



Human Trafficking
Policy & Research
Analyses Project

Comprehensive Review of Prior Prevalence Studies and Recommendations for Field Testing in the United States

OPRE Report # 2021-87

May 2021



Human Trafficking Policy and Research Analyses Project: Comprehensive Review of Prior Prevalence Studies and Recommendations for Field Testing in the United States

OPRE Report 2021-87

May 2021

Kelle Barrick and Rebecca Pfeffer, RTI International

Submitted to:

Mary Mueggenborg, Project Officer
Office of Planning, Research, and Evaluation
Administration for Children and Families
U.S. Department of Health and Human Services
330 C Street SW, 4th Floor, Washington, DC 20201

Contract Number: HHSP233201500039L

Project Director: Natasha Latzman
RTI International
3040 East Cornwallis Road
Research Triangle Park, NC 27709

This report is in the public domain. Permission to reproduce is not necessary. Suggested citation: Barrick, K. & Pfeffer, R. (2021). *Human Trafficking Policy and Research Analyses Project: Comprehensive review of prior prevalence studies and recommendations for field testing in the United States*, OPRE Report No. 2021-87, Washington, DC: Office of Planning, Research, and Evaluation, Administration for Children and Families, U.S. Department of Health and Human Services.

Disclaimer: The views expressed in this publication do not necessarily reflect the views or policies of the Office of Planning, Research and Evaluation, the Administration for Children and Families, or the U.S. Department of Health and Human Services.

This report and other reports sponsored by the Office of Planning, Research and Evaluation are available at <https://www.acf.hhs.gov/opre>.



[Sign up for OPRE News](#)



Like OPRE'S page on Facebook
[OPRE.ACF](#)



Connect on LinkedIn
[company/opreacf](#)



Follow OPRE on Twitter
[@OPRE_ACF](#)



Follow OPRE on Instagram
[@opre_acf](#)



TABLE OF CONTENTS

Overview..... 2

 Introduction.....2

 Primary Research Questions.....2

 Purpose.....2

 Methods.....3

 Key Findings and Highlights.....3

Executive Summary..... 5

Introduction..... 6

 Review of Prior Prevalence Studies.....8

 Search Strategy.....8

 Inclusion Criteria.....8

 Summary of Findings.....8

 Traditional Probability Samples.....12

 Multiple Systems Estimation and Capture-Recapture.....14

 Respondent-Driven Sampling and Link Tracing.....15

 Miscellaneous Approaches.....16

 Findings in Priority Industries.....16

 Approaches Under Review.....17

 Methodological Considerations.....17

Industry-Based Considerations for Field Testing..... 20

 Direct Care and Childcare Workers.....20

 Animal Husbandry.....22

 Construction.....23

 Illicit Activities.....24

Other Considerations for Field Testing..... 26

 Selection of Geographic Scope.....26

 The Impact of COVID-19.....26

 Recommendation for Field Testing.....28

References..... 30

Tables

Number	Page
1	Summary of Prevalence Study Methods.....9
2	Summary of Methodological Strengths and Weaknesses for Estimating Trafficking Prevalence.....18
3	Design Options, by Industry.....25



OVERVIEW

Human trafficking negatively affects individuals, families, public safety, the healthcare system, and the criminal legal system. A critical step toward mobilizing effective anti-trafficking efforts involves estimating the scope of the problem.

Introduction

As part of the Administration for Children and Families' Human Trafficking Policy and Research Analyses Project (HTPRAP), RTI International is undertaking a focused prevalence inquiry of human trafficking in the United States. The overarching goal of this task is to advance knowledge of promising methods for estimating human trafficking prevalence in the nation by field-testing at least two methods of prevalence estimation within one U.S. industry and one U.S. geographic location.

As an initial step, the team (1) conducted a comprehensive review of prior human trafficking prevalence studies, focusing primarily on the sampling and estimation strategies that have been successfully used in prior research; (2) assessed the strengths and weaknesses of the main prevalence sampling methods

for estimating trafficking; (3) considered how well each method could be used in different industries; and (4) developed recommendations for field-testing prevalence estimation strategies in the United States. This report summarizes the findings and recommendations to date.

Primary Research Questions

- What prevalence estimation strategies have been used successfully in prior human trafficking prevalence studies?
- What are the strengths and weaknesses of the main prevalence sampling methods for estimating trafficking?
- Which methods are most appropriate for estimating the prevalence of human trafficking in different industries?

Purpose


This report summarizes the methods used in prior human trafficking prevalence estimation studies. We discuss the strengths and weaknesses of each method in general and as applied to specific industries. We conclude with a recommendation for field-testing two prevalence estimation studies within one industry and one geographic location in the United States.

Methods

Data from this report were gathered through a comprehensive literature review of prior research estimating the extent of human trafficking in various populations. A broad set of keywords was searched in numerous academic databases. Additional articles were then identified through reference lists of those picked up in the initial search.

Key Findings and Highlights

- Prior prevalence studies have used a variety of sampling and estimation strategies, including traditional probability samples (e.g., multistage, stratified, cluster), variants of multiple systems estimation and capture-recapture techniques, respondent-driven sampling and related link-tracing strategies, and other novel approaches.
- Traditional probability samples used to estimate the prevalence of human trafficking have included both household- and school-based surveys. Although developing new large-scale surveys or adding questions to existing surveys would be powerful data collection mechanisms, doing so would not be efficient or feasible to meet the objectives of the current project. Probability samples developed for a specific industry in a limited geographic area allow for a more rigorous design than large-scale studies.
- The use of multiple systems estimation or capture-recapture techniques to estimate human trafficking prevalence makes sense only when there are adequate existing data (e.g., administrative data or records) from which to sample. For most industries, there are no known existing data sources from which to sample.
- Respondent-driven sampling and link tracing are appropriate methods for developing samples of specific populations in smaller geographic areas and could be applied to many industries.
- We recommend that HTPRAP's targeted prevalence study use traditional probability sampling and link-tracing sampling methodologies to estimate the prevalence of labor trafficking victimization in the construction industry.



One goal of the Human Trafficking Policy and Research Analyses Project is to **advance knowledge of promising methods for estimating human trafficking prevalence in the United States.**

To accomplish this, RTI International is undertaking a focused prevalence inquiry of human trafficking in the nation. The inquiry will involve the application of two rigorous sampling methods to estimate the prevalence of trafficking victimization in one U.S. industry and one U.S. location.

EXECUTIVE SUMMARY



On February 25, 2020, the Office on Trafficking in Persons (OTIP) specified five priority industries for consideration in this work: direct care work, childcare, animal husbandry, construction, and illicit activities through forced labor among gang-involved youth.

After a systematic and comprehensive review of prior human trafficking prevalence studies and consideration of the feasibility of sampling within the priority areas listed above, **we recommend that our targeted prevalence study use traditional probability sampling and link-tracing sampling methodologies to estimate the prevalence of labor trafficking victimization in the construction industry.** We further recommend the addition of the network scale-up method (NSUM) as a no-cost, tag-along third estimation method that can be added to one of the survey techniques listed above.

This recommendation is based on:

- a comprehensive literature review of prior prevalence studies and the methods used¹;
- a search of literature specific to the industries of interest to OTIP²;
- an analysis of the strengths and weaknesses of the main prevalence sampling methods for estimating trafficking³;
- consideration of industry-based factors that would affect prevalence estimation methodologies⁴;

- an analysis of how well each sampling method could be used in each of the five industries⁵;
- other considerations, including the selection of a geographic location for field testing and the impact of COVID-19⁶; and
- feedback from experts with expertise in human trafficking and methodologies for sampling hard-to-reach populations.

In summary, our recommendation—which is to field-test both a probability sampling method and a link-tracing method to estimate labor trafficking victimization among construction workers—is based on a systematic consideration of the rigor of the various potential sampling methods and the feasibility of sampling access. We further propose adding NSUM as a tag-along method, as it can be included at no additional cost and will contribute to the main goal of this project: to advance knowledge of promising methods for estimating human trafficking prevalence in the United States.

¹ See Table 1, page 4.

² See *Findings in Priority Areas*, page 9.

³ See Table 2, page 11.

⁴ See *Industry-Based Considerations for Field Testing*, page 14.

⁵ See Table 3, page 18.

⁶ See *Other Considerations for Field Testing*, page 20.



INTRODUCTION

As part of the Administration for Children and Families' Human Trafficking Policy and Research Analyses Project (HTPRAP), RTI International is undertaking a focused prevalence inquiry of human trafficking in the United States. The overarching goal is to advance knowledge of promising methods for estimating human trafficking prevalence in the nation.

We have proposed to do so by (1) conducting a comprehensive review of prior human trafficking prevalence studies and (2) field-testing two methods of prevalence estimation within one industry and one geographic location in the United States. Our labor sectors of consideration were guided by those specifically indicated as priority areas by the Office on Trafficking in Persons (OTIP) on February 25, 2020, in the workshop *Estimating the Prevalence of Human Trafficking in the United States: Considerations and Complexities*, hosted by the National Academies of Sciences, Engineering, and Medicine:

- Direct care workers, including personal care aides, home health aides, and nursing assistants in private homes, communities, and nursing homes
- Childcare workers
- Animal husbandry, including on chicken, egg, and dairy farms
- Construction, including roofing, carpentry, welding, electrical work, and debris removal (particularly after natural disasters)
- Illicit activities, particularly through forced labor among juveniles in domestic gang activity



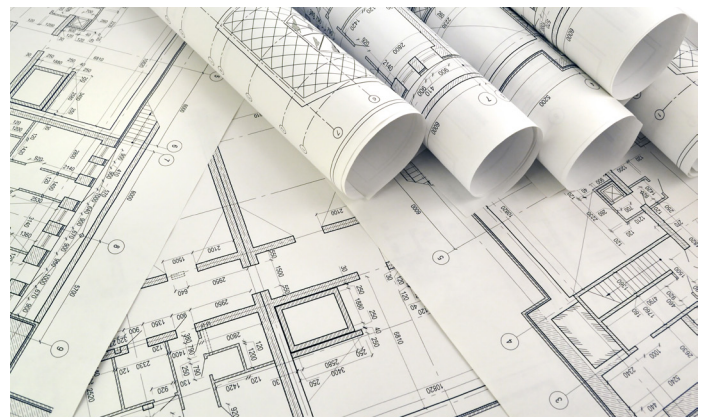
The following section of this report, *Review of Prior Prevalence Studies*, presents the search strategy and results of the comprehensive literature review of prevalence studies of human trafficking, organized to demonstrate the various sampling methodologies that have been used in past research, including the industries, geographic scope, and victim profiles of focus in these studies. An overview of all identified studies is presented in Table 1.

We then provide a descriptive overview of methodologies used most often in that prior human trafficking prevalence research. We note each method's potential applicability to a focused, industry-specific prevalence study in the United States within the five priority areas identified by OTIP. Additionally, we include an overview of prior research, including any of the sectors of interest to OTIP, to understand existing knowledge of prevalence within these industries and how it has been measured. We summarize the strengths and weaknesses of various sampling strategies used to estimate human trafficking prevalence in Table 2.

The next section of the report, *Industry-Based Considerations for Field Testing*, focuses on

recommendations for field-testing prevalence estimation methods in OTIP's five priority industries. We discuss the feasibility and sampling options for each potential industry and summarize these assessments in Table 3. We discuss geographic considerations and the impact of COVID-19 in *Other Considerations for Field Testing*.

Finally, our concluding section, *Recommendations for Field Testing*, includes a discussion of what we deem to be the most practical option for implementing a prevalence study in the United States. Our recommendations focus on field-testing traditional probability sampling and link tracing sampling in the construction industry.



REVIEW OF PRIOR PREVALENCE STUDIES



SEARCH STRATEGY

The focus of the prevalence study review was primarily on the sampling and estimation strategies that have been successfully used in prior research to estimate the extent of human trafficking in various populations, including in the United States, in other geographically specific regions, and around the world. The search terms were intentionally broad, including trafficking and other forms of sexual and labor exploitation, because the methods used to estimate the prevalence of these related abuses may also be relevant for estimating the prevalence of trafficking (see sidebar). These terms were searched in the following databases: PubMed, Web of Science, Embase, Criminal Justice Database (via ProQuest Central), PsychINFO, Sociological Abstracts, National Criminal Justice Reference Service, and Google Scholar. Additional articles were identified through reference lists of those picked up in the initial search. We included articles and reports published from 1999 through 2020.

Search Terms

Human trafficking, modern slavery, sex trafficking, sexual exploitation, labor trafficking, labor exploitation, forced labor, child labor, child prostitution, forced marriage, indentured servitude, debt bondage, domestic servitude, estimate, prevalence, scope.



INCLUSION CRITERIA

The search yielded 138 potentially relevant articles. Of those, 94 articles were excluded because they did not include an original prevalence estimate or were limited to a descriptive estimate based on a non-probability sample (e.g., clients of a single victim service provider). Forty-four studies sought to estimate the prevalence of sex and labor trafficking, exploitation, or both. For each of the 44 relevant studies, information on data sources, geographic scope, type of trafficking or exploitation, population sampled, sample size, and sampling and prevalence estimation strategies was extracted and recorded in a spreadsheet (Table 1).



SUMMARY OF FINDINGS

Prior prevalence studies have used various sampling and estimation strategies, including traditional probability samples (e.g., multistage, stratified, cluster), variants of multiple systems estimation (MSE) and capture-recapture techniques, respondent-driven sampling (RDS) and related link-tracing strategies, and other novel approaches. In the next section, we summarize the types of studies for which each of these methods was used and describe the methods' potential applicability for estimating the prevalence of human trafficking in the United States.

Table 1 Summary of Prevalence Study Methods

Year	Author	Geographic Scope	Trafficking Type	Victim Age	Sample Size	Data Sources	Population Sampled	Sampling Strategy
1999	Greene et al.	Country (U.S.)	Sex	Youth	640	Survey (primary)	Runaway homeless youth	Probability
2000	Kruse & Mahoney	Country (U.S.)	Labor	Youth	Varied by survey	Survey (secondary)	Youth aged 15+	Other
2005	Belser et al.	Global	Labor	Youth, Adult	3,164	Administrative, Survey (secondary), Media	Reported cases of forced labor	Capture-recapture
2006	Edwards et al.	Country (U.S.)	Sex	Youth	13,570	Survey (secondary)	Students, grades 7–12	Probability
2007	Levison et al.	6 cities, Brazil	Labor	Youth	239,340	Survey (secondary)	Youth aged 10–16	Probability
2008	Curtis et al.	1 city, U.S.	Sex	Youth	329	Survey (primary)	Youth involved in commercial sex	RDS
2009	Ball & Hampton	Country (Ukraine)	Sex, Labor	Youth, Adult	Varied by survey	Surveys (secondary, 2; primary, 1)	Key informants, households	Probability (2), purposive
2009	Kazmirski	Country (United Kingdom)	Forced Marriage	Youth	58	Surveys (primary)	Service providers	Convenience
2010	Levison & Langer	Countries (6)	Labor	Youth	Varied	Census	Youth aged 10–17	Probability
2010	Williamson et al.	1 state, U.S.	Sex, Labor	Youth, Adult	None	Census, Prior research	Foreign-born persons and American youth	Other
2011	Steinfatt & Baker	Country (Cambodia)	Sex	Youth, Adult	558	Observational	Sex venues	Other
2012	ILO	Global	Labor	Youth, Adult	7,519	Administrative, Media	Reported cases of forced labor	Capture-recapture
2012b	ICF Macro	Country (Paraguay)	Labor	Youth	1,002 households & 1,135 children	Survey (primary)	Children in households	Probability
2012a	ICF Macro	1 region, Rwanda	Labor	Youth	2,839 interviews	Survey (primary)	Households	Probability
2012	ICF Intl.	Country, (Pakistan)	Labor	Youth	650 work sites, 3,484 household interviews	Survey (primary)	Households and work sites	Probability

(continued)

Table 1 Summary of Prevalence Study Methods (continued)

Year	Author	Geographic Scope	Trafficking Type	Victim Age	Sample Size	Data Sources	Population Sampled	Sampling Strategy
2013	Datta & Bales	Countries (5)	Sex, Labor	Youth, Adult	Varied	Survey (secondary)	Households	Probability
2014	Zhang et al.	1 county, U.S.	Labor	Adults	826	Survey (primary)	Unauthorized adult migrant workers	RDS
2015	Bales et al.	Country (United Kingdom)	Sex, Labor	Youth, Adult	2,744	Administrative	Presumed victims	MSE
2015	Sommerfelt	Country (Haiti)	Labor	Youth	2,078 households, 1,617 youth	Survey (primary)	Children in households	Probability
2016	Van Dijk & van der Heijden	Country (Netherlands)	Sex, Labor	Youth, Adult	1,561	Administrative	Identified victims	MSE
2016	Busch-Armendariz et al.	1 state, U.S.	Sex, Labor	Youth, Adult	Varied	Administrative, Survey (primary)	Presumed and identified victims, social service agencies	Other
2017	Phillips	1 city, U.S.	Sex	Youth	403	Administrative	Persons arrested for commercial sexual exploitation-related crimes (victims, buyers, facilitators)	Capture-recapture
2017	Cruyff et al.	Country (Netherlands)	Sex, Labor	Youth, Adult	8,234	Administrative	Presumed victims	MSE
2017	ILO & Walk Free	Global	Sex, Labor	Youth, Adult	71,758	Survey (primary)	Households	Probability
2018	Atteraya et al.	Global	Labor	Youth	7,147	Survey (secondary)	Households	Probability
2018	Gilbert et al.	Country (Haiti)	Labor	Youth, Adult	2,916	Survey (primary)	Households	Probability
2018	Parks et al.	1 state, India	Labor	Adult	4,306	Survey (primary)	Work sites	Capture-recapture
2018	Pinzon-Rondon et al.	Country (Colombia)	Labor	Youth	50,000+	Survey (secondary)	Households	Probability

(continued)

Table 1 Summary of Prevalence Study Methods (continued)

Year	Author	Geographic Scope	Trafficking Type	Victim Age	Sample Size	Data Sources	Population Sampled	Sampling Strategy
2018a	UNODC	Country (Ireland)	Sex, Labor	Youth, Adult	311	Administrative	Known victims	MSE
2018b	UNODC	Country (Romania)	Sex, Labor	Youth, Adult	4,622	Administrative	Known victims	MSE
2018c	UNODC	Country (Serbia)	Sex, Labor	Youth, Adult	2,660	Administrative	Known victims	MSE
2019	Anderson et al.	1 state, U.S.	Sex, Labor	Youth, Adult	1,032	Administrative	Known victims	Other
2019	Dank et al.	1 city, Nepal	Sex	Youth	600	Survey (primary)	Adult entertainment workers	RDS
2019a	Zhang et al.	1 state, U.S.	Labor	Adult	404	Survey (primary)	Migrant farmworkers	Probability
2019b	Zhang et al.	1 state, India	Labor	Youth	562	Survey (primary)	Child laborers	Link tracing with time-location sampling
2019	Bales et al.	1 city, U.S.	Sex, Labor	Youth, Adult	185	Administrative	Known victims	MSE
2019	Farrell et al.	2 cities, U.S.	Sex, Labor	Youth, Adult	635	Administrative	Known victims	MSE
2019	Vincent et al.	1 city, India	Sex	Youth, Adult	317	Survey (primary)	Sex workers	Link tracing
2019	Lyneham et al.	Country (Australia)	Sex, Labor	Youth, Adult	414	Administrative	Known victims	MSE
2020	Shabbir et al.	1 region, Pakistan	Labor	Youth	Unknown	Survey (secondary)	Children	Probability
2020	Jordan et al.	Country (Nepal)	Sex	Youth	227	Survey (primary)	Children	RDS
2020	Bhatia et al.	Country (Nepal)	Labor, Forced Marriage	Youth	9,346 households 1,599 girls	Survey (secondary)	Children in households	Probability
2020	Martin et al.	1 state (U.S.)	Sex	Youth	71,007	Survey (primary)	9th and 11th graders	Probability
2020	University of Georgia	1 metro area (U.S.)	Sex and labor	Youth	641	Survey (primary)	Homeless youth	Capture-recapture

Note. ILO, International Labour Organization; MSE, multiple systems estimation; RDS, respondent-driven sampling; UNODC, United Nations Office on Drugs and Crime



TRADITIONAL PROBABILITY SAMPLES

Studies using traditional probability samples rely on an existing sampling frame of the population of interest to select a representative sample. Although there is variance in how sampling is accomplished across probability methodologies, these techniques use random selection and are appropriate when the total population size from which you are sampling is known. In trafficking research, probability samples have been used when survey research (for example, a household survey) may be able to capture potential trafficking or exploitation.

What Is Traditional Probability Sampling?

- Relies on an existing sampling frame of the population of interest
- Uses one of several methods of random selection to achieve a representative sample

Traditional probability samples were used in 17 studies. Most of these estimated the prevalence of child labor outside of the United States (Atteraya et al., 2018; Bhatia et al., 2020; Gilbert et al., 2018; ICF International, 2012; ICF Macro, 2012a, 2012b; Levison et al., 2007; Levison & Langer, 2010; Pinzon-Rondon et al., 2018; Shabbir et al., 2020; Sommerfelt, 2015). For the most part, these studies were able to conduct a secondary analysis of household survey data that had been collected for other purposes. For example, Pinzon-Rondon and colleagues (2018) analyzed data from the Colombian Demographic and Health Survey to estimate the number of children between the ages of 6 and 17 who worked during the week prior to the survey. This is a nationally representative survey that covered numerous topics and was administered to more than 50,000 households in Colombia. Use of an existing survey is a rigorous method for estimating the prevalence of child labor if coverage and response are high and the questions are sufficiently detailed. Unfortunately, there are no existing household-based surveys in the United States that could be reanalyzed to estimate the prevalence of human

trafficking. In this case, we do not feel that methods used to estimate international child labor are applicable to estimating the prevalence of human trafficking within a specific, targeted industry in the United States.

Two studies used household surveys to generate an estimate of “slavery in Europe” (Datta & Bales, 2013) and a “global estimate of modern slavery” (International Labour Organization [ILO] & Walk Free Foundation, 2017). Both studies used data collected through representative household surveys from a sample of countries and extrapolated the findings to other countries. For example, ILO and Walk Free (2017) developed a survey to estimate the prevalence of human trafficking and administered it to a representative sample of households in 48 countries. The researchers added a few questions to an existing survey to capture information on trafficking experiences in several countries. The focus (sex and labor trafficking) and geographic scope (European Union and world) of these studies are much broader than the aims of the HTPRAP.

Ball and Hampton (2009) conducted three separate studies to arrive at an estimate of human trafficking from Ukraine. Two of the studies involved inserting questions into existing probability-based household surveys; the third relied on key informant interviews. Ball and Hampton considered the findings from all three studies to arrive at an estimate.

Household Surveys: The Bottom Line

Although there may be value in either developing a new national household survey or adding questions to an existing survey to better understand exploitation broadly in the United States, doing so would not be efficient or feasible to meet the objectives of the current project.

Three studies used probability-based samples to estimate the prevalence of survival sex and commercial sexual involvement among youth in the United States (Edwards et al., 2006; Greene et al., 1999; Martin et al., 2020). Greene et al. (1999) developed a multistage sample of shelters in metropolitan and nonmetropolitan areas included in the National Household Survey on Drug Abuse to survey runaway and homeless youth about their experiences engaging in survival sex. This type of multistage sample may be feasible for three of the priority industries (direct care workers, childcare workers, and animal husbandry) for which the primary sampling unit would be employers (more

detail is provided in the *Recommendations for Field Testing* section). In a secondary analysis of the National Longitudinal Study of Adolescent Health (Add Health), Edwards and colleagues (2006) estimated the prevalence of exchanging sex for money or drugs among 7th–12th graders. Although Add Health includes questions about criminal activity and gang initiation, it does not currently include items that could be used to better understand labor trafficking for illicit activities. Martin et al. (2020) developed a population-based prevalence estimate of the sexual exploitation of youth in Minnesota by adding a question to the Minnesota Student Survey, a triannual census of students in Minnesota schools.

Existing Youth Surveys: The Bottom Line

If questions could be added to Add Health or existing state-based school surveys, they would be a powerful data collection mechanism for understanding various forms of trafficking among adolescents. This approach is likely beyond the scope of the HTPRAP.

One study used a multistage sample to estimate the prevalence of labor trafficking among migrant farmworkers in North Carolina (Zhang et al., 2019a). The researchers created segments from census blocks, assigned each segment to one of three strata, and then sampled the segments using probability proportional to size based on land area for crops that require manual labor. They oversampled segments with the highest proportion of land area for high-labor crops.

The field team then drove through each selected segment and photographed dwellings that appeared to house migrant farmworkers. Field interviewers went back to all the identified dwellings and randomly selected individuals to participate in interviews. This type of multistage sampling could potentially be applied to construction sites if a sampling frame is not available (more detail is provided below in *Recommendations for Field Testing*).

Multistage Sampling: The Bottom Line

The study by Zhang et al. (2019a) is the most closely aligned with the current effort in that it focused on a specific industry in a limited geographic area, which allows for a more rigorous design than larger-scale studies.

MULTIPLE SYSTEMS ESTIMATION AND CAPTURE-RECAPTURE

MSE and capture-recapture studies use existing data on known victims of trafficking from multiple sources to estimate the total number of victims. In broad terms, these methods rely upon the comparison of three or more different samples of trafficking victims, examining the extent to which individuals are captured in more than one dataset. MSE typically relies on multiple data sources, whereas capture-recapture uses multiple time points from one data source. Statistical modeling that accounts for the sizes of the three (or more) samples, as well as the extent of multiple captures of these individuals, can produce an estimate range of the total population size (Bird & King, 2018).

What Are Multiple Systems Estimation and Capture-Recapture Methods?

- Use existing data sources on known trafficking victims
- Examine the extent to which individuals are captured in more than one dataset
- Use statistical modeling to produce an estimate range of the population size
- Are appropriate only when victim populations are captured in one or more datasets

Variants of MSE and capture-recapture were used in 14 studies. Thirteen of the studies using MSE were focused broadly on sex and labor trafficking and did not focus on specific industries. The geographic areas covered ranged from cities to the globe. Two early studies combined numerous data sources (e.g., ILO reports and studies, other international organizations, government statistics and reports, academic papers, and media reports) on the number of forced-labor cases to estimate the prevalence of forced labor throughout the world (Belser et al., 2005; ILO, 2012). Because of the lack of direct measurement, the results from these studies were based on pooling results across a variety of data sources.

More recent research has focused on smaller geographic areas—countries and cities. These studies collected data from governmental and nongovernmental agencies that work with trafficking victims in some capacity in the selected geographic areas. Seven studies used administrative data on presumed or identified victims of sex and labor trafficking to estimate the number of victims in the United Kingdom (Bales et al., 2015), the Netherlands (Cruyff et al., 2017; van Dijk & van der Heijden, 2016), Ireland (United Nations Office on Drugs and Crime [UNODC], 2018a), Romania (UNODC, 2018b), Serbia (UNODC, 2018c), and Australia (Lyneham et al., 2019). Three studies focused on U.S. cities: Kansas City (Phillips, 2017), New Orleans (Bales et al., 2019), and two unnamed communities (Farrell et al., 2019). Because MSE relies on existing data on trafficking victims, this method is feasible only if adequate data already exist on the population of interest. The two studies by Farrell et al. (2019) in unnamed communities used a more traditional version of capture-recapture that involves “capturing” someone more than once during sampling in the field (Parks et al., 2019; University of Georgia, 2020). For example, the University of Georgia conducted interviews with homeless youth in places they were known to live and spend time. They allowed the youth to participate in the survey more than once and identified duplicate respondents.

Multiple Systems Estimation and Capture-Recapture: The Bottom Line

The use of MSE or capture-recapture techniques to estimate human trafficking prevalence makes sense only when there are adequate existing data (e.g., administrative data or records) from which to sample. For most of the industries of interest for this proposed study, there are no known existing data sources from which to sample.

RESPONDENT-DRIVEN SAMPLING AND LINK TRACING

RDS and other link tracing methods, used when a sampling frame is not available, involve chain referrals among participants. Similar to traditional snowball sampling, both of these methods involve initial study recruits, “seeds,” who fit the profile for study participation, who then refer additional people, who then also refer others, and so on. Although RDS and link tracing use a snowball-type design, they also incorporate statistical modeling to compensate for the nonrandom nature of the sampling strategy, which allows for population estimation (Salganik & Heckathorn, 2004; Vincent & Thompson, 2017). Typically, RDS involves a small number of initial seed participants and multiple waves of recruitment initiated from each seed, whereas link tracing starts with a larger, representative sample of seeds and requires fewer (typically two or three) recruitment waves.

What Are Respondent-Driven Sampling and Link Tracing Methods?

- Used when a sampling frame is not available
- Involve chain referrals among participants, similar to snowball sampling
- Incorporate statistical modeling to compensate for nonrandom nature of the sampling strategy

RDS or related forms of link tracing were used in seven studies. Most were focused on either sex or labor trafficking and had a limited geographic scope. Four of the studies used traditional RDS to estimate the prevalence of the commercial sexual exploitation of children in New York City (Curtis et al., 2008), Kathmandu (Dank et al., 2019), and Nepal (Jordan et al., 2020) and the prevalence of labor trafficking among unauthorized workers in San Diego County (Zhang et al., 2014). Two recent studies used link tracing to estimate the prevalence of child labor in Bihar, India (Zhang et al., 2019b), and of sex trafficking in Muzaffapur, India (Vincent et al., 2019). This approach is described in more detail in the *Recommendations for Field Testing* section.

Respondent-Driven Sampling and Link Tracing: The Bottom Line

RDS and link tracing are appropriate methods for developing samples of specific populations in smaller geographic areas and could be applied to any of the five priority industries.



MISCELLANEOUS APPROACHES

The remaining six studies used less traditional strategies to arrive at rough prevalence estimates. One study (Kruse & Mahoney, 2000) used secondary data from multiple sources to estimate the prevalence of illegal child labor in the United States. However, the paper does not describe the methods in adequate detail to replicate the estimate. Kazmirski et al. (2009) collected data from local and national organizations on cases of forced marriage in England to estimate the prevalence of reported cases, but they did not extend the estimate to include unreported victims. Williamson et al. (2010) quantified potential pull factors for trafficking among foreign-born individuals (e.g., demand for foreign-born workers, presence of trafficking in neighboring states) to estimate the number of individuals at risk for trafficking (based on census population data). They next quantified the demand for sex and labor and used those ratings to estimate how many at-risk people had been trafficked. A similar method was used for domestic minors involved in sex trafficking. Steinfatt & Baker (2011) used a geographic-based sampling approach to identify

and sample sex venues in Cambodia. They observed workers in the selected venues and counted the number of workers who appeared to be underage or unable to leave. Although the field team spoke with management at some of the venues, they did not interview or survey the workers. They used these observational data to estimate the prevalence of sex trafficking. Busch-Armendariz et al. (2016) combined administrative data on individuals identified as known or likely trafficking victims, along with surveys of social service providers, to estimate the prevalence of sex and labor trafficking in high-risk populations. They developed victimization rates from the agency survey and applied those percentages to high-risk populations. Anderson et al. (2019) de-duplicated lists of known sex and labor trafficking victims to identify the number of known victims and then incorporated those numbers with aggregate data to arrive at a prevalence estimate. We do not recommend using any of these novel approaches in the HTPRAP prevalence effort but rather focus on the more established and rigorous methods.

FINDINGS IN PRIORITY INDUSTRIES

Only two studies included any of the industries identified by OTIP as priorities for HTPRAP. Both Zhang et al. (2014) and Busch-Armendariz et al. (2016) included construction and agriculture in their labor trafficking studies. However, both were more broadly

focused on labor trafficking and simply captured these industries along with others. Neither focused specifically on these industries or on developing methods for sampling these populations.

APPROACHES UNDER REVIEW

We also identified other methods that seem relevant but have never or only rarely been used in published human trafficking prevalence studies. These include time-location sampling (TLS) and the network scale-up method (NSUM). Both are currently being tested outside of the United States in studies funded through the State Department's Prevalence Reduction Innovation Forum (PRIF).

TLS involves developing a sampling frame of venues-days-times where the target population congregates and using a random selection procedure (e.g., every fifth person) to select a representative sample of the population. TLS was pioneered by the Centers for Disease Control and Prevention in 1994 to conduct surveys with men who have sex with men (MacKellar et al., 2007). Zhang and colleagues (2019a) applied TLS in city centers and major transportation hubs to recruit youths for their study on the prevalence of child labor in India. They worked with community agencies and service providers to identify public locations that child laborers frequent and used a random-number table to approach every n th child to request participation in an interview. They supplemented this approach with link tracing in one city.

NSUM is unique in that it does not require sampling or surveying the target population. In this method, which relies on a probability sample of the general population, survey questions ask how many people the respondent knows who are in the target populations (e.g., "How many direct care workers do you know who [indicators of trafficking]?"). NSUM has been used for more than 20 years in the study of men who have sex with men, heroin users, people with HIV, and other hidden populations (Ezoe et al., 2012; Kadushin et al., 2006; Killworth et al., 1998). There are, however, concerns over the reliability of this method in estimating prevalence, as inaccurate recalls from respondents tend to significantly inflate the numbers (Salganik et al., 2011).

Time-Location Sampling and Network Scale-up Method: The Bottom Line

Both TLS and NSUM have been used to estimate the prevalence of hidden populations but have rarely or never been applied to human trafficking. Both methods are currently being tested in studies funded by the State Department's Prevalence Reduction Innovation Forum in international contexts.

METHODOLOGICAL CONSIDERATIONS

After identifying the types of sampling and estimation techniques that are being tested or have been used in exploitation and trafficking prevalence studies, we assessed the potential strengths and weaknesses of

each method (probability sampling, MSE, RDS, TLS, and NSUM) in estimating the prevalence of human trafficking in the United States (Table 2).

Table 2 Summary of Methodological Strengths and Weaknesses for Estimating Trafficking Prevalence

Method	Strengths	Weaknesses
Probability sample (e.g., multistage, stratified, cluster)	<ul style="list-style-type: none"> Traditional social science sampling method that yields representative samples of the population of interest; offers easy-to-understand parametric estimates for prevalence and baseline as well as intervention purposes Successfully used in prior human trafficking prevalence studies Can sample firms or persons 	<ul style="list-style-type: none"> All probability-based sampling requires a robust sampling frame, but trafficking victims are a rare and hard-to-reach population, which is difficult to capture in a survey Costly because of sample size and the nature of random field locations for data collection Multistage samples relying on employers as the primary sampling unit may be (1) denied access to employees or (2) given access to a limited or biased sample of employees (e.g., legally authorized workers) Respondents may not honestly answer questions about trafficking
Multiple systems estimation (MSE)	<ul style="list-style-type: none"> Uses existing administrative data sources and does not require primary data collection Minimizes burden on participants—victims are not approached or asked about their trafficking experiences Time and cost efficient Successfully used in prior human trafficking prevalence studies 	<ul style="list-style-type: none"> Gross underestimation of prevalence because existing data include only officially recognized victims—definitional inconsistencies can create many estimation difficulties. Okay for advocacy purposes and even for victim service/rescue operations, but not suited for estimations intended for interventions and least useful for impact assessment. Requires data on known victims from at least 3 independent data sources Requires personally identifiable data to link individuals across data sources Data sources may not use the same definition or screening tool to determine whether an individual is a victim Self-selection into lists may bias estimates (e.g., victim chooses to receive services)
Respondent-driven sampling (RDS) and link tracing	<ul style="list-style-type: none"> Does not require an existing sampling frame Yields diverse samples of the target population that may approach probability samples if assumptions are met Successfully used in prior human trafficking prevalence studies 	<ul style="list-style-type: none"> Requires social connections and may exclude individuals who are physically and socially isolated Reliance on initial seeds and subsequent participants to recruit new participants and penetrate the full universe. Difficult to balance uneven recruitment activities, with some having few waves of referrals and others appearing excessive. Because the research team does not have control over recruitment, the process may yield smaller-than-desired sample sizes, longer-than-desired recruitment periods, and nonrepresentative samples. Geographically constrained—works only in small geographical locales; not useful when large communities or locations are included in a study Difficult to derive population estimates because link-traced individuals are recruited in the sample with unequal probabilities due to their network size or recruitment preferences Respondents may not honestly answer questions about trafficking

(continued)

Table 2 **Summary of Methodological Strengths and Weaknesses for Estimating Trafficking Prevalence (continued)**

Method	Strengths	Weaknesses
Network scale-up method (NSUM)	<ul style="list-style-type: none"> • Does not require identifying and surveying victims • Questions can be embedded in general population surveys • Ability to estimate multiple hidden populations simultaneously (i.e., could ask about all 5 priority industries) • Minimizes harm to respondents—does not access the target population directly; rather, a random sample of the general population reports about members of the target population • Might reduce underreporting 	<ul style="list-style-type: none"> • Trafficking victimization is a rare and hidden event. A prohibitively large sample may be needed to capture individuals who have trafficking victims in their social network. • Measurement error in recalling characteristics about people who are known to the respondent • Barrier effects—members of the general population have different probabilities of knowing someone in the hidden population • Transmission error—would a person know that someone in their network was being trafficked? Data based on hearsay (potentially including personal stories, gossip, or even rumors) are highly unreliable because trafficking victimizations are not something people openly share with their friends or even families. The International Labour Organization published official guidelines that specifically discourage collecting data from third persons. • Has not been applied to human trafficking prevalence yet (currently being tested in all PRIF-funded studies, including Morocco, Pakistan, Costa Rica, Tunisia, and Brazil)
Time-location sampling (TLS)	<ul style="list-style-type: none"> • Does not require an existing sampling frame • Does not rely on seeds or other participants for recruitment • Can yield a large, diverse sample of the target population and ability to generalize findings to that population 	<ul style="list-style-type: none"> • Produces a probability sample of visits, not visitors, and requires the collection and analysis of unequal selection probabilities • Target population needs to attend public venues (e.g., bars, businesses, parks) and be visually identifiable • Excludes individuals who do not visit or rarely visit the selected venues • Has not been applied to human trafficking prevalence yet (currently being tested in the PRIF-funded Brazil, Morocco, and Tunisia studies) • Respondents may not honestly answer questions about trafficking

Note: PRIF, Prevalence Reduction Innovation Forum (U.S. State Department).



INDUSTRY-BASED CONSIDERATIONS FOR FIELD TESTING

In addition to the general strengths and weaknesses of each method, we also considered the feasibility of piloting each method in the prioritized industries. Table 3 presents potential design options by industry and method.

DIRECT CARE AND CHILDCARE WORKERS

A multistage probability sample is feasible for both direct care and childcare workers. Agencies and establishments that hire direct care and childcare workers would serve as the primary sampling unit and employees as the secondary sampling unit. This approach was used in the National Home Health Aide Survey in 2007 (Bercovitz et al., 2011). A complete official registry of all licensed providers will provide the sampling frame for any given geographical location, and data collection activities can be planned depending on budget availability. A substantial limitation to this approach is that it would exclude individuals in unlicensed or less formal employment arrangements, who may be among the most vulnerable to trafficking victimization. This approach also relies on the employer to provide a full sampling frame of workers; some



employers may deny access to employees or provide access to a limited sample. An employer who is, for example, trying to hide certain types of employees (e.g., those without work authorization) would bias the sample.

RDS or link tracing would be better suited to include direct care and childcare workers in all types of employment scenarios. In this approach, we would partner with unions or other advocacy groups in the area to conduct formative research and identify seeds across the spectrum of direct care and childcare workers to start the referral and recruitment chains. If initial research indicates that certain immigrant groups or other subpopulations are likely overrepresented among these employment sectors, it may be possible to identify RDS seeds in other community-based settings where these groups are known to congregate, such as churches or other places of worship. RDS has been successfully used to survey migrant home care workers in Germany (Hipp et al., 2019). The official registry of licensed providers can guide the initial selection of seeds to approximate random sampling so that maximum diversity and geographical coverage are ensured, and potential bias associated with traditional RDS at entry points is minimized.

NSUM does not require a separate data collection mechanism, so it is feasible to embed it in another method using a survey. In this approach, indirect questions about trafficking victimization could be included in a survey of a probability or RDS sample of direct care or childcare workers. As mentioned previously, there are concerns that NSUM may significantly inflate the numbers because of inaccurate recalls by respondents, and it is therefore not advisable to use as a stand-alone method. However, because including NSUM questions in another survey requires no additional cost, NSUM can easily be used as a tag-along method in this project to better understand how the prevalence estimate that it produces aligns with those produced by other methods.

TLS may be feasible with childcare workers, using parks and playgrounds as likely locations, but substantial formative research would be needed to assess the practicality of this approach. Direct care workers are dispersed broadly across communities and we do not anticipate that these workers would congregate in specific venues from which we could sample, so TLS is not recommended.

MSE does not appear to be feasible with either direct care or childcare workers because there are no known data sources on trafficking victimization among this population.



ANIMAL HUSBANDRY

A multistage probability sample is feasible for farmworkers involved in animal husbandry. Farmers and employers would serve as the primary sampling unit and farmworkers involved in animal husbandry activities would serve as the secondary sampling unit. This is the approach taken on the National Agricultural Workers Survey (Hernandez & Gabbard, 2018). Although that survey focuses on crop farmers, the same approach is likely feasible with chicken, egg, and dairy farmers. A substantial limitation to this approach is its reliance on the employer to provide a full sampling frame of workers; some may deny access to employees or provide access to a limited sample. A farmer who is trying to hide certain types of employees, including those without work authorization, would bias the sample. Access to the employees will be the biggest challenge and would require careful planning and field testing to ensure secure access to the target population.

RDS or link tracing is also feasible for animal husbandry. In this approach, we would partner with unions or other advocacy groups in the area to conduct formative research and identify seeds who are employed by different farms in the area. All businesses in animal husbandry, as long as they are part of regular food supply chains, are registered. A variant of link tracing, known as Vincent Link Tracing Sampling (VLTS), starts with a larger, representative sample of seed and requires fewer recruitment waves. This strategy of link tracing can greatly improve the precision in the selection of initial

entry points. However, careful field activities would need to occur to ensure access to the workers in this labor sector, such as approaching their residence or stores/laundromats where they may congregate to start the RDS-type recruitment.

TLS may also be feasible with animal husbandry workers. Because chicken, egg, and dairy farms are likely clustered in rural areas, there could be a limited number of grocery stores or laundromats where farmworkers congregate. Advocacy organizations with established relationships with farmworker communities may also bring together laborers for events, which may provide an opportunity for surveying this population. Formative research would be needed to determine the extent to which workers congregate at certain public locations. This would also exclude individuals who do not visit the selected venues.

Although not recommended as a stand-alone method because of concerns over its reliability, NSUM would be a feasible addition to another survey sampling methodology with this population. In this approach, indirect questions about trafficking victimization could be included in a survey of a probability, RDS, or TLS sample of animal husbandry workers.

There are no known data sources on trafficking victimization among animal husbandry workers, so MSE is not an available option.

CONSTRUCTION

A multistage probability sample may be feasible for construction workers. Although the use of day laborers inhibits the use of an employer-based sampling procedure, a geography-based sampling approach may be feasible. For example, Fletcher et al. (2007) obtained a random sample of construction workers in New Orleans after Hurricane Katrina by using a comprehensive address database of the city. They selected a random sample of housing unit addresses proportionate to the number of units in each census tract, visited each unit to determine whether there was construction work in the area, and, if so, selected construction workers at each site. This approach would require the support of city government agencies. The geographic sampling approach used by Zhang et al. (2019a) with migrant farmworkers may also be adapted to construction workers; the sampling unit would be construction sites rather than dwelling units.

RDS or link tracing is also feasible for construction workers. In this approach, we could either use the probability-based sample described above to find seed participants or partner with unions or other advocacy groups in the area to conduct formative research and identify seed participants who are employed by different contractors in the area. On-site interviews are not feasible and are also disruptive, and therefore formative research is needed to explore the best way to recruit

subjects. One way is to pass out recruitment coupons to construction workers at the construction sites. An alternative would be to use auxiliary information to develop a sampling frame to include all communities where construction workers may reside to develop community contacts for the initial seed participant selection.

NSUM is also feasible with this population, as a tag-along with any survey data collection. In this approach, indirect questions about trafficking victimization could be included in a survey of a probability or RDS sample of construction workers.

TLS and MSE do not appear to be feasible with construction workers. These workers are dispersed broadly across communities and we do not anticipate that they would frequent certain venues or that they would be visually distinguishable from other types of workers, so TLS is not recommended. There are also no known data sources on trafficking victimization among this population, so MSE is not an available option.

Importantly, to focus these efforts on construction after a natural disaster—which OTIP had noted as a priority—researchers would need to have flexibility as to the timing, location, and geographic region of their efforts.





ILLICIT ACTIVITIES

A probability sample is not feasible for illicit activities. There is no sampling frame for individuals involved in illicit activities or of juveniles involved in gang activity. Because the labor is illicit, an employer-based multistage sample is also not an available option.

RDS or link tracing is feasible for illicit activities. In this approach, we would partner with child welfare or juvenile justice agencies, shelters, or survivor networks in the area to conduct formative research and identify seed participants who are involved in juvenile domestic gang activity. This approach would enable us to develop a sampling frame for the seed selection among these agency-involved youths to maximize racial/ethnic and gender diversity, geographical coverage, and the range of illicit activities. We could then deploy an RDS-type recruitment procedure. This is probably the most feasible and rigorous method for estimating prevalence in this labor sector. However, this methodology relies on significant buy-in from and collaboration with local agencies and organizations. There are also potential safety concerns for youth who participate in these interviews, as their peers may perceive the interviews as snitching.

TLS is not recommended for sampling those involved in illicit activities. Juveniles involved in gang activity may congregate in specific public locations (e.g., a park), but they cannot be reliably identified by their appearance.

This approach would also exclude individuals who do not visit the selected venues. A weakness of TLS is the lack of a comprehensive understanding of locations and times associated with possible congregations of populations of concern, especially those that are accessible by researchers.

As noted elsewhere, NSUM is not a reliable enough method to employ on its own, but including it with another survey-based method engaging this population is feasible. In this approach, indirect questions about trafficking victimization could be included in an RDS or TLS sample of juveniles. As there are no known data sources on trafficking victimization for illicit activities, MSE is not an available option. Through our work on the Domestic Human Trafficking and the Child Welfare Population project, we are aware of at least five state departments of juvenile justice (Florida, Texas, New York, Kentucky, and Maryland) that capture data on the trafficking status of children. However, these screening instruments and data fields are not specific to tracking illicit activities and would require substantial formative research to assess their suitability for this purpose.

Regardless of the approach taken, we anticipate that gaining access to this population will be more difficult than it will be for the other industries. Additionally, accurate reporting among potential participants may be more of an issue, and safety concerns must also be considered.

Table 3 Design Options, by Industry

Industry	Probability Sample	Respondent-Driven Sampling (RDS)/Link Tracing	Network Scale-Up Method (NSUM)	Time-Location Sampling (TLS)	Multiple Systems Estimation (MSE)
Direct care workers	# Multistage sample with agencies/ establishments as primary sampling unit and employees as secondary sampling unit for those employed by an agency (no sampling frame for those in less formal work arrangements)	+ Partner with unions or other advocacy groups in selected geographic area to identify seeds	~ Administer survey to multistage probability sample of direct care workers employed by an agency or RDS participants	= Workers are geographically dispersed in a community, and we do not anticipate that they would frequent specific venues	= No known data source focused on trafficked persons in this population
Childcare workers	# Multistage sample with agencies/ establishments as primary sampling unit and employees as secondary sampling unit for those employed by an agency (no sampling frame for those in less formal work arrangements)	+ Partner with unions or other advocacy groups in selected geographic area to identify seeds	~ Administer survey to multistage probability sample of childcare workers employed by agency or RDS participants	^ Childcare workers may congregate at parks and playgrounds that could be sampled. Formative research would be required to determine feasibility in a given geographic area. COVID-19 may affect congregation in public places.	= No known data source focused on trafficked persons in this population
Animal husbandry (chicken, egg, and dairy farms)	# Multistage sample with chicken, egg, and dairy farms as primary sampling unit and employees as secondary sampling unit	+ Partner with unions or other advocacy groups in selected geographic area to identify seeds	~ Administer survey to multistage probability sample of farmworkers or RDS participants	^ Physical isolation in rural areas may promote farmworkers' socializing in limited public locations (e.g., grocery stores and laundromats) that could be identified and sampled. Formative research would be required to determine feasibility in a given geographic area. COVID-19 may affect congregation in public places.	= No known data source focused on trafficked persons in this population
Construction (particularly after natural disasters)	+ Construction locations change frequently, but it may be possible to identify a sampling frame. Additionally, a geographic-based multistage sample may be feasible.	+ Partner with unions or other advocacy groups in selected geographic area to identify seeds. Work with city officials to identify contractors whose building bids are at significantly lower prices.	~ Administer survey to RDS participants	= Workers are geographically dispersed in a community, and we do not anticipate that they would frequent specific venues other than construction sites	= No known data source focused on trafficked persons in this population
Illicit activities (particularly among juveniles in gang activity)	= No sampling frame	+ Partner with child welfare or juvenile justice agencies, shelters, or survivor networks in selected geographic area to identify seeds	~ Administer survey to RDS participants	= Juveniles involved in gang activity may socialize in public locations but are not easily identifiable. Gaining access to this population may be particularly difficult. COVID-19 may affect congregation in public places.	^ Florida collects trafficking status on children through the juvenile justice system; however, additional work is needed to determine whether they have an adequate number of cases to support capture-recapture.
<div> <div>+ Feasible</div> <div># Feasible but with substantial limitations</div> <div>^ Potentially feasible, but formative research would be needed to make that determination</div> <div>~ Not advisable as a stand-alone method but can be included as part of another survey method</div> <div>= Not feasible</div> </div>					



OTHER CONSIDERATIONS FOR FIELD TESTING

SELECTION OF GEOGRAPHIC SCOPE

The decision on where to pilot test two human trafficking prevalence estimation methods is largely dependent on the industry and methods selected. For each of the industries, the location would need to be a place with an adequate number of workers to survey. Many of the methods will also require the availability of an adequate sampling frame; strong partnerships with local advocacy groups, unions, or government agencies; or both. After the industry selection is made, we will begin conducting outreach with the relevant stakeholders to determine where the study could be successfully conducted.

THE IMPACT OF COVID-19

COVID-19 has altered the landscape of some of the priority industries identified by OTIP for this project. For example, the childcare industry has been massively transformed by both daycare closures and the inability or unwillingness of families to send children to communal care facilities during the pandemic, which has led to large-scale permanent closures of daycare businesses (Hashikawa et al., 2020) and to families seeking long-term, less formal, home-based childcare options. The impact of these changes on the potential for labor trafficking or exploitation in childcare is not yet understood. Emerging research suggests that the scope of the changes in the childcare industry caused by the COVID-19 pandemic—including changes to both the supply and demand—may hamper our ability to sufficiently sample this population currently.

At the same time, COVID-19 has also brought the home health aide industry to public prominence; the health risks that these workers face as they continue to provide their services—especially to vulnerable older adults and people with disabilities—has been the subject of considerable attention (e.g., Sterling et al., 2020). It is possible that this shift presents a window of opportunity to better identify those who have been exploited in the industry. However, those whose exploitation meets the threshold of trafficking are likely to remain isolated and difficult to identify.

Other industries may be less affected by the pandemic, including construction and illicit activities by gang-involved youth. However, access to individuals involved in these industries is quite different, as construction happens out in the open and illicit activities are by nature hidden and covert.

It is worth considering the efficacy of potential methodologies during COVID-19 as well. TLS may not be an effective strategy in an age in which communal gatherings are discouraged.





RECOMMENDATIONS FOR FIELD TESTING

To select an industry and methods for field testing, we considered various aspects of feasibility as well as the rigor and range of appropriate sampling methodologies.

We have determined that applying probability-based sampling and link-tracing sampling methods to the construction industry offers the greatest opportunity to understand how well these methods capture human trafficking victimization in one industry, in one geographic location. Our rationale for this recommendation is as follows.

From a planning perspective, the most important factor is the labor sector in which the prevalence study is to be carried out. Whenever primary data are collected, access to the prospective population becomes a critical factor in determining whether the recruitment methods are feasible and operationally practical. Therefore, sampling design is most dependent, other factors equal, on the targeted labor sector.

We believe that the most practical labor sector to target for this project is the construction industry. This work largely occurs in outdoor, accessible settings. In addition

to being visible from the street or other public areas, construction sites are also known and registered with municipalities. These characteristics make probability-based sampling strategies possible. We believe the impacts of COVID-19 on the characteristics and functioning of the industry to be minimal, which makes planning this project more feasible.

There is a limited selection of methods for estimating the prevalence of human trafficking, all of which have limitations as well as strengths, and all of which have been applied in various contexts individually. Rarely have there been efforts to compare head-to-head two or more methods to gauge their relative rigors in precision and complexity (i.e., costs) in implementation. This project—to use two different sampling methodologies—represents an important opportunity to learn about prevalence estimation and our suggestion is to include both a probability-based sampling strategy and a more targeted, link-tracing strategy.

Because the target population in this study is highly skewed and often hidden, the so-called gold standard

in survey research—probability-based sampling—may be both difficult to implement and questionable as a benchmark for evaluation purposes. Yet, probability-based sampling is valuable in that it reduces sources of bias that may be introduced into the sampling procedure. Therefore, we recommend that one of the sampling strategies used in this study involve probability-based sampling. Briefly, we imagine that this sampling could involve a geographic sampling approach. For example, it is possible to develop, through a grid-type sampling approach, a map of all existing construction sites for a given geographic location. In this design, a grid would be applied to a map of the entire geographic location and pieces of the grid would be randomly selected for inclusion in the study. Following the approach used with migrant farmworkers in the 2019a study by Zhang and colleagues, we would randomly select segments of a city, and the field team would physically drive through each selected segment and map all construction sites. This map would serve as the sampling frame from which construction sites would be randomly selected to include in the study. The field team would redeploy to the sampled construction sites and approach a random sample of workers at each site (i.e., every n th worker at the selected sites) to participate in an interview.

Additionally, we recommend employing an RDS strategy. Specifically, we believe that link tracing is a promising method to use among construction workers, who often work in groups, have regular contact with other construction laborers, and are accessible to researchers because of the visible nature of their work. Using this method, we would devise a strategy to identify seed participants and then rely on RDS to identify subsequent study participants.

We also propose adding NSUM-type questions to piggyback on one of these primary methods. Although NSUM's reliability is questionable, it can be readily combined with more rigorous methods for little additional cost. Moreover, comparing NSUM with other approaches will provide additional evidence of its reliability (or lack thereof) and provide valuable insight to the field.

In conclusion, we believe (1) that employing traditional probability sampling and link-tracing sampling, with NSUM added as an additional tag-along methodology, will inform our understanding of the strengths and weaknesses of each method for measuring the prevalence of labor trafficking victimization and (2) that the construction industry offers the most realistic opportunity for success.



References

- Anderson, V. R., Kulig, T. C., & Sullivan, C. J. (2019). Estimating the prevalence of human trafficking in Ohio, 2014-2016. *American Journal of Public Health*, 109(10), 1396-1399. <https://doi.org/10.2105/AJPH.2019.305203>
- Atteraya, M. S., Ebrahim, N. B., & Gnawali, S. (2018). Determinants of child maltreatment in Nepal: Results from the 2014 Nepal multiple indicator cluster survey (the 2014 NMICS). *Child Abuse and Neglect*, 76, 400-407. <https://doi.org/10.1016/j.chiabu.2017.11.018>
- Bales, K., Hesketh, O., & Silverman, B. (2015). Modern slavery in the UK: How many victims? *Significance*, 16-25.
- Bales, K., Murphy, L. T., & Silverman, B. W. (2019). How many trafficked people are there in Greater New Orleans? Lessons in measurement. *Journal of Human Trafficking*, 6(4), 375-387. <https://doi.org/10.1080/23322705.2019.1634936>
- Ball, D., & Hampton, R. (2009). *Estimating the extent of human trafficking from Ukraine: Final report*. International Organization for Migration, with Financial Support from the United States Agency for International Development (USAID, IOM). Washington, DC: United States Agency for International Development.
- Belser, P., de Cock, M., & Mehran, F. (2005). *ILO minimum estimate of forced labour in the world*. Geneva, Switzerland: International Labour Office.
- Bercovitz, A., Moss, A., Sengupta, M., Park-Lee, E. Y., Jones, A., Harris-Kojetin, L. D., & Squillace, M. R. (2011). *An overview of home health aides: United States, 2007*. Hyattsville, MD: Centers for Disease Control.
- Bhatia, A., Krieger, N., Victora, C., Tuladhar, S., Bhabha, J., & Beckfield, J. (2020). Analyzing and improving national and local child protection data in Nepal: A mixed methods study using 2014 Multiple Indicator Cluster Survey (MICS) data and interviews with 18 organizations. *Child Abuse and Neglect*, 101, 104292. <https://doi.org/10.1016/j.chiabu.2019.104292>
- Bird, S. M., & King, R. (2018). Multiple systems estimation (or capture-recapture estimation) to inform public policy. *Annu Rev Stat Appl*, 5(1), 95-118. <https://doi.org/10.1146/annurev-statistics-031017-100641>
- Busch-Armendariz, N., Nale, N. L., Kammer-Kerwick, M., Kellison, B., Torres, M. I. M., Heffron, L. C., & Nehme, J. (2016). *Human trafficking by the numbers: The initial benchmark of prevalence and economic impact for Texas*. Austin, TX: The University of Texas at Austin, University of Texas Libraries.
- Cruyff, M., van Dijk, J., & van der Heijden, P. G. M. (2017). The challenge of counting victims of human trafficking. *Chance*, 30(3), 41-49.
- Curtis, R., Terry, K., Dank, M., Dombrowski, K., & Khan, B. (2008). The CSEC population in New York City: Size, characteristics, and needs. Center for Court Innovation.
- Dank, M., Vincent, K., Hughes, A., Dhungel, N., Gurung, S., & Jackson, O. (2019). Prevalence of minors in Kathmandu's adult entertainment sector. *Freedom Fund*.
- Datta, M. N., & Bales, K. (2013). Slavery in Europe: Part 1, Estimating the dark figure. *Human Rights Quarterly*, 35, 817-829.
- Edwards, J. M., Iritani, B. J., & Hallfors, D. D. (2006). Prevalence and correlates of exchanging sex for drugs or money among adolescents in the United States. *Sexually Transmitted Infections*, 82, 354-358.
- Ezoe, S., Morooka, T., Noda, T., Sabin, M. L., & Koike, S. (2012). Population size estimation of men who have sex with men through the network scale-up method in Japan. *PloS One*, 7(1), e31184. <https://doi.org/10.1371/journal.pone.0031184>
- Farrell, A., Dank, M., Kafafian, M., Lockwood, S., Pfeffer, R., Hughes, A., & Vincent, K. (2019). *Capturing human trafficking victimization through crime reporting*. Final Report submitted to the U.S. Department of Justice. Washington, DC: U.S. Department of Justice.
- Fletcher, L. E., Pham, P., Stover, E., & Vinck, P. (2007). Latino workers and human rights in the aftermath of Hurricane Katrina. *Berkeley Journal of Employment & Labor Law*, 28(1), 107-162.
- Gilbert, L., Reza, A., Mercy, J., Lea, V., Lee, J., Xu, L., Marcelin, L. H., Hast, M., Vertefeuille, J., & Domercant, J. W. (2018). The experience of violence against children in domestic servitude in Haiti: Results from the Violence Against Children Survey, Haiti 2012. *Child Abuse and Neglect*, 76, 184-193. <https://doi.org/10.1016/j.chiabu.2017.10.014>
- Greene, J. M., Ennett, S. T., & Ringwalt, C. L. (1999). Prevalence and correlates of survival sex among runaway and homeless youth. *American Journal of Public Health*, 89(9), 1406-1409. <https://doi.org/10.2105/ajph.89.9.1406>
- Hashikawa, A. N., Sells, J. M., DeJonge, P. M., Alkon, A., Martin, E. T., & Shope, T. R. (2020). Child Care in the Time of Coronavirus Disease-19: A Period of Challenge and Opportunity. *Journal of Pediatrics*, 225, 239-245. <https://doi.org/10.1016/j.jpeds.2020.07.042>

- Hernandez, T., & Gabbard, S. (2018). Findings from the National Agricultural Worker Survey (NAWS) 2016-2016: A demographic and employment profile of United States farmworkers. *JBS International*.
- Hipp, L., Kohler, U., & Leumann, S. (2019). How to implement respondent-driven sampling in practice: Insights from surveying 24-hour migrant home care worker. *Survey Methods: Insights from the Field*, 1-13. <https://doi.org/10.13094/SMIF-2019-00009>
- ICF International. (2012). *Children working in the carpet industry of Pakistan: Prevalence and conditions*. Report submitted to the U.S. Department of Labor, Office of Child Labor, Forced Labor and Human Trafficking. Washington, DC: U.S. Department of Labor, Office of Child Labor, Forced Labor and Human Trafficking.
- ICF Macro, Inc. (2012a). *Child labor in agriculture in the Northern Province of Rwanda*. Report submitted to the U.S. Department of Labor, Office of Child Labor, Forced Labor and Human Trafficking. Washington, DC: U.S. Department of Labor, Office of Child Labor, Forced Labor and Human Trafficking.
- ICF Macro, Inc. (2012b). *Child labor in the sugarcane industry in Paraguay*. Report submitted to the U.S. Department of Labor, Office of Child Labor, Forced Labor and Human Trafficking. Washington, DC: U.S. Department of Labor, Office of Child Labor, Forced Labor and Human Trafficking.
- International Labour Organization (ILO). (2012). *ILO global estimate of forced labour: Results and methodology*. Geneva, Switzerland: ILO, Special Action Programme to Combat Forced Labour.
- International Labour Organization (ILO), & Walk Free Foundation. (2017). *Global estimates of modern slavery: Forced labour and forced marriage*. Geneva, Switzerland: ILO.
- Jordan, L., Chui, C. H., Larmar, S., & O'Leary, P. (2020). Overcoming methodological challenges in prevalence studies in developing contexts with vulnerable children. *International Social Work*, 63(3), 371-385.
- Kadushin, C., Killworth, P., Bernard, H. R., & Beveridge, A. A. (2006). Scale-up methods as applied to estimates of heroin use. *Journal of Drug Issues*, 36(2), 417-440.
- Kazmirski, A., Keogh, P., Kumari, V., Maisie, R., Gowland, S., Purdon, S., & Khanum, N. (2009). Forced marriage: Prevalence and service response. In. Department of Children, Schools & Families (DCSF).
- Killworth, P. D., McCarty, C., Bernard, H. R., Shelley, G. A., & Johnsen, E. C. (1998). Estimation of seroprevalence, rape, and homelessness in the United States using a social network approach. *Evaluation Review*, 22(2), 289-308.
- Kruse, D. L., & Mahoney, D. (2000). Illegal child labor in the United States: Prevalence and characteristics. *Industrial and Labor Relations Review*, 54(1), 17-40.
- Levison, D., Hoek, J., Lam, D., & Duryea, S. (2007). Intermittent child employment and its implications for estimates of child labour. *Int Labour Rev*, 146(3-4), 217-251. <https://doi.org/10.1111/j.1564-913X.2007.00014.x>
- Levison, D., & Langer, A. (2010). Counting child domestic servants in Latin America. *Population And Development Review*, 36(1), 125-149. <https://doi.org/10.1111/j.1728-4457.2010.00321.x>
- Lyneham, S., Dowling, C., & Bricknell, S. (2019). *Estimating the dark figure of human trafficking and slavery victimization in Australia*. Australia: Australian Institute of Criminology.
- MacKellar, D. A., Gallagher, K. M., Finlayson, T., Sanchez, T., Lansky, A., & Sullivan, P. S. (2007). Surveillance of HIV risk and prevention behaviors of men who have sex with men--a national application of venue-based, time-space sampling. *Public Health Reports*, 122 Suppl 1(Suppl 1), 39-47. <https://doi.org/10.1177/00333549071220S107>
- Martin, L., McMorris, B., Johnston-Goodstar, K., & Rider, N. (2020). *Trading sex and sexual exploitation among high school students: Data from the 2019 Minnesota Student Survey*. Minneapolis, MN: Women's Foundation of Minnesota.
- National Academies of Sciences, Engineering, and Medicine. (2019). *Estimating the prevalence of human trafficking in the United States. Proceedings of a workshop—in brief*. Washington, DC: The National Academies Press. <https://www.nap.edu/catalog/25550/estimating-the-prevalence-of-human-trafficking-in-the-united-states-considerations-and-complexities>
- Parks, A. C., Zhang, S., Vincent, K., & Rusk, A. G. (2019). The prevalence of bonded labor in three districts of Karnataka State, India: Using a unique application of mark-recapture for estimation. *Journal of Human Trafficking*, 5(3), 179-200.
- Phillips, A. R. (2017). *Commercial sexual exploitation: An analysis of prostitution in Kansas City*. Thesis in criminal justice and criminology. Kansas City, MO: University of Missouri-Kansas City.

Pinzon-Rondon, A. M., Cifuentes, L. B., Zuluaga, C., Botero, J. C., & Pinzon-Caicedo, M. (2018). Wealth, social protection programs, and child labor in Colombia: A cross-sectional study. *International Journal of Health Services*, 48(3), 535-548. <https://doi.org/10.1177/0020731417747421>

Salganik, M. J., Fazito, D., Bertoni, N., Abdo, A. H., Mello, M. B., & Bastos, F. I. (2011). Assessing network scale-up estimates for groups most at risk of HIV/AIDS: evidence from a multiple-method study of heavy drug users in Curitiba, Brazil. *American Journal of Epidemiology*, 174(10), 1190-1196. <https://doi.org/10.1093/aje/kwr246>

Salganik, M. J., & Heckathorn, D. D. (2004). Sampling and estimation in hidden populations using respondent-driven sampling. *Sociological Methodology*, 34, 193-239.

Shabbir, M. S., Siddiqi, A. F., Kassim, N. M., Mustafa, F., & Salman, R. (2020). A child labour estimator: A case of Bahawalpur Division. *Social Indicators Research*, 147, 95-109.

Sommerfelt, T. (2015). *Child fosterage and child domestic work in Haiti in 2014: Analytical report*. Fafo-report. Oslo.

Steinfatt, T. M., & Baker, S. (2011). *Measuring the extent of sex trafficking in Cambodia—2008. SIREN trafficking estimates*. United Nations Inter-Agency Project on Human Trafficking. New York, NY: United Nations.

Sterling, M. R., Tseng, E., Poon, A., Cho, J., Avgar, A. C., Kern, L. M., Ankuda, C. K., & Dell, N. (2020). Experiences of home health care workers in New York City during the coronavirus disease 2019 pandemic: A qualitative analysis. *JAMA Internal Medicine*, 180(11), 1453-1459. <https://doi.org/10.1001/jamainternmed.2020.3930>

United Nations Office on Drugs and Crime (UNODC). (2018a). *Monitoring Target 16.2 of the United Nations Sustainable Development Goals: Multiple systems estimation of the numbers of presumed victims of trafficking in persons: Ireland*. Research Brief. Vienna: UNODC.

United Nations Office on Drugs and Crime (UNODC). (2018b). *Monitoring Target 16.2 of the United Nations Sustainable Development Goals: Multiple systems estimation of the numbers of presumed victims of trafficking in persons: Romania*. Research Brief. Vienna: UNODC.

United Nations Office on Drugs and Crime (UNODC). (2018c). *Monitoring Target 16.2 of the United Nations Sustainable Development Goals: Multiple systems estimation of the numbers of presumed victims of trafficking in persons: Serbia*. Research Brief. Vienna: UNODC.

University of Georgia. (2020). *Estimating the prevalence of trafficking among homeless and runaway youth ages 14-25*. Final Report submitted to the National Institute of Justice. Washington, DC: National Institute of Justice.

van Dijk, J. V., & van der Heijden, P. G. M. (2016). *Research brief: Multiple systems estimation for estimating the number of victims of human trafficking across the world*. Geneva, Switzerland: United Nations Office on Drugs and Crime.

Vincent, K., & Thompson, S. (2017). Estimating population size with link-tracing sampling. *Journal of the American Statistical Association*, 112(519), 1286-1295.

Vincent, K., Zhang, S. X., & Dank, M. (2019). Searching for sex trafficking victims: Using a novel link-tracing method among commercial sex workers in Muzaffarpur, India. *Crime & Delinquency*. <https://doi.org/10.1177/0011128719890265>

Williamson, C., Gezinski, L., & Trisha, S. (2010). *Ohio trafficking in persons study commission research and analysis sub-committee report on the prevalence of human trafficking in Ohio*. Submitted to Ohio Attorney General Richard Cordray.

Zhang, S. X., Barrick, K., Evans, B., Weber, R., McMichael, J., Mosquin, P., Vincent, K., & Ramirez, D. (2019a). *Labor trafficking in North Carolina: A statewide survey using multistage sampling*. Final Report submitted to the U.S. Department of Justice. Washington, DC: U.S. Department of Justice.

Zhang, S. X., Dank, M., Vincent, K., Narayanan, P., Bharadwaj, S., & Balasubramaniam, S. M. (2019b). Victims without a voice: Measuring worst forms of child labor in the Indian State of Bihar. *Victims & Offenders*, 14(7), 832-858.

Zhang, S. X., Spiller, M. W., Finch, B. K., & Qin, Y. (2014). Estimating labor trafficking among unauthorized migrant workers in San Diego. *Annals of the American Academy of Political and Social Science*, 653, 65-86.