RAIS Journal for Social Sciences | VOL. 9, No. 2, 2025
ISSN 2574-0245 (Print) | ISSN 2574-1179 (Online) | DOI: 10.5281/zenodo.17468896

Child Labor and Illegal Chemical Pesticide Use in Jalal-Abad, Kyrgyzstan: A List Experiment via Phone Survey

Yoshinari KAJISHITA[1*], Renat TOKBAEV[2], Nurzat SULTANKERIMOVA[3], Ghulam Dastgir KHAN[4]

[1]Graduate School of Innovation and Practice for Smart Society, Hiroshima University, Japan
[2]Independent Researcher, Bishkek, Kyrgyzstan
[3]Independent Researcher, Bishkek, Kyrgyzstan
[4]The IDEC Institute, Hiroshima University, Higashi-Hiroshima, Japan
**Corresponding author: Yoshinari Kajishita, yoshinari.kajishita@gmail.com*

Abstract: In rural Kyrgyzstan, it is common for children to help their parents on family farms, a practice often viewed as a way to learn essential life skills. However, concerns are growing over the health risks associated with exposure to chemical pesticides especially illegal ones. Previous studies have mostly used surveys that directly asked respondents about sensitive issues such as child labor and illegal chemical pesticide use, which likely resulted in underreporting because respondents may have been uncomfortable or afraid to answer honestly. To address this, we conducted a phone-based list experiment with farming households in Jalal-Abad, Kyrgyzstan, to obtain more accurate estimates. Results showed that the prevalence of illegal chemical pesticide use was 41.1% according to the list experiment, but only 13.9% by direct questioning—a statistically significant difference of 27.2 percentage points ($p = 0.017$), indicating substantial underreporting in direct responses. For child labor, the list experiment estimated 29.6%, while direct questioning yielded 46.5%; however, this difference was not statistically significant ($p = 0.10$). This likely reflects the fact that child labor is traditionally not regarded as a sensitive issue in this context and is seen as a normal part of rural family life. The high rate of illegal chemical pesticide use, on the other hand, may be related to recent government policy shifts—such as a reduced emphasis on eco-friendly agriculture, and land redistribution programs—which may have decreased farmers' incentives to comply with environmental regulations. These findings highlight the need for both improved measurement methods and more effective policies to protect children from the risks of illegal chemical pesticide use in rural agricultural communities.

Keywords: Child Labor, Illegal Chemical Pesticides, List Experiment, Kyrgyzstan, Agriculture

1. Introduction

This study investigates the prevalence of child labor and illegal chemical pesticide use among farming households in Jalal Abad, Kyrgyz Republic, using a phone-based list experiment designed to elicit truthful responses to sensitive questions. Our findings indicate that both child labor and the use of unregistered or banned chemical pesticides remain prevalent, despite existing policies aimed at their reduction. These results underscore the gap between formal regulations and actual practices, emphasizing the urgent need for targeted interventions and improved monitoring mechanisms in the agricultural sector.

Agriculture plays a central role in the Kyrgyz economy, providing employment to a large share of the rural population. In recent years, the government has promoted eco-friendly pesticide use and organic farming practices to enhance sustainability and reduce environmental harm (FAO, 2020). Despite these efforts, illegal pesticide use persists, often driven by lower costs and perceived higher efficacy of chemical inputs among smallholders. Simultaneously, child labor remains a pressing issue, with children frequently involved in tasks such as weeding, harvesting, and pesticide application. International and national assessments of child labor in Kyrgyz agriculture, such as those conducted by UNICEF (2023), USDOL (2024), and UNEP (2015), rely primarily on conventional household surveys that use direct questioning. In contrast, this study employs a list experiment—an indirect questioning technique designed to reduce social desirability bias and encourage more accurate reporting of sensitive behaviors. The health risks associated with pesticide exposure in children are substantial. In utero and early life exposure to organophosphate and organochlorine pesticides, such as DDT and its metabolite DDE, has been linked to neurobehavioral impairments, abnormal neonatal reflexes, and increased risks of developmental disorders (Garry, 2004; Liu & Schelar, 2012; Muñoz-Quezada et al., 2013; Rosas & Eskenazi, 2008; Vrijheid et al., 2016). Field observations and recent UNEP reports (2015) indicate that Jalal Abad and surrounding regions remain hotspots for environmental pesticide risks and hazardous child labor, underscoring the need for improved surveillance and enforcement.

Collecting accurate data on sensitive behaviors like illegal chemical pesticide use and child labor is challenging, as respondents often underreport due to social desirability bias and fear of sanctions. To address this challenge, this study adopts a list experiment, an indirect questioning technique that allows respondents to answer without revealing their sensitive behavior directly, thereby reducing response bias (Blair & Imai, 2012; Glynn, 2013; Imai, Park, & Greene, 2015). List experiments have been successfully applied in various contexts to measure socially sensitive or stigmatized attitudes, such as racial prejudice in the American South (Kuklinski, Cobb, & Gilens, 1997), opposition to affirmative action among white liberals (Gilens, Sniderman, & Kuklinski, 1998), restrictionist immigration attitudes under social desirability pressures (Janus, 2010), and the prevalence of sexual violence during war (Traunmüller, Kijewski, & Freitag, 2019). By employing this approach in rural Kyrgyzstan, we provide robust empirical evidence on the persistence of illegal pesticide use and child labor, offering actionable insights for policy and child protection initiatives. The rest of the paper is organized as follows: section 2 describes the experimental design and data, section 3 provides the results, and section 4 concludes the paper with a discussion.

2. Data and Experimental Design

2.1. Experiment design

In collaboration with the Jalal-Abad regional office of the Ministry of Water Resources, Agriculture and Processing Industry of the Kyrgyz Republic, we conducted a phone survey in June 2025 with 716 farming households. During a single call, each household participated in two separate list experiments: first on illegal chemical pesticide use, followed immediately by one on child labor. In both list experiments, respondents were asked the following introductory question: "Now I'm going to read you four things that farmers sometimes do during the season. After I read all five, just tell me how many of them apply to you. I don't want to know which ones, just how many."

In the list experiment on illegal chemical pesticide use, interviewers read the following list to the respondents:

1. I used compost or organic fertilizer this season.
2. I attended a farmer training or workshop in the last 3 months.
3. I can speak French fluently.
4. I have a valid passport.

For the treatment group, interviewers added the sensitive item:

5. I used illegal chemical pesticides such as one without certificate in the recent past.

In the list experiment on child labor, interviewers read the following list to the respondents:

1. I used agricultural machinery this season.
2. I attended a farmer training or workshop in the last 3 months.
3. I can speak Japanese fluently.
4. I have a valid passport.

For the treatment group, interviewers added the sensitive item:

5. Children under the age of 16 worked with farming on my household's land this season.

In the illegal chemical pesticide use list experiment, 372 farming households were randomly assigned to the control group and 343 households to the treatment group (see Figure1).

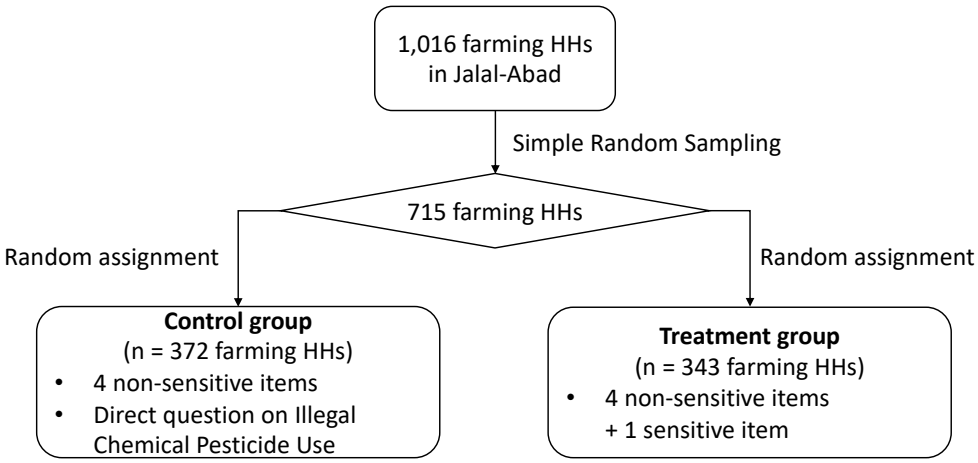

Figure 1. Sampling and Random Assignment for Illegal Chemical Pesticide Use List Experiment

For the child labor list experiment, a separate and independent randomization was conducted, with 380 to the control group and 335 households assigned to the treatment group (see Figure 2).

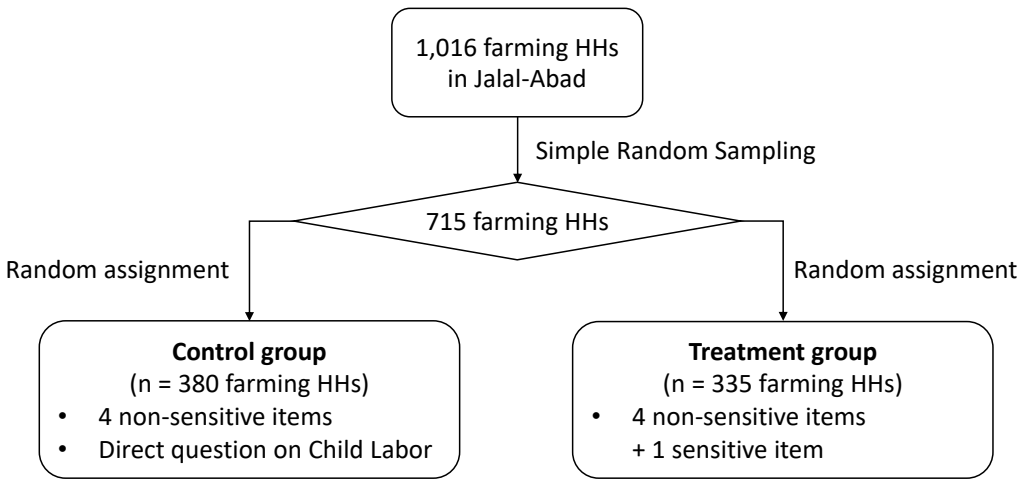

Figure 2. Sampling and Random Assignment for Child Labor List Experiment

Thus, assignment to groups in the illegal chemical pesticide use and child labor list experiments was fully independent. Further details on the survey and experimental design are available in Kajishita and Tokbaev (2025).

Three interviewers (two male, one female) were involved in data collection. Both the assignment of interviewers and the order in which households were called were randomized to minimize potential bias, including any effects associated with interviewer characteristics or the timing of calls. The call order randomization was specifically designed to eliminate bias that could arise from differences in respondents' availability or willingness to participate at various times of day.

2.2. Data and Description

All phone interviews were completed between June 16 and June 29, 2025, the same two-week window in which the hidden "intervention" occurred—that is, adding the sensitive item to the treatment list for each list experiment (illegal chemical pesticide use and child labor). Interviewers followed the pre-randomized call order and placed any necessary re-calls before June 29; no data were gathered outside these dates.

The illegal chemical pesticide list experiment produced valid data from 372 control-list households and 343 treatment-list households (see Table 1). Responses again clustered around two or three items, and the non-response rate exceeded 80 %. When the identical sensitive question was asked directly of control-group respondents, only 14 % (10 of 72) admitted to using an unregistered or banned pesticide, underscoring the large under-reporting difference later quantified in our regression analysis.

Table 1. Summary of responses to list experiment and direct questioning about illegal chemical pesticide use

List experiment - illegal chemical pesticide							Direct question – illegal chemical pesticide			
	Control group			Treatment group						
Response value	Frequency	Proportion		Frequency	Proportion		Response value	Frequency	Proportion	
0	0	0	%	0	0	%	No	62	16.7	%
1	9	2.4		1	0.3		Yes	10	2.7	
2	29	7.8		14	4.1					
3	34	9.2		46	13.4					
4	0	0		1	0.3					
5				0	0					
Non-response	300	80.6	%	281	81.9	%	Non-response	300	81.3	%
Total	372	100		343	100		Total	372	100	

In the child labor list experiment, we obtained usable counts from 380 control-list households and 335 treatment-list households (see Table 2). Most respondents reported two or three items as true. Non-response—failure to provide any count—was high at roughly 81 % in both arms, reflecting the field-work problems noted earlier. Among the smaller subset of control-group respondents who were subsequently asked the sensitive question directly, 46 % (33 of 71) acknowledged that at least one child under 18 had recently worked on the farm.

Table 2. Summary of responses to list experiment and direct questioning about child labor

List experiment - child labor							Direct question – child labor			
	Control group			Treatment group						
Response value	Frequency	Proportion		Frequency	Proportion		Response value	Frequency	Proportion	
0	0	0	%	0	0	%	No	38	10	%
1	0	0		1	0.3		Yes	33	8.7	
2	28	7.4		7	2.1					
3	43	11.3		50	14.9					
4	0	0		3	0.9					
5				0	0					
Non-response	309	81.3	%	274	81.8	%	Non-response	309	81.3	%
Total	380	100		335	100		Total	380	100	

The high non-response rate stemmed from two main factors. First, although the author directly monitored two of the interviewers throughout data collection, a third interviewer subcontracted part of their assigned calls to an untrained individual. Consequently, data from 243 households were excluded due to concerns about data quality. Second, among the two monitored interviewers, one reached only 112 of 256 households, and technical issues caused the loss of an additional 50 households' data.

Nevertheless, because both interviewer assignment and call order were randomized to minimize bias related to interview timing, the analytic sample is considered externally valid relative to the original sampling frame, aside from standard attrition caused by inactive phone numbers, unreachable respondents, or lack of consent. Attrition—including refusals possibly linked to the sensitive nature of the survey questions—occurred independently of random assignment and is therefore unlikely to have biased the prevalence estimates derived from the list experiments.

2.3. Estimation Strategy

To estimate the prevalence of illegal chemical pesticide use and child labor, we employ a list experiment (item count technique) combined with a linear regression framework for each sensitive behavior (where s is either illegal chemical pesticide use or child labor). The basic model is as follows:

$$Y_i = \beta_0 + \beta_1 \cdot T_{i,s} + \varepsilon_{i,s} \quad (1)$$

Where:

- Y_i is the number of statements that respondent iii reports as true in the list experiment for behavior sss.
- $T_{i,s}$ is a binary treatment indicator that equals 1 if the respondent received the treatment list (which includes the sensitive item) and 0 if the respondent received the control list (without the sensitive item).
- β_0 represents the average number of non-sensitive items endorsed by the control group.
- β_1 captures the difference in mean counts between the treatment and control groups, which corresponds to the estimated prevalence of the sensitive behavior.
- $\varepsilon_{i,s}$ is the individual error term.

3. Results

We present the results from both the list experiment and direct questioning to estimate the prevalence of child labor and illegal chemical pesticide use among farming households in Jalal-Abad, Kyrgyzstan.

First, we focus on illegal chemical pesticide use. The list experiment yielded a prevalence of 41.1%, whereas direct questioning captured only 13.9% (see Table 3 and Table1.) This 27.2 percentage point difference was statistically significant (p = 0.017), suggesting substantial underreporting in direct questioning due to the sensitive and potentially illegal nature of pesticide use.

Table 3. Prevalence of Illegal Chemical Pesticide Use

	Control group	Treatment group	Diff-means Estimate
	2.35	2.76	0.411
	(0.081)	(0.063)	(0.104)
$n =$	72	62	

Next, we turn to child labor. The list experiment estimated a prevalence of 29.6%, while direct questioning yielded a higher rate of 46.5% (see Table 4 and Table2.) This difference of –16.9 percentage points was not statistically significant (p = 0.10), indicating that indirect questioning did not uncover additional hidden responses for child labor.

Table 4. Prevalence of Child Labor

	Control group	Treatment group	Diff-means Estimate
	2.61	2.90	0.296
	(0.058)	(0.060)	(0.084)
$n =$	71	61	

4. Discussion and Conclusion

This study provides evidence on the true prevalence of child labor and illegal chemical pesticide use among farming households in Jalal-Abad, Kyrgyzstan, using a list experiment to reduce underreporting. The results reveal that illegal chemical pesticide use is substantially underreported in direct questioning: the list experiment estimated a prevalence of 41.1%, compared to 13.9% from direct questioning. In contrast, no statistically significant difference emerged between indirect and direct estimates for child labor. This suggests that child labor may not be perceived as a sensitive issue in this context and is widely accepted as part of rural family life.

Interestingly, direct questioning produced a higher estimate of child labor than the list experiment. This contrasts with the usual pattern for sensitive behaviors, where indirect methods typically elicit higher reporting. One possible explanation is that, in rural Kyrgyzstan, child labor—defined as children helping with family farming—is seen as normal and socially acceptable rather than shameful. Respondents may have felt comfortable reporting it openly in direct questioning. Alternatively, the discrepancy may reflect ambiguity in how respondents interpret the term “child labor” or the statistical variability inherent in list experiments.

The high prevalence of illegal chemical pesticide use revealed by the list experiment may be linked to recent policy shifts, such as a reduced emphasis on eco-friendly agriculture and land redistribution programs (24.kg, 2024). These changes may have weakened farmers’ incentives to comply with environmental regulations.

Overall, the findings underscore the urgent need for improved survey methods and stronger agricultural policies. In particular, enhanced regulation and monitoring are essential to protect children from the risks associated with illegal chemical pesticide exposure in rural farming communities.

Acknowledgments

We express our gratitude to the Jalal-Abad agricultural authorities, local enumerators, and participating households for their cooperation. This work was supported by JST SPRING, Grant Number JPMJSP2132.

Declaration of AI Assistances

During the writing of this manuscript, we have used ChatGPT to improve the grammar and language structure clarity. After the use of this tool, the authors have read and confirmed all the text. Authors take full responsibility for the content of the manuscript.

References

24.kg. (2024, October 10). Into state ownership. Which assets and for what amount were returned this year. https://24.kg/obschestvo/307584_vsobstvennost_gosudarstva_kakie_obyektyi_inakakuyu_summu_vernuli_vetom_godu/

Blair, G., & Imai, K. (2012). Statistical Analysis of List Experiments. *Political Analysis*, *20*(1), 47–77. https://doi.org/10.1093/pan/mpr048

Imai, K., Park, B., & Greene, K. F. (2015). Using the predicted responses from list experiments as explanatory variables in regression models. *Political Analysis*, *23*(2), 180-196. https://doi.org/10.1093/pan/mpu017

FAO (2020). Overview of organic agriculture development in Europe and Central Asia. Hungary: Budapest.

Garry, V. F. (2004). Pesticides and children. *Toxicology and Applied Pharmacology, 198*(2), 152-163.

Gilens, M., Sniderman, P. M., & Kuklinski, J. H. (1998). Affirmative action and the politics of realignment. *British Journal of Political Science*, *28*(1), 159-183.

Glynn, A. N. (2013). What Can We Learn with Statistical Truth Serum? Design and Analysis of the List Experiment. *Public Opinion Quarterly, 77*(S1), 159–172.

Gonzalez-Ocantos, E., et al. (2012). Vote Buying and Social Desirability Bias: Experimental Evidence from Nicaragua. *American Journal of Political Science, 56*(1), 202–217.

Janus, A. L. (2010). The influence of social desirability pressures on expressed immigration attitudes. *Social Science Quarterly*, *91*(4), 928-946.

Kajishita, Yoshinari and Renat Tokbaev. 2025. "Child Labor and Illegal Chemical Pesticide Use in Jalal-Abad, Kyrgyzstan: A List Experiment with Randomized Survey Modes." AEA RCT Registry. June 16. https://doi.org/10.1257/rct.16102-1.0

Kuklinski, J. H., Cobb, M. D., & Gilens, M. (1997). Racial attitudes and the" New South". *The Journal of Politics*, *59*(2), 323-349.

Liu, J., & Schelar, E. (2012). Pesticide exposure and child neurodevelopment: summary and implications. *Workplace health & safety, 60*(5), 235–243.

Muñoz-Quezada, M. T., et al. (2013). Neurodevelopmental effects in children associated with exposure to organophosphate pesticides: a systematic review. *Neurotoxicology, 39*, 158-168.

Rosas, L. G., & Eskenazi, B. (2008). Pesticides and child neurodevelopment. *Current opinion in pediatrics, 20*(2), 191-197.

Traunmüller, R., Kijewski, S., & Freitag, M. (2019). The Silent Victims of Sexual Violence during War: Evidence from a List Experiment in Sri Lanka. *Journal of Conflict Resolution*, *63*(9), 2015-2042. https://doi.org/10.1177/0022002719828053 (Original work published 2019).

UNICEF. (2023). *Situation analysis of children in the Kyrgyz Republic*. UNICEF. https://www.unicef.org/kyrgyzstan/reports/situation-children-kyrgyzstan

United Nations Department of Economic and Social Affairs (UNDRR). (2023). *Risk Spotlight: Kyrgyzstan*. https://www.undrr.org/media/102727/download

United Nations Environment Programme. (2015). *Demonstration of non-thermal treatment of DDT wastes in Central Asia (Kyrgyz Republic and Tajikistan): GEF-6 PIF template* [Project identification form]. Global Environment Facility. https://open.unep.org/project/GEF-9421

United States Department of Labor. (2024). *Findings on the Worst Forms of Child Labor: Kyrgyz Republic*. https://www.dol.gov/sites/dolgov/files/ILAB/child_labor_reports/tda2023/Kyrgyz-Republic.pdf

Vrijheid, M., Casas, M., Gascon, M., Valvi, D., & Nieuwenhuijsen, M. (2016). Environmental pollutants and child health—a review of recent concerns. *International Journal of Hygiene and Environmental Health, 219*(4-5), 331-342.