our survey was the only version of the test adapted to the Chinese language and environment[30] and had been used in child development studies throughout urban China.[31,32] The Chinese adaptation of the BSID-I was scaled using an urban sample of healthy Chinese children.

The BSID-I assesses the child's performance on a series of tasks and produces 2 standardized scores: the Mental Development Index (MDI), which addresses language and cognitive functions; and the Psychomotor Development Index (PDI), which evaluates psychomotor development.[29] Each of these indices takes into account the child's gestational and chronological ages.

Both indices are then scaled to have an expected mean of 100 and a SD of 16. Scores on each index can range between 50 and 150.[30] Mild impairment for each index is defined as $70 \leq \text{MDI} < 80$ and $70 \leq \text{PDI} < 80$, whereas moderate or severe impairment for each index is defined as MDI <70 and PDI <70.[30] Toddlers failing to achieve the minimum MDI or PDI score (50) were assigned a score of 49.

The test was administered one-on-one in the household using a set of standardized toys and a detailed scoring sheet. The primary caregiver was always present during test administration. He or she was responsible for holding or supporting the child during test administration, and, when needed, for soothing or reassuring the child and helping the enumerator to communicate test instructions to the child.

The Chinese version of the test has an inter-rater reliability of 0.99 for each of the 2 subindices.[30] The test-retest reliability is high, at 0.82 for MDI and 0.88 for PDI.[30] The parallel forms reliability is also high, at 0.85 for MDI and 0.87 for PDI, indicating that the test scores are consistent when there is a variation in the methods or instruments used in the test.[30] The internal consistency of the MDI is 0.93, and the internal consistency of the PDI is 0.90. This study represents 1 of the largest administrations of the BSID-I ever conducted in China, and to our knowledge, it is the only administration of the BSID-I ever conducted in rural communities in China's nationally designated poverty counties.

Examining the Sources of Information

The parenting survey administered to the caregivers included questions about where they obtained their parenting information. The caregivers could cite 1 or more sources, where the listed options included professional sources such as local doctors, the family planning bureau, or the women's representative (the women's representative is a village-based, government-appointed woman who helps to handle "women's affairs." The exact nature of the role varies widely from county to county, and even from village to village. It may be a full-time position, part-time position, or simply an unfilled position. Some women's representatives are actively involved in everything, from helping women to get to the hospital to give birth to explaining contraception options, whereas others simply keep basic records on the number of women in the village and their ages), as well as nonprofessional sources such as family, friends, TV, books, the Internet, and their own experiences.

Demographic Information

We collected basic demographic information from caregivers including their age, their relationship to the child, educational attainment of the mother and grandmother, the number of children, the gender and age of the target child, and whether the household received the Minimum Living Standard Guarantee Payments, a form of government welfare for the lowest-income families nationwide that we used in our analysis as an indicator for poverty.

Statistical Analysis

All statistical analyses were performed using STATA 14.1. p values below 0.05 were considered statistically significant. STATA's multiple linear regression model was used to conduct the multivariate analysis. We included the following variables as potential confounders in the multivariate analysis: child's age, child's gender, whether the child was born prematurely, whether the toddler is the only child, child's health status (stunting and underweight), whether the toddler's mother was identified as the primary caregiver, maternal educational level and age, and whether the family received government welfare.

To account for the nested nature of the data used in this study, we clustered all SEs at the village level. (This was performed because although our analyses look at individual-level differences, our treatment assignment was randomized at the village level.) Clustering was conducted by using the vce (cluster village) command in Stata to correct SEs at the village level.

RESULTS

Sample Participants

Table 1 presents the basic socioeconomic and demographic characteristics of the study participants. In our sample, 41.4% of the children were aged 18 to 23 months and 58.6% were aged 24 to 30 months. The average age of toddlers in our sample was 24.4 months, with an SD of 3.4 (data not shown). More than half (61.3%) were only children. Among those who were not, most (96.6%) had 1 sibling. The mother was identified as the primary caregiver for 62.4% of the toddlers; for most of the other children (87.8%), the grandmother was identified as such. Most of the mothers (70.8%) had completed middle school or higher. Nearly 60% of fathers had out-migrated for work and were not living at home. For mothers, this number was 32.6%. Approximately one-quarter (23.9%) of the sample households received government welfare.

Caregiver Attitudes

Table 2 presents caregiver attitudes toward parenting. A large share of caregivers (88.6%) reported that they enjoyed spending time with their child. Almost all caregivers (91.1%) reported that they generally got along well with their child and found playing with their child to be fun and interesting (83.7%). Tellingly, nearly all (94.9%) of caregivers believe that it is their responsibility to help children learn about the world around them.

Conversely, only small fractions of caregivers revealed negative attitudes regarding parenting. For example, 10.3% of caregivers reported being irritated by their child over the past month, whereas 21.5% felt that spending time with their child had been stressful.

Although mothers and grandmothers show comparable levels of positive attitudes about the children in their care, grandmothers are significantly more stressed when

Table 1. Descriptive Statistics of Sample Toddlers and Caregivers

Characteristic	Percent	Observations
Gender of child		
Male	51.7	746
Female	48.3	696
Age of child		
18–23 mo	41.4	597
24–30 mo	58.6	845
Premature childbirth		
Yes	5.2	75
No	94.8	1367
Siblings		
None (only child)	61.3	884
1	37.4	539
2 or more	1.3	19
Primary caregiver		
Mother	62.4	900
Grandmother	33.0	476
Others	4.6	66
Mother is a migrant worker		
Yes	32.6	470
No	67.4	972
Father is a migrant worker		
Yes	59.6	859
No	40.4	583
Maternal education level		
Primary school or lower	29.2	421
Middle school	55.4	799
High school or higher	15.4	222
Grandmothers' education level		
Primary school or lower	75.4	1087
Middle school	19.5	281
High school or higher	5.1	74
Maternal age		
≤25 yrs	48.5	700
>25 yrs	51.5	742
Family receives government welfare		
No	76.1	1098
Yes	23.9	344

spending time with their grandchildren: 31.2% of grandmothers reported being stressed by the children in their care, compared with only 16.4% of mothers ($p = 0.00$).

Sources of Information on Parenting

Fewer than 12% of caregivers in our sample received information about parenting practices from professional resources (Table 3). Instead, family members (43.4%) were the most commonly cited sources of parenting information, followed by books or the Internet (34.6%) and TV (33.1%). Approximately one-quarter of sample caregivers (25.2%) also cited their own experiences, learning how to parent through trial and error.

Stimulative Practices

Despite the high level of caregiver education, the finding that sample caregivers are cognizant of their parenting roles as educators, and the fact that caregivers largely relish this role, we find that engagement in stimulative practices is infrequent (Table 4). Only 12.6% of caregivers reported having told stories to their child; 37.5% sang to their child, 39.2% used toys to play with their child, and 7.1% did all 3 activities on the day before the survey. On average, the sample toddlers spent approximately 2 and a half hours (155 minutes) each day playing alone and more than 1 hour (67.6 minutes) per day watching TV.

Again, we see significant differences between mothers and grandmothers. Mothers sing to their child and use toys to play with their child at significantly higher rates than do grandmothers ($p = 0.001$, $p = 0.000$). Mothers are also twice as likely to engage in all 3 stimulating activities as grandmothers ($p = 0.009$). We see no significant differences between mothers and grandmothers in children's solitary play or screen time.

Associations With Parenting

Having established that most of the sample caregivers do not frequently interact with their children, we now consider the role of caregiver attitudes and sources of information on parenting in shaping caregiver engagement in stimulative practices.

Table 5 shows that caregivers who found playing with their child to be "fun and interesting" were more likely to engage in our 3 focal behaviors, whereas caregivers who reported being irritated with their child in the past month were less likely to engage in stimulative behaviors.

Table 6 shows that caregivers who cited professional sources were 5 percentage points more likely to engage in all 3 activities, which translates to a 76% increase when compared with average levels of engagement among caregivers who did not use professional sources. Examining engagement by practice, we find that caregivers who did use professional sources were 7 percentage points (60%) more likely to tell stories to their child, 11 percentage points (30%) more likely to sing to their child, and 12 percentage points (32%) more likely to play with their child using toys than their counterparts who relied on nonprofessional sources.

Child Development

Next, we examine development outcomes among the sample toddlers. The mean Mental Development Index (MDI) score for the sample was 83.7—a full SD below the mean of a distribution of healthy children in China—and the mean Psychomotor Development Index (PDI)

Table 2. Caregiver Attitudes Toward Parenting

	All Caregivers			Mother Caregivers			Grandmother Caregivers			*t* test
	Agreement with Statement			Agreement with Statement			Agreement with Statement			*p*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(6) & (9)
Statement	**Disagree**	**Unsure**	**Agree**	**Disagree**	**Unsure**	**Agree**	**Disagree**	**Unsure**	**Agree**	
Positive attitudes										
I really enjoy being with my child.	5.5	5.9	88.6	4.8	6.1	89.1	6.3	5.9	87.8	0.41
Last month, my child and I have gotten along very well.	4.0	4.9	91.1	3.9	5.5	90.6	4.2	4.0	91.8	0.52
Playing with my child is fun and interesting.	8.6	7.7	83.7	8.5	7.2	84.3	8.2	8.4	83.4	0.59
Helping children to learn about the world around them is the responsibility of their parents or caregivers.	2.9	2.2	94.9	3.0	2.2	94.8	2.3	2.3	95.4	0.69
Negative attitudes										
Last month, I got irritated with my child.	76.5	13.2	10.3	78.2	12.5	9.3	73.0	15.2	11.8	0.16
Last month, the time I have spent with my child has been very stressful.	68.9	9.6	21.5	73.8	9.8	16.4	59.1	9.7	31.2	0.00

score was 105.2 (Table 7). In total, 42.0% of the sample toddlers had delayed cognitive development. Overall, 14.6% of the sample exhibited mild cognitive delays, and over one-quarter (27.4%) of the sample exhibited moderate or severe cognitive delays. Psychomotor delays were relatively lower, affecting only 10% of our sample, with 6.0% exhibiting mild delays and 4.2% exhibiting moderate or severe delays.

Finally, we assess whether the lack of stimulative practices is associated with child development. Table 8 shows that caregiver engagement in our 3 focal behaviors was consistently and positively associated with children's cognitive and motor development. In particular, children scored higher on the MDI by 7.62 points (0.48 SD) on average when their caregivers told stories to them, 8.16 points (0.51 SD) when their caregivers sang to them, and 5.45 points (0.34 SD) when their caregivers played with them. Similarly, PDI scores were higher by 3.15, 4.38, and 2.94 points (0.20, 0.27, and 0.18 SD) when their caregivers engaged with them in telling stories, singing, and play activities, respectively. We find no significant correlation between solitary play and cognitive development. Daily screen time is positively associated with the PDI score, with a low effect size of 1.21 points (0.08 SD).

DISCUSSION

To explore the parenting landscape in rural China, we collected unique data on 1442 caregiver-toddler dyads in rural areas of Shaanxi province and examined caregiver attitudes toward parenting, sources of information about parenting, and interactive parenting practices, and how each of these differed across generations. We also measured how parenting attitudes and sources of information informed parenting practices. Finally, we measured the levels of child development in our sample and the association between parenting practices and children's developmental outcomes.

As expected, given the economic and social trends in China, the sample exhibited favorable conditions for parenting. Most of the caregivers were only responsible for 1 child, precluding a potential quantity-quality tradeoff in child-rearing. Mothers were fairly well educated, with nearly 3 in 4 having a middle school education or higher. Moreover, caregivers reported feeling largely positive about their children: we found no evidence of indifference toward their children in our analysis of parenting attitudes. Caregivers overwhelmingly believe that it is their role to ensure that their children grow up well and learn about the world around them.

Table 3. Sources of Information About Parenting Practices

	Total		Mother		Grandmother		*t* test
	(1)	(2)	(3)	(4)	(5)	(6)	(4) and (6)
Information Source	**Percent**	**Number**	**Percent**	**Number**	**Percent**	**Number**	***p***
Family members	43.4	626	48.1	433	34.7	165	0.00
Books or Internet	34.6	498	44.0	396	15.5	74	0.00
TV	33.1	476	39.1	352	22.7	108	0.00
Own experiences	25.2	364	17.1	154	40.1	191	0.00
Local doctor, local bureaus of family planning, or women's representative	11.7	168	18.8	169	7.8	37	0.00
Friends	9.2	133	38.3	345	18.5	88	0.00

Table 4. Parenting Indicators

	All Caregivers		Mother		Grandmother		*t* test (Mother & Grandmother)
	Mean or %	Number	Mean or %	Number	Mean or %	Number	*p*
Focal indicators							
Caregiver told stories to the child (%)	12.6	182	13.6	122	11.6	55	0.288
Caregiver sang to the child (%)	37.5	541	41.1	370	31.9	152	0.001
Caregiver used toys to play with the child (%)	39.2	565	42.1	379	32.4	154	0.000
Caregivers did all 3 activities (%)	7.1	103	8.7	78	4.8	23	0.009
Additional indicators							
Daily time that the child plays alone (min)	155	—	147.6	900	161.8	476	0.096
Daily screen time (min)	67.6	—	64.4	900	72.4	476	0.053

Despite these favorable conditions, most of the caregivers in our sample did not engage with children in a way that encouraged early development. Caregivers rarely told stories, sang, or used toys to play with their children. The children in our sample were left to play alone for over 2 and a half hours per day and spent over 1 hour each day in front of a screen. This is substantially higher than the recommendation by the American Academy of Pediatrics that children younger than 2 years should not be exposed to any television program.[26]

These overall figures mask important significant differences between mothers and grandmothers. Although mothers and grandmothers are similarly positive about the children in their care, grandmothers are much more stressed when spending time with them and engage significantly less than mothers do in the 3 stimulating interactions.

Because information on parenting and child development influences caregivers' parenting styles and may differ across platforms, we sought to examine the different sources of information available to caregivers in rural China. Our results show that the most used source is a nonprofessional one: family members. However, although family members may share valuable parenting information, they may also spread misinformation from 1 generation to the next. The Internet, TV, and books were the next most cited sources. It is unclear from our analysis whether these sources are promoting accurate parenting information; from a policy perspective, however, they provide effective platforms for reaching caregivers.

Our investigation of information sources underlined a low reliance on public health institutions. Only 1 in 10 caregivers cited professionals such as doctors or family planning officials as sources of parenting information. This low rate is likely caused by a combination of information-seeking behaviors that do not value such sources (i.e., demand problems) and by the inaccessibility of the sources themselves (i.e., supply problems). Although accurate statistics are unavailable, some evidence suggests that pediatric specialists have declined in China in response to the one-child policy, and other evidence suggests that childcare health workers are underrepresented in rural areas.[17]

Notwithstanding their low utilization rates, professional sources of parenting information were positively associated with caregiver engagement in stimulative practices, suggesting that these sources may

Table 5. Link Between Caregiver Attitudes and Caregiver-Child Interaction Practices

	(1)	(2)	(3)	(4)	(5)	(6)
	Told Stories to the Child	Sang to the Child	Used Toys to Play with the Child	Used All 3 Practices	Daily Time in Solitary Play, in Hours	Daily Screen Time, in Hours
I really enjoy being with my child.	−0.02 (0.03)	−0.08 (0.05)	−0.02 (0.04)	−0.02 (0.02)	−0.05 (0.23)	0.04 (0.10)
Last month, my child and I have gotten along very well.	−0.04 (0.03)	0.04 (0.05)	−0.06 (0.05)	−0.001 (0.02)	0.30 (0.23)	−0.02 (0.13)
Playing with my child is fun and interesting.	0.06* (0.02)	0.12** (0.04)	0.12** (0.04)	0.05** (0.02)	−0.24 (0.18)	−0.02 (0.08)
Helping children to learn about the world around them is the responsibility of their parents or caregivers.	0.01 (0.04)	−0.04 (0.06)	0.08 (0.06)	−0.01 (0.03)	−0.07 (0.31)	0.26* (0.11)
Last month, I got irritated with my child.	−0.05* (0.02)	−0.13** (0.04)	−0.11** (0.04)	−0.03 (0.02)	0.31 (0.26)	0.01 (0.10)
Last month, the time I have spent with my child has been very stressful.	−0.03 (0.02)	−0.03 (0.03)	−0.03 (0.03)	−0.04* (0.01)	0.32 (0.17)	−0.14 (0.07)
Observations	1442	1442	1442	1442	1442	1442

Regression estimates from multiple linear models adjusted for gender, age, whether the toddler was born prematurely, whether the toddler is the only child, child's health status (stunting and underweight), whether the toddler's mother was identified as the primary caregiver, maternal educational level and age, and whether the family received government welfare. SEs are clustered at the village level. Professional sources include doctors, family planning bureaus, and/or women's representatives at the village $^{**}p < 0.01$, $^{*}p < 0.05$.

Table 6. Link Between Source of Information and Caregiver-Child Interactions Practices

	(1)	(2)	(3)	(4)	(5)	(6)
	Told Stories to the Child	Sang to the Child	Used Toys to Play with the Child	Used All 3 Practices	Daily Time in Solitary Play, in hours	Daily Screen Time, in hours
Caregiver used professional sources	0.07* (0.03)	0.11** (0.04)	0.12** (0.04)	0.05* (0.03)	−0.04 (0.10)	0.09 (0.23)
Observations	1442	1442	1442	1442	1442	1442

Regression estimates from multiple linear models adjusted for gender, age, whether the toddler was born prematurely, whether the toddler is the only child, child's health status (stunting and underweight), whether the toddler's mother was identified as the primary caregiver, maternal educational level and age, and whether the family received government welfare. SEs are clustered at the village level. Professional sources include doctors, family planning bureaus, and/or women's representatives at the village $^{**}p < 0.01$, $^{*}p < 0.05$.

in fact be effective at providing information on parenting practices. This association stands even when controlling for poverty and education status, indicating that the relationship is not driven by socioeconomics. In other words, although governmental health institutions are severely underused, they have the potential to give caregivers access to valuable parenting information.

We found high rates of developmental delay in our sample and showed that these delays were associated with the lack of caregiver engagement in stimulative practices. In particular, holding toddler and caregiver characteristics constant, each of our 3 interactive practices (telling stories to, playing with, and singing to the child) was associated with an increase in the Mental Development Index of 5.45 to 7.62 points (equivalent to 0.34–0.47 SD) and a more modest increase in the Psychomotor Development Index of approximately 2.94 to 3.15 (equivalent to 0.18–0.27 SD). The stronger link with cognitive development may be because of the nature of the specific practices measured in this study. Although using toys to play with a child may be expected to improve motor development (depending on the toy and the chosen mode of play), the link with motor development may be less direct for telling stories to or singing to a child. Our multivariate analysis shows no evidence that the duration of solitary play is associated with developmental outcomes. On the one hand, the time that the toddler spends alone is the time in which they do not engage in any stimulating interaction. On the other hand, some studies have documented a beneficial aspect to unstructured playtime. Among other things, solitary play can be educational and may lead to improvements in processing social information as well as increasing imagination and divergent thinking.[33] It is therefore possible that these 2 competing effects make it challenging to detect a clear net association. We also find a small but surprisingly positive association between TV exposure and psychomotor development. This may be mediated by a socioeconomic status effect not captured by our wealth proxy (government welfare); wealthier families may spend more time watching TV and may also have better developed toddlers through other means (for example, better diet). Overall, however, the results from the multivariate analysis suggest that stimulating parenting is closely linked with better developmental outcomes.

Table 7. Mental and Psychomotor Development of Sample Toddlers

	Percent	Observations	95% CI
Cognitive delay (MDI <80)	42.0	606	0.39–0.45
Moderate or severe (MDI <70)	27.4	395	0.25–0.30
Mild (70 ≤ MDI <80)	14.6	211	0.13–0.16
Psychomotor delay (PDI <80)	10.2	147	0.09–0.12
Moderate or severe (PDI <70)	4.2	60	0.03–0.05
Mild (70 ≤ PDI <80)	6.0	87	0.05–0.07

CI represents the 95% confidence interval for the fraction of sample children. MDI, Mental Development Index; PDI, Psychomotor Development Index.

Our study contributes to the growing literature studying parenting in different cultures and under different socioeconomic circumstances. Our findings suggest that the major economic and social shifts occurring in rural China have not led to a widespread prevalence of stimulative parenting practices. Although caregivers report positive attitudes toward child-rearing, reliable sources of scientific information are lacking. Moreover, our results show a troubling generational disconnect between the information-seeking behaviors and parenting practices of rural caregivers, with rural mothers more likely than grandmothers to seek information from books, the Internet, or professional sources, and subsequently more likely to engage in stimulative parenting practices with their children. Given that one-third of children in our sample are primarily cared for by their grandmothers, this may be 1 reason for the high rates of delayed child development in these areas.

We acknowledge a few limitations to this study. First, the cross-sectional nature of our dataset does not allow us to discern whether the associations we observe are causal. Parent-child interaction in particular is a bidirectional phenomenon. For example, children functioning at a lower level may not make the social initiatives that help to engage caregivers in stimulating parenting behaviors. That said, this concern is alleviated to some degree by biological studies showing the neurological response to interactive caregiver-toddler practices and longitudinal and randomized studies that document how improved parenting leads to better developmental outcomes.[1,21] For the 2 additional indicators (screen time and solitary play time) and for the link between parenting practices and sources of parenting

Table 8. Association Between Parenting Behavior and Child Development

	MDI Score					PDI Score				
	β	95% CI	*p*	R-squared	F value	β	95% CI	*p*	R-squared	F value
Told stories to the child	7.62	4.55 to 10.70	0.00	0.08	11.06	3.15	−0.03 to 6.34	0.05	0.07	11.53
Sang to the child	8.16	6.04 to 10.28	0.00	0.10	15.2	4.38	2.16 to 6.60	0.00	0.08	13.70
Used toys to play with the child	5.45	3.16 to 7.74	0.00	0.08	10.90	2.94	1.00 to 5.05	0.004	0.07	11.95
Daily time in solitary play, in hours	−0.33	−0.78 to 0.11	0.13	0.06	9.45	0.01	−0.40 to 0.43	0.99	0.06	11.35
Daily screen time, in hours	0.75	−0.20 to 1.71	0.12	0.06	9.45	1.21	0.34 to 2.08	0.007	0.07	12.17

Regression estimates from multiple linear models adjusted for gender, age, whether the toddler was born prematurely, whether the toddler is the only child, child's health status (stunting and underweight), whether the toddler's mother was identified as the primary caregiver, maternal educational level and age, and whether the family receives government welfare. Clustering is at the village level. CI, confidence interval; MDI, Mental Development Index; PDI, Psychomotor Development Index.

information, caution is warranted when interpreting these associations.

Second, the indicators that we use to measure parent-child interaction are limited in that they are self-reported rather than observational, and they do not capture verbal engagement with the child beyond storytelling or singing. For example, we do not have information on counting or naming objects.

A third limitation is that although many studies in Western countries have used the restandardized Bayley Scales of Infant Development (BSID)-II and BSID-III, the first BSID was the only version adapted for use in China at the time of our study.[30] Finally, because our study was conducted in 1 poor region of Western China, our results may not be generalizable to other settings.

Given our findings, there are 2 broad directions for future research. Given that preschool cognitive skills have been shown to be good predictors of higher educational attainment and adult labor productivity,[2] our findings have serious implications for the future of China's labor force. Further research is needed to design and upscale programs that can prevent these delays from affecting future cohorts of children. Because our study finds that the lack of stimulating parenting is associated with these delays, such programs would ideally include a teaching component through which caregivers learn rich and engaging parenting strategies and techniques. In previous evaluation studies conducted elsewhere, this has taken the form of house visits by health care aides or mother training courses. The results of these programs are encouraging[34,35]; however, such programming has yet to be evaluated in rural China.

Second, further research is needed to better understand the exact nature of stimulating parenting practices in rural households. The 5 indicators that we use in this study are a good start but do not present a clear picture of the degree to which caregivers engage with their children. Qualitative or observational studies of caregiver-child interactions would contribute greatly to the literature in this regard.

Finally, future research should investigate in more detail how caregivers choose their primary sources of information on parenting. Some of the questions that remain unanswered include why professional sources of information are underused, to what extent these sources promote a healthy parenting culture, and whether and how Internet and technology can be used as platforms that can empower caregivers with easily accessible knowledge. Answers to these questions would help policymakers spread a more rewarding and up-to-date culture of parenting among rural China's caregivers.

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