MODERN SLAVERY PREVALENCE ESTIMATION IN THE UK

A SCOPING REVIEW

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University of Nottingham Rights Lab

Independent Anti-Slavery Commissioner

Foreword by Eleanor Lyons, the Independent Anti-Slavery Commissioner

Evidence and data are the foundation of effective policymaking and practice in the fight against modern slavery. Yet despite considerable efforts across the anti-slavery sector including important contributions from academia, charities, and statutory bodies, significant gaps in our understanding of modern slavery in the UK remain.

The hidden and complex nature of this crime makes it difficult to measure. But without robust and reliable prevalence estimates, our national response risks being misinformed. If we do not know how many people are being exploited, where, or in what ways, we cannot target our resources effectively, nor can we uphold our moral and legal commitments to victims and survivors. Too many remain uncounted and unsupported which is why I made the development of a stronger evidence base a central pillar of my Strategic Plan for 2024–2026. A key part of this work involves supporting and commissioning research that can shed light on the scope, scale, and nature of modern slavery.

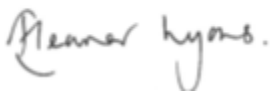
This scoping review by the Rights Lab represents a vital contribution to that evidence base. It provides a comprehensive and timely assessment of the methodologies available for estimating modern slavery prevalence in the UK. It critically evaluates a wide range of approaches from Multiple Systems Estimation (MSE) to survey-based methods, to emerging innovations such as Natural Language Processing (NLP), geospatial analysis, and machine learning.

The review demonstrates clearly that while no single method will capture the full complexity of modern slavery in the UK, different methods can be applied strategically to estimate prevalence across the broad umbrella of modern slavery offences and within specific subpopulations. The report also highlights the considerable data assets we already hold in the UK, while making the case for better integration, ethical governance, and survivor-informed approaches to research.

Importantly, the review echoes and strengthens the need for the creation of a modern slavery and human trafficking data hub, a vital tool for enabling inter-agency data sharing and analysis. Such a resource could not only underpin regular prevalence estimations but also support the development of national risk maps, help identify patterns of vulnerability, and enable more targeted and effective policy responses.

Looking ahead, I will be expanding my focus to look at emerging threats by identifying and analysing trends in modern slavery across short, medium and long-term timeframes. This work will aim to provide early-warning intelligence and practical foresight tools to inform disruption strategies before patterns of harm become entrenched. The insights and methodological recommendations set out in this report will be instrumental in shaping that agenda, offering both the analytical foundations and data-driven approaches required to anticipate and address the evolving nature of modern slavery in the UK.

I urge policymakers to give serious consideration to the recommendations set out in this review and to embed them within the UK's wider strategic response to modern slavery. Strengthening our national evidence base must be treated as a priority to enable better-targeted interventions and improved outcomes for victims and survivors. Robust prevalence estimation is not just a research ambition; it is essential to addressing the true scale and nature of exploitation in the UK both now and in prevention of future harms.



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The Rights Lab is the world's leading modern slavery research institute and home to the largest group of modern slavery scholars in the world. The Rights Lab is committed to identifying evidence-based strategies for abolition and to embedding survivor-informed research through our long-running INSPIRE project (Involving Survivors of Slavery in Policy & Intervention Research), which works across all of the Lab's research programmes. Research for this report is supported by funding from Research England Quality-related Research (QR) Policy Support Funding as allocated through the Institute for Policy and Engagement at the University of Nottingham and the UK Independent Anti-Slavery Commissioner's (IASC) Office. The content of this report also draws on evidence submitted by the Rights Lab to the UK House of Lords Modern Slavery Act 2015 Committee (Session 2024-2025).

List of Acronyms

AAAS	American Association for the Advancement of Science
ADR UK	Administrative Data Research UK
DOMV	Determinants of Migrant Vulnerability
DSIT	Department for Science, Innovation, and Technology
ECAT	Council of Europe Convention on Action against Trafficking in Human Beings
EO	Earth Observation
ESRC	Economic and Social Research Council
FMU	Forced Marriage Unit
GCMS	Global Commission on Modern Slavery and Human Trafficking
GFEMS	Global Fund to End Modern Slavery
GSI	Global Slavery Index
HRDAG	Human Rights Data Analysis Group
IASC	UK Independent Anti-Slavery Commissioner
IOM	International Organisation for Migration
LA	Local Authorities
LLM	Large Language Models
LTS	Link-tracing Sampling
MSA	UK Modern Slavery Act 2015
MSE	Multiple Systems Estimation
NDL	National Data Library
NGO	Non-Governmental Organisation
NLP	Natural Language Processing
NRM	National Referral Mechanism
NSUM	Network Scale-Up Method
ONS	Office for National Statistics
OSEC	Online Sexual Exploitation of Children
RDS	Respondent Driven Sampling
SARs	Suspicious Activity Reports
SCAS	Serious Crime Analysis Section
SE	Standard Error
SDR UK	Smart Data Research UK
TLS	Time-Location Sampling
UKRI	United Kingdom Research and Innovation
UKDS	UK Data Service
USS	Understanding Society
USTIP	United States Trafficking in Persons Office
ViCLAS	Violent Crime Linkage Analysis System

Executive Summary

1. The phenomenon of modern slavery, its victims and survivors, constitutes a seldom heard, hidden population comprised of UK and foreign nationals across an expanding set of modern slavery offences. There is support for and recognition of the need for regular modern slavery prevalence estimations for the UK to inform HMG legislation, policy formulation, and budget allocation for law enforcement, prosecution, and survivor support programmes. This support includes that of the UK Independent Anti-Slavery Commissioner, who has formally set out the need for UK prevalence estimations in her strategy for 2024-2026.

2. Prevalence estimation involves the production of a scientifically and statistically robust estimates of the number, proportion, and ratio of individuals in some form of modern slavery and human trafficking within a given study population, which seeks to minimize bias and uncertainty and that can be replicated over time. There have been five prevalence estimations of modern slavery in the UK:
    a. 2014 estimation of 9,547-13,181[1]
    b. 2014 estimation of 8,300[2]
    c. 2018 estimation of 136,000[3]
    d. 2018 estimation of 99,469[4]
    e. 2023 estimation of 122,000[5]

3. The variation in prevalence estimations between 2014 and 2023 ($8{,}300 \leq n \leq 136{,}000$) is explained by several factors:
    a. Differences in the definition of modern slavery and the practices that comprise it, including forced labour, forced marriage, and human trafficking.
    b. The use of different prevalence estimation methods, including multiple systems estimation (MSE), secondary vulnerability modelling and extrapolation of household survey data, and Natural Language Processing (NLP) modelling of West Midlands police records with extrapolation to the whole of the UK.

4. There is a wide range of methods available for modern slavery prevalence estimation for the United Kingdom:
    a. Multiple systems estimation (MSE)
    b. Sampling and surveys
    c. Natural Language Processing (NLP) and Large Language Models (LLMs)

5. There is no single best method for prevalence estimation, but different methods for estimating prevalence of victims of the many offences comprising the

[1] Bales, K., Hesketh, O., and Silverman, B.W. (2015) 'Modern slavery in the UK: How many victims?' *Significance*, 12 (3): 16-21.
[2] Walk Free (2014) *Global Slavery Index 2014*: 18; available online: Link
[3] Walk Free (2018) *Global Slavery Index 2018*: 180; available online: Link
[4] NDAS (2018) *Modern Slavery Estimation*: 23.
[5] Walk Free (2023) *Global Slavery Index 2023*: 205; available online: Link

umbrella concept of modern slavery, as well as different methods for estimating victims and perpetrators of modern slavery offences within subpopulations of the UK.

6. There are vast sources of data and a well-developed data infrastructure in the UK that can be used for modern slavery prevalence estimation that currently remain siloed and fragmented. There is also a wide range of opportunities to use data science, artificial intelligence (AI), earth observation (EO), remote-sensing, machine learning, and geospatial analytical techniques to provide meaningful insights into the risk and vulnerability factors related to modern slavery that can extend and enhance our understanding *beyond* prevalence.

Recommendations

Methodological Recommendations

1. The most cost-efficient and least-biased method for estimating the prevalence of modern slavery understood in its 'umbrella' form in the UK is multiple systems estimation (MSE), using the data held by the UK Home Office in the National Referral Mechanism alongside other data sources held by Local Authorities (LAs) for individuals identified as victims who chose not to be referred into the NRM.

2. Sampling and survey approaches should be used for modern slavery prevalence estimation for specific kinds of modern slavery offences across different subgroups within the UK, which adhere to the following key principles of sampling and survey design.
    a. Key principles for sampling choices:
        i. Adhere as much as possible to the random probability sampling where possible.
        ii. Find suitable adjustments and estimators for non-random samples.
        iii. Have a well-defined target population with a sampling strategy that best addresses the target population.
    b. Key principles for survey design:
        i. Secure informed consent from all respondents and provide guarantees through data management plans and robust ethical protocols to protect data privacy and avoid re-identification of individuals.
        ii. Include survivors and those with lived experience in the co-design of the survey.
        iii. Clearly specify the type of modern slavery offence that is being measured.
        iv. Use simple and unambiguous questions that capture indicators for the type of modern slavery offence being measured.

v. Include questions that capture respondents' socio-economic and demographic data alongside other possible drivers and confounding factors associated with the type of offence.
vi. For network models (e.g., link-tracing or network scale-up, NSUM) include questions on personal network size and knowledge of the number of victims known within these personal networks.

3. The UK should produce triennial[6] estimations of modern slavery prevalence to provide up to date understanding of the nature and extent of modern slavery.

Recommendations for Government

4. In order to be able to use the NRM data for MSE, the Home Office should amend the current data ingestion process and case management system so that multiple referrals for the same person are no longer merged into a single record and that the different sources of the referrals are maintained.

5. The Department for Science, Innovation, and Technology (DSIT), through its Government Digital Service, should establish a modern slavery and human trafficking data warehouse[7] for inter-agency sharing, collating, and analysis for detailed insights into prevalence, risk, and vulnerabilities of modern slavery. This data warehouse could form part of the UK Government's plan to establish a National Data Library (NDL) and build on the extant UK data infrastructure, including the UK Data Service, Administrative Data Research (ADR), Smart Data Research (SDR), and other data collections.

6. The Department for Science, Innovation, and Technology (DSIT), through its Government Digital Service, should also engage in building modern slavery risk maps that harness the vast sources of data available at high levels of spatial resolution to provide greater understanding of the economic, demographic, and social geographies of modern slavery risk to inform modern slavery policy development and resource allocation.

[6] Undertaking an annual prevalence estimate may be unlikely for time and cost reasons. Triennial estimates would be frequent enough to still enable useful comparisons across the years.
[7] The idea for a modern slavery and human trafficking data warehouse has been inspired by the human trafficking data warehouse at Southern Methodist University (SMU) in Texas, funded initially by the US National Institute of Justice, see https://www.smu.edu/dedman/research/htdr/about.

Overview and Approach

This report is based on: (1) a review of extant studies (*n* = 46) in the English-language literature that have estimated prevalence of modern slavery and human trafficking in the UK and other country contexts around the world;[8] (2) an assessment of the strengths and weaknesses of different prevalence estimation methods; (3) a meeting of the IASC Data Advisory Group; (4) a stakeholder survey (*n* = 93);[9] (5) workshops with public sector CEOs and Deputy CEOs as part of the Cabinet Office Leadership College for Government (*n* = 50);[10] and (6) a collation of data sources for prevalence estimation and risks of modern slavery and human trafficking in the UK (*n* = 57).[11] The different elements of this approach provide a state-of-the-art review, which draws on the methodological options and lessons learned from other country contexts, the lessons learned from the UK, the views of a wide range of stakeholders in the UK and internationally, and a mapping of extant data sources in the UK.

Introduction and Background

Before the passage of the UK Modern Slavery Act 2015, two different modern slavery prevalence estimations were carried out for the UK. First, using data from the National Referral Mechanism (NRM) under the auspices of the Council of Europe Convention on Action against Trafficking in Human Beings (ECAT) and the analytical technique known as multiple systems estimation (MSE), Bales, Hesketh, and Silverman estimated that there were between 9,547 and 13,181 people in modern slavery in the UK.[12] Second, using data from household surveys on forced labour and forced marriage, coupled with secondary vulnerability analysis, the anti-slavery non-governmental organisation (NGO) Walk Free extrapolated data from high prevalence countries to produce an estimate of 8,300 people in modern slavery in the UK.[13]

Prevalence estimation involves the production of a scientifically and statistically robust estimation of the number, proportion, and ratio of individuals in some form of modern slavery and human trafficking within a given study population, which seeks to minimize bias and uncertainty and that can be replicated over time. With any estimation, there will always be a range of values, where the true number lies somewhere between the lowest estimated and highest estimated values, also known as the confidence interval.[14] Producing such estimations is fraught with methodological challenges, including those involving conceptual and definitional

[8] See Appendix 1 for a list of the studies.
[9] See Appendix 2 for the full list of survey questions.
[10] See Appendix 3 for the full list of organisations that took part in the College.
[11] See Appendix 4 for the full list of data sources.
[12] Bales, K., Hesketh, O., and Silverman, B.W. (2015) 'Modern slavery in the UK: How many victims?' *Significance*, 12 (3): 16-21.
[13] Walk Free (2014) *Global Slavery Index 2014*: 18; available online: https://cdn.walkfree.org/content/uploads/2014/02/09122630/2014-Global-Slavery-Index.pdf.
[14] In capturing the range of values within which the true value in the population resides, analysis typically uses 95% confidence, such that across repeated estimates, the true would be within these ranges 95% of the time. See, e.g., Lohr, S.L. (2022) *Sampling: Design and Analysis*, London: CRC Press: 381-384.

clarity, data availability, the hidden nature of the phenomena, the need for advanced methodological and statistical techniques, and the ability to make robust inferences from typically incomplete or biased samples of data.[15]

The Bales et al. estimation provided the evidence base that helped contribute to parliamentary debates that ultimately led to the passage of the UK Modern Slavery Act 2015.[16] Since its passage, there have been repeated calls for new estimations to be produced. Various members and formal committees in the House of Commons and the House of Lords, anti-slavery non-governmental organisations, policy makers, academics, and others have made the argument that the UK needs prevalence estimations to provide greater understanding of the true nature and extent of the challenge of modern slavery. Since the passage of the MSA 2015, the number of practices that fall under the umbrella concept of modern slavery has increased, where in 2017 the UK Home Office produced a typology of modern slavery comprising 17 different modern slavery offences across four categories with four dimensions based on a review and analysis of a selection of cases (n = 250) within the NRM and selected records of convicted offenders (n = 78).[17] This expansion in the number of offences, coupled with increased awareness of the issue of modern slavery, necessarily mean that any new prevalence estimation will very likely be much larger than the original estimate of 10,000-13,000.[18]

Since 2015, there have been further modern slavery prevalence estimations for the UK. First, using its household survey and vulnerability modelling approach, Walk Free estimated the number of people in modern slavery in the UK to be 136,000 in 2018 and 122,000 in 2023;[19] however, the methods underpinning these estimations have been changed, rendering any like-for-like comparisons over time problematic. Second, analysts applied a Natural Language Processing (NLP) approach to West Midlands police log records, the results of which were then scaled up to the whole of the UK to estimate a total of 99,469 people in modern slavery.[20]

Table 1. *Modern Slavery Prevalence Estimations for the UK, 2014-2023*

Date	Method of Estimation	Findings
2014	Multiple Systems Estimation	9,647 < *N*< 13,181

[15] Landman, T. (2020) 'Measuring Modern Slavery: Law, Human Rights, and New Forms of Data,' *Human Rights Quarterly*, 42 (2): 303-331; available online: https://muse.jhu.edu/article/754938/; see also Landman, T., Fitzgerald, T. and Boyd, D. (2025) 'Challenges of Prevalence Estimation in Human Trafficking Research,' paper presented at the Annual Meeting of the Law and Society Association, Chicago, 22-25 May 2025, available upon request.
[16] Landman, T., Brewster, B., Thornton, S. (2024) 'Taking Back Control: Human Rights and Human Trafficking in the United Kingdom,' *Societies* 14: 47. https://doi.org/10.3390/soc14040047.
[17] Cooper, C., Hesketh, O., Ellis, N., and Fair, A. (2017) *A Typology of Modern Slavery Offences in the UK, Research Report 93*, Home Office; available online: https://assets.publishing.service.gov.uk/media/5a822a42e5274a2e8ab57d66/typology-modern-slavery-offences-horr93.pdf.
[18] Indeed, a review of the cases in the NRM used for the original estimate shows that that the victims were primarily female non-UK nationals involved in sex trafficking. This narrow focus of cases is likely owing to the UK establishing the NRM as part of its legal obligations under the Council of Europe Convention on Action against Trafficking in Human Beings (ECAT). Moreover, the NRM had 17,004 potential cases of modern slavery by December 2023, and 19,125 cases by the end of December 2024.
[19] Walk Free (2018) *Global Slavery Index 2018*; Walk Free (2023) *Global Slavery Index 2023*.
[20] NDAS (2018) *Modern Slavery Estimation*: 23.

2014	Survey extrapolation	*N* = 8,300
2018	Survey extrapolation	*N* = 136,000
2018	Natural Language Processing (NLP)	*N* = 99,469
2023	Survey extrapolation	*N* = 122,000

These differences across these five prevalence estimations (see Table 1) demonstrate that there is currently no agreed national consensus on the number of people in modern slavery in the UK, while it is reasonable to argue that there are increasing sources of data and the development of multiple methods for producing new (and we argue regular) prevalence estimations that would be of great value to the anti-slavery community, policy makers, and law enforcement bodies. Modern slavery prevalence estimation in the UK should be seen as in its infancy and in need of further methodological development.

This report contributes to the issue of modern slavery and human trafficking prevalence estimation in several important ways. First, it provides a review of extant prevalence estimation studies in the UK and other country contexts around the world with a view to providing greater understanding and clarity surrounding available methods and analytical techniques. Second, it provides an assessment of different methods for prevalence estimation for the UK, including multiple-systems estimation (MSE), sampling and survey-based approaches, and natural language processing (NLP). Third, it assesses the data landscape and infrastructure in the UK for sources that can be integrated and analysed both for prevalence estimation and for systematic analysis that moves *beyond* prevalence, including geospatial risk and vulnerability mapping. Finally, it provides a set of recommendations for how prevalence estimation in the UK can be made more standardised, regularised, transparent, and replicable.

Problem Definition

Modern slavery emerged in the 1990s as an umbrella term and framing device[21] to capture a group of extreme exploitative practices.[22] The UK Modern Slavery Act 2015 does not define modern slavery; however, the statutory guidance that accompanies the act draws on legal definitions drawn from (1) the 1926 Slavery Convention, (2) the 1930 ILO Forced Labour Convention, (3) the 2000 United Nations (UN) Protocol to Prevent, Suppress and Punish Trafficking in Persons Especially Women and Children, supplementing the United Nations Convention against Transnational Organized Crime (The Palermo Protocol), and (4) the 2012 Bellagio-Harvard Guidelines on the Legal Parameters of Slavery. The UK Home Office and Office for National Statistics (ONS) focus on five main offences as part of the understanding of modern slavery:

1. Labour exploitation
2. Sexual exploitation
3. Domestic servitude
4. Criminal exploitation
5. Organ harvesting

This list of offences is not a precise definition of modern slavery but delineates a series of modern slavery offences or practices. A recent report on modern slavery and the United Nations Security Council offers the following expanded definition:

> *Modern slavery is an umbrella term used to describe a set of related exploitative practices … [that] encompass a range of different forms of exploitation—many of which have their own established definitions in international law—each of which have an identifiable connection to modern slavery. This includes slavery, servitude, institutions and practices similar to slavery, forced or compulsory labour, trafficking in persons, forced marriage, and the recruitment or use of children in armed conflict.*[23]

This summary includes forced marriage and child soldiers, where for the UK context, only forced marriage is relevant.[24] Modern slavery victims can suffer the harms and circumstances associated with one or more of the different practices

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[21] Snow, D. A. and Benford, R.D. (1988) 'Ideology, Frame Resonance, and Participant Mobilization,' *International Social Movement Research*, 1: 197-215; Benford, R.D. (1997) 'An Insider's Critique of the Social Movement Framing Perspective,' *Sociological Inquiry*, 67 (4): 409-430.

[22] Bales, K. (1999) *Disposable People: New Slavery in the Global Economy*, Berkeley, CA: University of California Press; Quirk, J. (2011) *The Anti-Slavery Project: From the Slave Trade to Human Trafficking*, Philadelphia, PA: University of Pennsylvania Press; Landman, T. and Garrington, C. (2022) *The Rights Track: Sound Evidence on Human Rights and Modern Slavery*, London and New York: Anthem Press.

[23] Free the Slaves and Rights Lab (2024) *Modern Slavery and the United Nations Security Council: Summary Report*, Washington DC: Free the Slaves and University of Nottingham: Rights Lab, available online: https://freetheslaves.net/un-security-council-research/.

[24] Forced marriage does occur within the UK, while the use of child soldiers does not; however, there are cases of foreign nationals who have been child soldier victims. The UK's Forced Marriage Unit (FMU) collects data on instance of forced marriage. See, e.g., Rights Lab (2023) *Briefing: The Forced Marriage Unit's 2022 Statistics*, University of Nottingham: Rights Lab, available online: https://www.nottingham.ac.uk/research/beacons-of-excellence/rights-lab/resources/reports-and-briefings/2023/july/briefing-the-forced-marriage-unit's-2022-statistics.pdf. The practice of using child soldiers is highly prevalent across the world, particularly in country contexts that are experiencing inter-state and intra-state violent conflict. See, e.g., Alfredson, L.S. (2023) Child soldiers as contemporary slaves: A human rights approach, *Journal of Human Rights*, 22 (3): 307-333.

set out in this definition over the short, medium, or long term, and they can escape such circumstances as well as return to them.

Potential victims in the NRM include those who experienced modern slavery within the UK or outside the UK.[25] Knowledge about these harms and circumstances, however, remains partial, biased, incomplete, and unrepresentative of the full nature and extent of these different modern slavery practices, a problem evidenced by the fact that many potential victims refuse to be referred into the NRM, where between 2016 and 2024, there has been a significant increase in Duty to Notify (DtN) reports relative to NRM referrals.[26] Victims of modern slavery are refusing to be referred into the NRM due to fear of immigration repercussions (specifically the fear of detention and deportation), a more general fear of authorities, the inability to self-identify as a victim, a lack of understanding about what the NRM is and what support will be provided, and the questionable benefit of the NRM system.

Furthermore, DtN reports do not represent an accurate reflection of the 'number of victims encountered who do not enter the NRM' and that some authorities with first responder responsibility keep their own records of potential victims outside the NRM and the DtN.[27] First responders do not always complete a DtN form due to time constraints, as well as a lack of awareness and guidance on the DtN process. For the purposes of this report, modern slavery victims are thus often understood to be 'hidden,' 'hard-to-find,' 'elusive,' or 'hard-to-detect' populations some of whom are known and some of whom are not known.[28] Any programme of systematic research seeking to determine the number and proportion of modern slavery victims in the UK must confront what social scientists and statisticians call 'the fundamental problem of unobservability.'[29]

Methodological advances since the late 19th century until today across a wide range of disciplines and topic areas have improved our ability to estimate the prevalence of such populations and overcome many of the challenges associated with their hidden nature. The building blocks of these methods include (1) a sample (or samples) from a known population, (2) data capture relevant to the population, (3) specification of the different practices and harms that constitute modern slavery, (4) the production of statistical inferences from the sample to a larger unknown population, and (5) the use of methods that maximise the certainty and minimize the uncertainty (or error) in producing estimations of prevalence (See Figure 1). These building blocks represent the 'evidence-inference methodological core'[30] of

[25] Rights Lab, Wilberforce Institute, Centre for the Study of International Slavery, Modern Slavery and Human Rights Policy and Evidence Centre (2021) The Top 20 Source Countries for Modern Slavery Victims in the UK, University of Nottingham: Rights Lab, available online: https://www.nottingham.ac.uk/research/beacons-of-excellence/rights-lab/resources/reports-and-briefings/2021/april/the-top-20-source-countries-for-modern-slavery-in-the-uk.pdf.
[26] Rights Lab and IASC (2025) *Refusal to Consent: Factors Influencing the Uptake of Modern Slavery Support under the National Referral Mechanism*, University of Nottingham: Rights Lab and London: The UK Independent Anti-Slavery Commissioner (IASC), available online: https://www.nottingham.ac.uk/research/beacons-of-excellence/rights-lab/documents/reports-and-briefings/2025/april/refusal-to-consent-final-report.pdf.
[27] *Ibid*, p. 11, 14.
[28] Thompson, S. K. (2012) *Sampling, Third Edition*, Hoboken, NJ: Wiley, pp. 199-282.
[29] Landman, T. (2020) 'Measuring Modern Slavery: Law, Human Rights, and New Forms of Data,' *Human Rights Quarterly*, 42 (2): 303-331; available online: https://muse.jhu.edu/article/754938/.
[30] Almond, G. (1990) *A Discipline Divided: Schools and Sects in Political Science*, Newbury Park, CA: Sage Publications, p. 52.

prevalence estimation and are part of the general social science acceptance of the 'ubiquity of uncertainty.'[31]

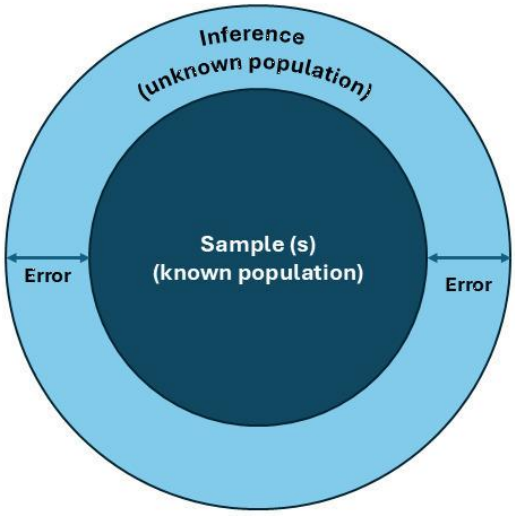

***Figure 1**. Samples, inference, and uncertainty*

[31] Cioffi-Revilla, C. (1998) *Politics and Uncertainty: Theory, Models and Application*, Cambridge: Cambridge University Press, 7: '...uncertainty is ineradicable, because nothing humanly possible can be done to eliminate it.'

Research Questions

There are several fundamental research questions that have been and could be answered through robust prevalence estimation. Depending on data availability and data quality, providing answers to these questions can be of great help to modern slavery researchers, anti-slavery non-governmental organisations, survivors,[32] law enforcement agencies, government agencies, policymakers, and private corporations.[33] The questions here do not constitute an exhaustive list but do include many questions that remain unanswered at present.

1. How many victims of modern slavery are there in the UK?
2. How many victims of different modern slavery offences are there in the UK?
3. What is the number of male and female victims of modern slavery in the UK?
4. What are the differences in the age profile of victims of modern slavery in the UK?
5. What is the number of UK and non-UK victims of modern slavery in the UK?
6. What is the breakdown by nationality of the number of victims of modern slavery in the UK?
7. What is the number of victims of modern slavery by police jurisdiction in the UK?
8. What is the geospatial distribution of victims of modern slavery in the UK?
9. What is the prevalence of modern slavery across different industries and economic sectors?
10. How does the prevalence of modern slavery in the UK change over time?

These and other research questions clearly involve different levels of analysis, broad umbrella concepts of modern slavery, specific modern slavery offences, and differences in prevalence across groups and other characteristics and attributes. These overarching concepts and breakdowns are amenable to social scientific and statistical inquiry across the many different methods of prevalence estimation set out in this review.

[32] The Rights Lab hosted two workshops with its Survivor Research Advisory Group (SRAG) on the topic of prevalence estimation. In the first workshop, survivors were sceptical of the value of prevalence estimations, arguing that in many ways, such efforts are 'redundant' since they are already aware of their own experiences, and they expressed concerns that prevalence estimation projects divert limited resources away from other much-needed areas of support. In the second workshop, survivors engaged in a series of prevalence estimation exercises and then participated in a debate on the arguments for and against prevalence estimation. The debate revealed that earlier scepticism from the group was tempered by a greater understanding of the value of prevalence estimation in combatting modern slavery in the UK.

[33] Among policy makers, parliamentarians, and private corporations there is recognition that there need to be greater efforts to analyse the presence and prevalence of forced labour (a form of modern slavery) in the complex and 'non-linear' UK supply chains. See, e.g., Joint Committee on Human Rights (2025) *Forced Labor in UK Supply Chains, Sixth Report of Session 2024-2025*, HC 633/HL Paper 159, available online: https://committees.parliament.uk/publications/49011/documents/257592/default/.

The Case for Prevalence Estimation

In the UK, there has been a steady demand for modern slavery prevalence estimation, while many anti-slavery and anti-human trafficking organisations within the UK and outside the UK have made prevalence estimation a key part of their theories of change and programming, including the United States Office to Monitor and Combat Trafficking in Persons (TIP), the former Global Fund to End Modern Slavery (GFEMS), Freedom Fund, International Justice Mission, and Justice and Care.

There are a number of strong arguments for why prevalence estimation should be carried out. First, prevalence estimation can bring diverse actors in government, business, civil society, donor, technology, and other sectors together. Second, it can identify and solve definitional and other technical issues that otherwise might go unaddressed. Third, it can build relationships that last beyond the estimation itself and can spread and deepen practitioners' exposure to and understanding of different methodologies. Fourth, it can provide the necessary baseline data on the nature and extent of the problems of modern slavery and human trafficking, increased levels of information on perpetrators and victims, geospatial distributions of perpetrators and victims, and methods for providing endline data after a period of intervention to assess the relative contribution that anti-slavery and anti-trafficking efforts have made to the reduction in prevalence. Fifth, it can counter misinformation or disinformation on the scale and nature of the problem and accelerate the refinement of policies, programs, practices, and priorities, as well as inform advocacy and media campaigns and invigorate further research.

In our stakeholder survey for this review, we asked respondents the different ways in which they use or would like to use prevalence estimation, including (1) understanding the nature and extent of modern slavery nationally and internationally, (2) awareness raising, (3) policy making, (4) assessing the effectiveness of interventions, and (5) for research purposes. Figure 2 shows their different responses, broken down by the type of organisation, where there is considerable variation in the different uses of prevalence estimation, but a strong response from representatives from central government departments for using prevalence estimation to assess the effectiveness of interventions.

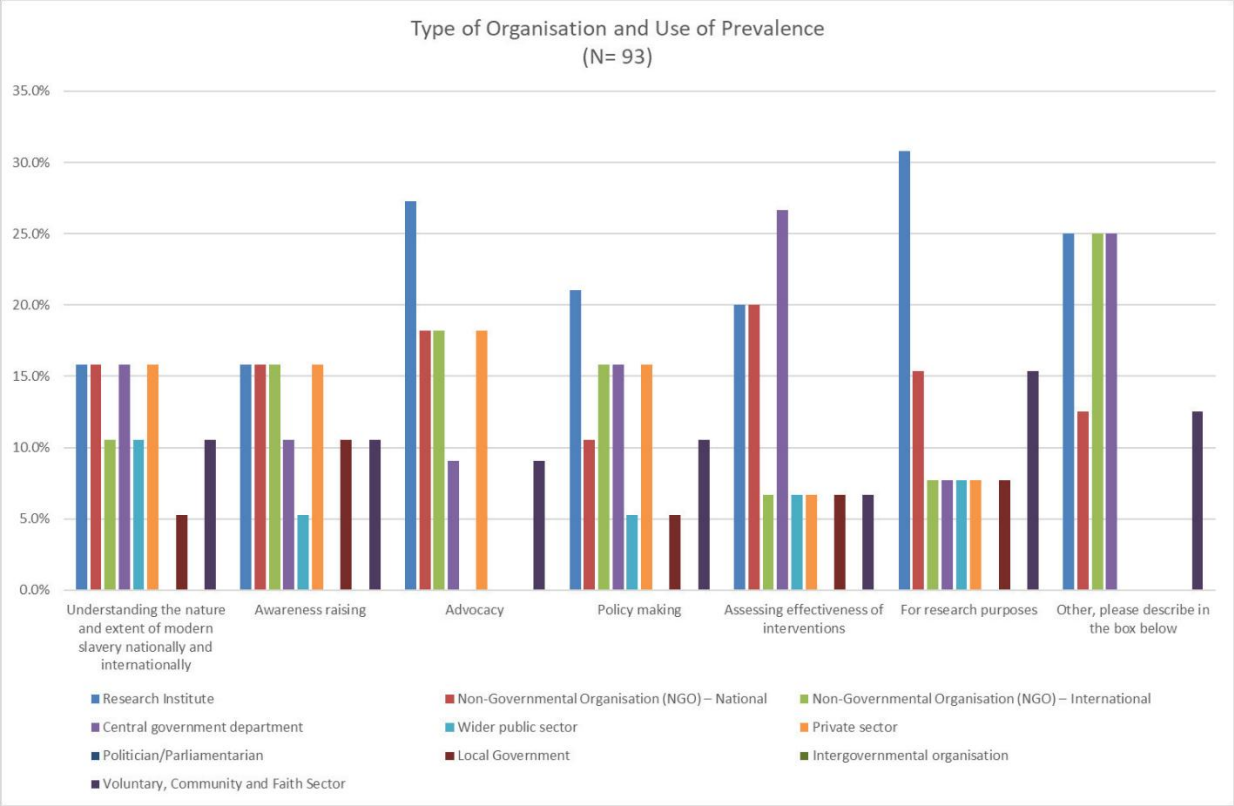

***Figure 2**. Main uses of modern slavery prevalence estimation by type of organisation*

Source: IASC and Rights Lab Stakeholder Survey (N = 93), May 2025.

Despite the views captured through this survey and a considerable array of research and studies, prevalence estimation for modern slavery and human trafficking is not without its critics. Critics argue that such efforts can be highly reductionist, abstract, and dehumanizing, since they represent human experience only through a simple set of numbers.[34] Quantification homogenizes, simplifies, and makes invisible the lived experience of victims and survivors.[35] Prevalence estimation studies can be extractive in diverting funding away from helping prosecutions, supporting survivors, and other programs of work dedicated to helping fight modern slavery and human trafficking. There thus remains unease and scepticism within survivor, scholarly, and practitioner communities about how such studies may risk doing more harm than good.[36]

There are also practical and ethical considerations. Prevalence studies are expensive, time consuming, technically demanding, and risky. The hidden and networked nature of modern slavery and trafficking offences demands advanced

[34] Alston, P. (ed.) (2024) *The Complexity of Human Rights: From Vernacularization to Quantification*, London: Bloomsbury.
[35] Lumley-Sapanski, A. and Schwarz, K. (2024) 'Constructive (in)visibility and the trafficking industrial complex: Leveraging borders for exploitation,' *Transactions of the Institute of British Geographers*, 00, e12739, available online: https://doi.org/10.1111/tran.12739.
[36] The Rights Lab has run two separate sessions on prevalence estimation with its Survivor Research Advisory Group (SRAG) and includes Live Experience Advisory Panels (LEAPs) in all of its research projects. Survivor feedback has included a mix of scepticism and critique but also a degree of healthy support for its prevalence work.

methodologies; the presence of perpetrators demands security precautions; the risk of harm to vulnerable people demands robust ethical protections; and the political ramifications of research focused on states' use (or lack of use) of power demand savvy relationship management and appropriate forms of communication.[37]

Table 2 summarises the main arguments for and against modern slavery prevalence estimation. Any prevalence estimation study should remain attentive to the concerns over the naïve use of its results, remain attentive to measures of uncertainty, and use prevalence estimation alongside other complementary sources of information.

Table 2. *The case for and against modern slavery prevalence estimation.*

The case for prevalence	The case against prevalence
Bring together a diverse range of actors	Reductionist, abstract, and dehumanizing
Identify and solve definitional and technical issues	Homogenizes, simplifies, and makes invisible
Build capacity among practitioners	Extractive and diverts funding
Allow for meaningful social change	Expensive, time consuming, and risky
Provide baseline and endline data	Technically and methodologically demanding
Increased information on perpetrators and victims	Security risks for researchers
Geospatial distributions and temporal trends	Possible harm to victims and survivors
Nature and extent of the problem	Politically challenging contexts
Inform advocacy efforts	Problems of error and uncertainty

[37] We are grateful to Terence Fitzgerald, Global Vice President, Program Quality and Measurement at International Justice Mission for sharing these insights with our team.

Review of Prevalence Estimations

This section of the report provides a high-level overview of the extant literature on modern slavery and human trafficking prevalence estimation. Across a total of forty-six (46) studies carried out between 2010 and 2025, the review focussed on the main research questions, the target population, the type of approach, the type of samples of data, and the final estimations.[38] The review primarily focussed on the approach and methodological innovations that have relevance to modern slavery prevalence estimation in the UK (see next section).

Table 3 summarizes these studies, which shows considerable geographical coverage ranging from the local to the global, different types of modern slavery and human trafficking, and considerable variation in the use of different prevalence estimation methods. The review focussed on the country and/or location of studies, the target population, the main methods adopted, the estimates themselves, and the main lessons and limitations that have emerged. Modern slavery and human trafficking prevalence estimation is a growing field of systematic research, which exhibits methodological innovation and an embrace of new technologies to provide more robust results and more useful insights for a wide range of stakeholders.

***Table 3**. Methodological characteristics of existing modern slavery and human trafficking prevalence estimation studies conducted between 2010 and 2025*

Methodological characteristic	Number of studies (*n*=46)
Geographical scope	
Global/Regional	8
Multi-national	2
National	16
Subnational	20
Type of modern slavery	
Human trafficking	19
Labour trafficking	11
Sex trafficking	5
Child labour exploitation	6
Sexual exploitation of children	7
Forced marriage	3
Domestic servitude	1
Primary estimation method	
Household surveys	19
Respondent driven sampling	5
Multiple systems estimation	4

[38] Barrick and Pfeffer (2021) carried out a scoping review of forty-four (44) sex and labour trafficking prevalence estimation studies published between 1999 and 2020, where there is considerable overlap with our source list and prevalence methods evaluation. See Barrick, K. and Pfeffer, R. (2021) 'Advances in Measurement: A Scoping Review of Prior Human Trafficking Prevalence Studies and Recommendations for Future Research,' *Journal of Human Trafficking*, 10 (1): 1-19; https://doi.org/10.1080/23322705.2021.1984721.

Time and location sampling	5
Network scale-up method	1
Hybrid/Other approaches	2

Note: some studies examine more than one type of modern slavery and human trafficking.

Beyond global studies, such as the *Global Slavery Index* (see below), we reviewed studies that include countries such as Australia, Bahrain, Dominican Republic, Haiti, Ireland, Kuwait, Malaysia, Nepal, The Netherlands, Oman, Pakistan, The Philippines, Qatar, Romania, Saudi Arabia, Singapore, Thailand, United Arab Emirates, and the United Kingdom. At the subnational level, we reviewed studies that include Bihar (India); the Northern Province of Rwanda; the State of Karnataka (India); Kathmandu Valley (Nepal); Muzaffarpur (India); Angeles City, Mabalacat, Manila City, Makati, Parañaque, Pasay and Quezon City (Philippines); and Phnom Penh, Siem Reap and Sihanoukville (Cambodia).

Within the United States, we reviewed studies that include Florida, Georgia, Minnesota, North Carolina, Ohio, and Texas. We reviewed further US studies that have focused on Greater New Orleans, Sacramento County, and San Diego. The different choices of geography and types of modern slavery and human trafficking are a function of advocacy, awareness, and funding, while the prevalence estimation methods were chosen as the most appropriate for the studies' target population, research questions, data availability, and geographical contexts.

Methods for Prevalence Estimation

Drawing on our review of existing studies, this section of the report reviews the available methods for modern slavery prevalence estimation in the UK, including (1) multiple systems estimation (MSE), (2) sampling and survey approaches, and (3) natural language processing (NLP) and Large Language Models (LLMs). This section of the report also addresses the ability to do 'out of sample' projections using machine learning and artificial intelligence (AI) techniques.

Multiple Systems Estimation (MSE)

Multiple systems estimation (MSE) has a long history in the field of statistics dating back to the 19th century, where it was used to estimate an unknown population of fish off the coast of Denmark.[39] The method is also known as 'multiple recapture census'[40] or 'capture-tag-recapture,'[41] and has been used to estimate the prevalence of 'hard-to-find' or 'closed' populations, including human populations, such as the number of children with a congenital anomaly, the number of volunteer organisations in small cities and towns, the number of drug addicts in the United States, and the number of crimes committed in a given area.[42]

The Human Rights Data Analysis Group (HRDAG)[43] has used the method to estimate the number of people killed in the civil war in Guatemala (1979-1982), the conflict in Peru (1980-2000),[44] the occupation of East Timor (1974-1999),[45] the number of people killed and the flow of refugees in the conflict in Kosovo (March to June 1999),[46] the number of killings, forced disappearances, kidnappings, and child soldiers in the conflict in Colombia (1985-2019),[47] and the number of deaths in

[39] Petersen, 'The yearly immigration of young plaice into the Limfjord from the German Sea, etc.' (1986) 6 *Report of the Danish Biological Station* 1–18.
[40] Cormack, R.M. (1968) 'The Statistics of Capture-Recapture Methods,' *Oceanography and Marine Biology: An Annual Review*, 6: 455-501.
[41] Ball, P., Asher, J., Sulmont, D., and Manrique, D. (2003) 'How many Peruvians have died? An estimate of the total number of victims killed or disappeared in the armed internal conflict between 1980 and 2000.' Washington DC: American Association for the Advancement of Science; Landman, T., (2006) *Studying Human Rights*, London: Routledge; Landman, T. and Carvalho, E. (2009) *Measuring Human Rights*, London: Routledge; Landman, T. (2020) 'Measuring Modern Slavery: Law, Human Rights, and New Forms of Data,' *Human Rights Quarterly*, 42(2): 303-331.
[42] Bishop, Y.M.M., Feinberg, S.E., and Holland, P.W. (1974)'Estimating the Size of a Closed Population,' Chapter 6 in *Discrete Multivariate Analysis: Theory and Practice*, MIT Press, pp. 229-256.
[43]Human Rights Data Analysis Group initially formed within the American Association for the Advancement of Science (AAAS), then moved to Palo Alto under the name of Benetech, and then re-emerged as an independent non-governmental organisation based in San Francisco, California: https://hrdag.org/.
[44] Ball. P., Asher, J., Sulmont, D., and Manrique, D. (2003) *How Many Peruvians Have Died? An Estimate of the Total Number of Victims Killed or Disappeared in the Armed Conflict between 1980 and 2000*, Washington DC: American Association for the Advancement of Science, 7, available online: https://www.aaas.org/sites/default/files/s3fs-public/Peru2003.pdf.
[45] Silva, R. and Ball, P. (2007) 'The Demography of Conflict-Related Mortality in Timor-Leste (1974-1999): Empirical Quantitative Measurement of Civilian Killings, Disappearances & Famine-Related Deaths', in J. Asher, D. Banks and F. Scheuren (eds.) *Statistical Methods for Human Rights*, New York: Springer.
[46] Ball, P. Betts, W., Scheuren, F., Dudukovich, J., and Asher, J. (2002) *Killings and Refugee Flow in Kosovo March-June 1999: A Report to the International Criminal Tribunal for the Former Yugoslavia*, Washington DC: The American Association for the Advancement of Science.
[47] Human Rights Data Analysis Group (HRDAG) (2022) *Informe metodológico del proyecto conjunto JEP-CEV-HRDAG de integración de datos y estimación estadistica*, 18 August 2022, Tables 1-4, pp. 10-11; available at: https://www.comisiondelaverdad.co/.

custody in Syria (2011-2023).[48] HRDAG has also used the method to estimate the number of police killings in the United States (2003-2009; 2011). The many methodological lessons from these different studies have applicability to the issue of prevalence estimation for modern slavery.

In the field of modern slavery research and policy, MSE has been used to estimate the number of victims in the UK (2010-2013),[49] the Netherlands (2016-2019),[50] Romania (2015-2016),[51] and New Orleans (2016).[52] Table 4 lists these different human rights and modern slavery prevalence estimations that have used MSE, including the location of the study, the number of sources that were used, the dates that are covered, and the final estimations, reported where available as their full range of the estimates. For our stakeholder survey, 39% of respondents know and understand the principles and operation of MSE for modern slavery prevalence estimation used for the 2014 estimation in the UK.[53]

***Table 4**. Prevalence estimations of human rights violations and modern slavery victims using multiple systems estimation (MSE)*

Location	Sources	Dates	Main findings
Guatemala	Truth commission 2 NGOs	1979-1982	119,300 < N < 145,000 killings during civil war
Peru	Truth commission 5 NGOs	1980-2000	61,007 < N < 77,532 killings during civil war 56,741 < N < 61,289; 61,462 < N < 75,387 (2019 estimations)
East Timor	Truth commission Household survey Graveyard records		90,000 < N < 124,000 killings during occupation by Indonesia
Kosovo	Border records Exhumations	March-June 1999	52,043 internally displaced people 1,316 people killed
Colombia	112 data sources	1985-2019	204,395 < N < 225,410 forced disappearances (1985-2016) 777,852 < N < 852,756 homicides (1985-2018) 74,768 < N < 92,849 kidnappings (1985-2019) 27,101 < N < 40,828 child soldiers (1990-2017)
Syria	8 lists	2011-2023	32,000 < N < 37,000
United States	Two lists	2003-2009; 2011	7,427 police killings (1,966 unreported)
United Kingdom	National Crime Agency	2010-2013	10,000 < N < 13,000 victims of modern slavery
The Netherlands	Six different lists	2016-2019	10,542 < N < 17,812 victims of modern slavery
New Orleans	Multiple lists	2016	650 < N < 1600 victims of modern slavery
Romania	Multiple lists	2015-2016	~1200 victims

[48] Gargiulio, M, Shah, T. and Price, M. (2024) 'Deaths in custody during the armed conflict in Syria, 2011-2023,' 10 December, San Francisco: Human Rights Data Analysis Group, available online: https://hrdag.org/report/20241210-deaths-in-custody.pdf.
[49] Bales, K., Hesketh, O., and Silverman, B. W. (2015) 'Modern Slavery in the UK: How Many Victims?' *Significance*, 12(3): 16-21.
[50] Van Dijk, J., Cruyff, M., and van der Heijden, P. (2021) *A Multiple Systems Estimation of presumed victims of human trafficking in the Netherlands during 2016-2019*.
[51] Van Dijk, J., Cruyff, M., and van der Heijden, P. (2018) 'Research Brief: 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' (United Nations Office for Drugs and Crime, 2018)
[52] Bales, K., Murphy, L.T., and 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.
[53] For the question, 'Do you know and understand multiple systems estimation ('MSE'), which was used to produce an estimate of human trafficking in the UK in 2014?' 42 of 68 respondents (62%) answered 'no' and 26 of 68 (39%) answered 'yes'.

Across all these examples of prevalence estimation, the projects collate existing lists of people identified as victims or potential victims of modern slavery, match the records of these people across the different lists using unique identifiers (known as record linkage), clean and build a unified database of victim records coded according to the lists in which they either appear or do not appear, and then use MSE to provide a point estimate with associated lower and upper bounds of the estimation (see Figure 3). It is very important to understand that MSE does not provide a precise number, but a range of numbers within which the most likely true number of people falls.[54] Thus, the estimation carried out for the UK ranges from 10,000 to 13,000, with the likely number of people for the period falling somewhere between these two values.

***Figure 3**. Data collation, matching, and estimation process for multiple systems estimation (MSE)*

Multiple systems estimation is predicated on the availability of multiple, independent samples (or lists) of a known population across which identified members of the population appear in one or many samples (or lists). Figure 4 provides a stylised representation of MSE across two lists (**A** and **B**) in which individuals may or may not appear, as well as the individuals who appear on both lists (**M**), where each list and the combination of lists 'capture' an individual. MSE then analyses the ratio of probabilities of individuals being captured in one or both lists to estimate the unknown number of individuals with which a final total of individuals (**N**) can then be estimated.

[54] For example, in the data analysis conducted for the Peruvian Truth and Reconciliation Commission, HRADG estimated that the number of killings between 1980 and 2000 ranged from 61,007 to 77,552 with the likely number being 69,280. Reporting in the popular media; however, rarely reported the range and instead simply stated that nearly 70,000 people had been killed. See Ball. P., Asher, J., Sulmont, D., and Manrique, D. (2003) *How Many Peruvians Have Died? An Estimate of the Total Number of Victims Killed or Disappeared in the Armed Conflict between 1980 and 2000*, Washington DC: American Association for the Advancement of Science, 7, available online: https://www.aaas.org/sites/default/files/s3fs-public/Peru2003.pdf.

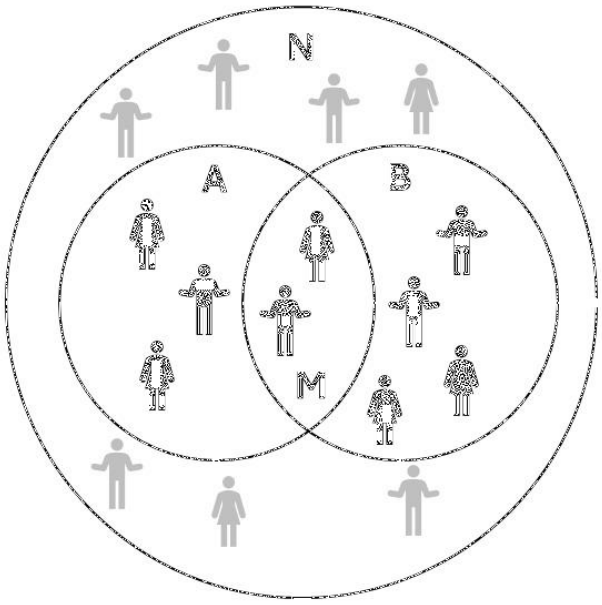

***Figure 4**. Stylised representation of two lists, their overlap, and the total number of individuals*

Source: Adapted from Ball, Asher, Sulmont, and Manrique (2003); Landman and Carvalho (2009: 56)

There are different probabilities of people appearing on one, the other, or both lists. The probability for a person out of a total unknown population ***N*** to appear on List A is ***P*(A) = A/N** and the probability for a person to appear on List B is ***P*(B) = B/N**. In similar fashion, the probability of a person to appear on both List A and List B (or M) is ***P*(M) = M/N**. It in its simplest form across only two lists, the total number of people (known and unknown) calculated through MSE using the data from these lists and their overlap is **A*B/M**.[55] When the number of lists increases, MSE estimates a series of logistic regression models with different combinations of lists to arrive at a range of estimates with their associated upper and lower bounds. Figure 5 shows the logical combinations of three lists, where part of the resulting matrix has known people, the overlap of known people, and the remaining cells of unknown people that need to be estimated. If each list either has or does not have a person (i.e., a binary outcome), then the total number of logical combinations of three lists is eight (or $2^3 = 8$), where data sources provide information on seven of the eight cells and MSE is used to estimate the values in the missing cell, and as a result, the estimated total number of people (***N***).

[55] The full specification and derivation of these different probabilities and the total estimation can be found in Bishop, Y.M.M., Feinberg, S.E., and Holland, P.W. (1974)'Estimating the Size of a Closed Population,' Chapter 6 in *Discrete Multivariate Analysis: Theory and Practice*, MIT Press, pp. 229-256.

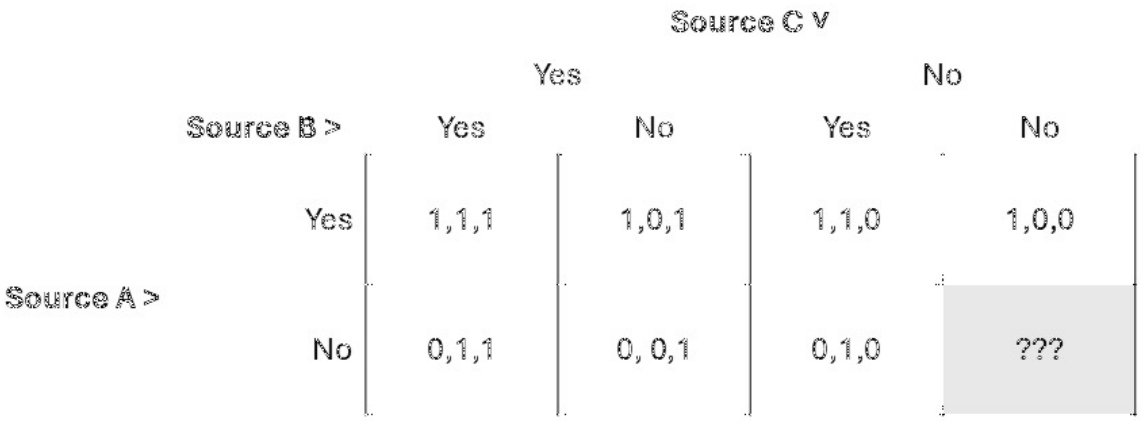

Figure 5. *Logical combination of the presence or absence (1,0) of people on separate and overlapping lists.*

MSE projects start by collating the lists and then matching records across these lists, such that the final cleaned database is organised according to victims with unique identifiers, and codes for the presence or absence of these victims in each list and whether they are captured across multiple lists. Table 5 shows a stylised representation of the database structure after the lists have been combined, coded, and matched.

Table 5. *Final cleaned, anonymised, and matched database of victims across multiple lists.*

Victim ID	Source A	Source B	Source A&B
0001	0	1	0
0002	1	1	1
0003	1	0	0
0004	0	1	0
0005	1	1	1
0006	0	1	0
0007	1	0	0

In the case of the analysis conducted for the UK, there were 6 separate lists across which there were a total of 2,744 known and reported victims of modern slavery. The lists included those from (1) local authorities (LA), (2) non-government organizations (NG), (3) police forces (PF), (4) government organizations (GO), (5) the general public (GP), and (6) the National Crime Agency (NCA).[56] The capture of these victims varied across the separate lists, where some victims also appeared across multiple lists. Table 6 shows the number of victims per source, and the

[56] Silverman, B.W. (2020) 'Multiple-systems analysis for the quantification of modern slavery: classical and Bayesian approaches,' *Journal of the Royal Statistical Society A*, 183 (3): 691-736.

various degrees of overlap across two sources, three sources, and four sources. The table shows that single sources captured the most victims (90.82%), while the number of victims captured by multiple sources decreases as the number of sources that overlap increases, for example, only 8.78% of victims were captured by two sources, 0.36% by three sources, and only 0.036% by four sources (Figure 6).

***Table 6**. Number of victims on each possible combination of lists, 2013.*

Sources						Total
LA	*NG*	*PF*	*GO*	*GP*	*NCA*	
Single source capture						
Yes						54
	Yes					463
		Yes				907
			Yes			695
				Yes		316
					Yes	57
Two source capture						
Yes	Yes					15
Yes		Yes				19
Yes			Yes			3
	Yes	Yes				56
	Yes		Yes			19
	Yes			Yes		1
	Yes				Yes	3
		Yes	Yes			69
		Yes		Yes		10
		Yes			Yes	31
			Yes	Yes		8
			Yes		Yes	6
				Yes	Yes	1
Three source capture						
Yes	Yes	Yes	Yes			1
Yes	Yes					1
	Yes	Yes	Yes			4
	Yes	Yes			Yes	3
		Yes	Yes		Yes	1
Four source capture						
Yes	Yes	Yes	Yes			1
Total						2744

LA = local authorities; NG = non-government organizations; PF = police forces, GO = government organizations; GP = general public and NCA = National Crime Agency

Source: Silverman, B.W. (2020) 'Multiple-systems analysis for the quantification of modern slavery: classical and Bayesian approaches,' *Journal of the Royal Statistical Society A*, 183 (3): 691-736.

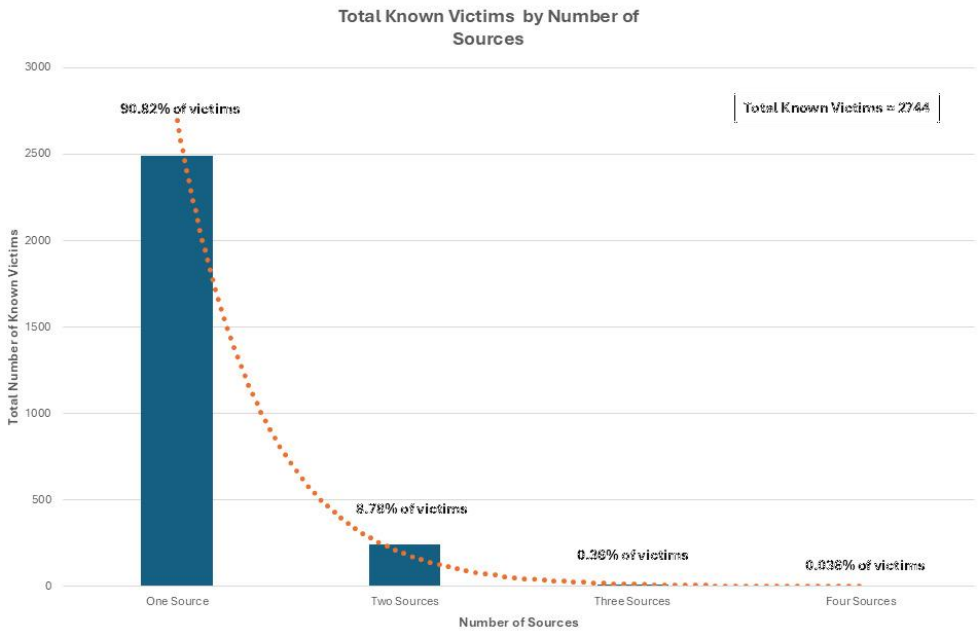

***Figure 6**. Total number of known victims by number of sources*

There was enough overlap across the six lists, however, for the application of multiple systems estimation, which used a series of six different models that incorporated the different combinations of the overlap of sources and the victims they captured. Each model produced an estimate of the total population (*N*) and the associated lower and upper bounds of the estimate, taking into account the standard error of each estimate. The lowest estimate of the total population was 9,547 ≤ **10,951** ≤ 12,697, while the highest estimate was 9982 ≤ **11,418** ≤13,181.[57] The popular interpretation of this analysis is that there were likely between 10,000 and 13,000 victims of modern slavery in 2013.

This is the first known example of MSE being applied to victims of modern slavery and in many ways represents a breakthrough moment in the history of modern slavery prevalence estimation, an effort that was soon followed for the Netherlands, Romania, and New Orleans. MSE has not yet been repeated for the United Kingdom, but there may be opportunities for it to be repeated regularly since similar types of data continue to be collected. Before any such analysis is repeated, however, there are core assumptions, common violations of these assumptions, and further considerations required before undertaking MSE for the UK.

Core Assumptions

The core assumptions of MSE include: (1) independence of the administrative lists (e.g., routine referrals can inflate the overlap of sources and lead to an under-estimate);[58] (2) an equal probability that victims are captured by one or more

[57] Silverman, B. W. (2014) 'Modern slavery: an application of multiple systems estimation.' Home Office, London; available online: https://www.gov.uk/government/publications/modern-slavery-anapplication-of-multiple-systems-estimation. Bales, K., Hesketh, O., and Silverman, B. W. (2015) 'Modern Slavery in the UK: How Many Victims?' *Significance*, 12(3): 20.

[58] Lum, K., Price, M. E., & Banks, D. (2013) 'Applications of Multiple Systems Estimation in Human Rights Research,' *The American Statistician*, 67(4), 191–200. http://www.jstor.org/stable/24591478

administrative lists (i.e., excluded groups can lead to bias);[59] (3) ability to achieve perfect record linkage of victims (potential for the use of aliases and typos that produce false matches and biased estimates);[60] (4) the population of interest is closed (i.e., movement and fluidity of people creates statistical noise);[61] and (5) the independent administrative lists are non-redundant (i.e., near identical lists add little information).[62] There are a number of strategies for addressing the common violations of these core assumptions to make sure that any estimation using MSE is as unbiased as possible. These assumptions have been variously challenged, which our stakeholder survey respondents also raised in their free text responses with the need for further consideration of the method and its applicability in estimating prevalence in the future.

Further Considerations for the UK

In addition to these assumptions and the challenges in addressing them, there are additional considerations that need to be addressed for using MSE for modern slavery prevalence estimation in the UK context.

First, the number of offences that now fall under the umbrella term modern slavery have increased since this first estimation was carried out. This development means that MSE can be used to estimate that aggregate numbers of victims across all offences; however, there may be natural limits to the use of MSE for different kinds of offences, given that there may be limited (or sparse) overlap across different sources. Indeed, even in the original estimation, the largest numbers of victims were captured primarily across two sources.

Second, efforts from government, the non-governmental sector, and law enforcement in the identification and support for potential victims of modern slavery have increased since the passage of the Modern Slavery Act 2015. The number of potential victims in the NRM has increased from the 552 in 2009 to 19,125 in 2024.[63] These figures suggest that either the true number of victims has risen dramatically since the first estimation or that authorities have become more effective in identifying them, or both.

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[59] Manrique-Vallier, D., Price, M.E., and Gohdes, A. (2013) 'Multiple Systems Estimation Techniques for Estimating Casualties in Armed Conflicts,' in Taylor B. Seybolt, Jay D. Aronson, and Baruch Fischoff (eds.) *Counting Civilian Casualties: An Introduction to Recording and Estimating Nonmilitary Deaths in Conflict*, Oxford: Oxford University Press, pp. 165-184.

[60] Sadinle, M. (2018) 'Bayesian propagation of record linkage uncertainty into population size estimation of human rights violations,' *The Annals of Applied Statistics*, 12(2): 1013-1038; https://projecteuclid.org/journals/annals-of-applied-statistics/volume-12/issue-2/Bayesian-propagation-of-record-linkage-uncertainty-into-population-size-estimation/10.1214/18-AOAS1178.full

[61] Banks, D., and Mokel, E. (2023) 'Multiple Systems Estimation and Human Trafficking,' *CHANCE*, 36(4), 12–14. https://doi.org/10.1080/09332480.2023.2290944

[62] Cruyff, M., Overstall, A., Papathomas, M., & McCrea, R. (2020) 'Multiple System Estimation of Victims of Human Trafficking: Model Assessment and Selection,' *Crime & Delinquency*, 67(13-14), 2237-2253. https://doi.org/10.1177/0011128720981908

[63] Home Office (2024) Modern Slavery: National Referral Mechanism and Duty to Notify Statistics UK, available online: https://www.gov.uk/government/statistics/modern-slavery-nrm-and-dtn-statistics-july-to-september-2024.

Third, the IASC has discovered that local authorities have been collating lists of potential victims who have chosen not to enter the NRM,[64] such that there are more potential data that can be added to any new MSE analysis. In effect, these victim lists sit outside the NRM and can tell us more about potential victims that are not yet known, at least in terms of the formal reporting mechanisms. It is unlikely that these victims are captured by other lists and thus any enumeration of them needs to be considered as additional known victims. The existence of such lists at the local level also suggests, as noted by many of our stakeholder survey respondents, that there is great geospatial variation in the identification of potential victims.

Fourth, over the years since the first estimation, NRM data reveal a mixture of UK national and non-UK national victims with an increasing number and proportion of UK nationals. MSE will be able to accommodate these national differences if, and only if, there is sufficient overlap of victims across different sources.

The combination of these different factors means that the number of victims of modern slavery today is likely to be much larger than in the first estimation, that there are additional possible layers of analysis that may be able to capture differences across type of offence, and that there is the possibility of further breakdown of the data in terms of victim nationality.

Fifth, another limitation to using MSE concerns the ways in which potential victims are identified. Certain types of modern slavery offences and profiles of potential victims are of great interest to stakeholders with responsibility to identify, suggesting that there may be a set of natural biases in identification and thus a skewing of the raw data comprising administrative lists, rendering any estimation through MSE incomplete and not fully representative of the whole population of victims. This limitation can be addressed through greater awareness and continued dialogue concerning different types of offences and the profiles of people that comprise the universe of potential victims among frontline workers, law enforcement, NGOs, and first responders. It also suggests that additional public bodies should be recognised as first responders, such as the NHS, where potential identification is possible.

Finally, since 2019, the Home Office has taken over responsibility for the NRM and implemented a programme of digitisation of referrals into the NRM and its case management system.[65] The process of raw data ingestion involves a screening, or triage step, where potentially multiple referrals for the same person are assessed and then merged into a single record (or row in the data), which currently loses valuable information and prevents data file preparation for the application of MSE for any future prevalence estimation. While the Home Office has made NRM data available in fully disaggregated form for the period January 2014 to March 2025 (N = 113,686), which includes a field for First Responder, the current file structure does

[64] Rights Lab and the Independent Anti-Slavery Commissioner (2025) *Refusal to Consent: Factors Influencing the Uptake of Modern Slavery Support under the National Referral Mechanism*, Nottingham: Rights Lab; London: IASC: https://www.nottingham.ac.uk/research/beacons-of-excellence/rights-lab/documents/reports-and-briefings/2025/april/refusal-to-consent-final-report.pdf.

[65] We are grateful for our visit to the Home Office for a discussion on the data ingestion process.

not list multiple sources of identification.[66] The issue is further complicated by the observation that first responders reporting may not be independent from one another (i.e., cross referrals or single referrals) or that there may be a mix of different offences in the referrals (i.e., the same person may be a victim of forced criminality and sexual exploitation).

Figure 7 provides an illustration of the issue with merging reports. The left-hand side of the figure illustrates the current (i.e., post-2019) process of data ingestion, which involves using multiple referrals per person (e.g. Source A and Source B) to create one single record for that person. In contrast, the right-hand side of the figure shows that information from Source A and Source B can be retained in creating a record for the person and creating separate data (or columns) for the fact that this person has been referred through two different sources. If the data ingestion process were changed to reflect and represent the different sources that referred the same person into the NRM, then MSE would again be possible for prevalence estimation in the ways that were conducted in 2014.

We recommend that further exploratory work can be undertaken to perform a retrospective case review for a sample of cases to examine source reporting, independence, and overlap. It would also be advisable to explore changing the data ingestion process to retain multiple first responders for future tabulation of the NRM.

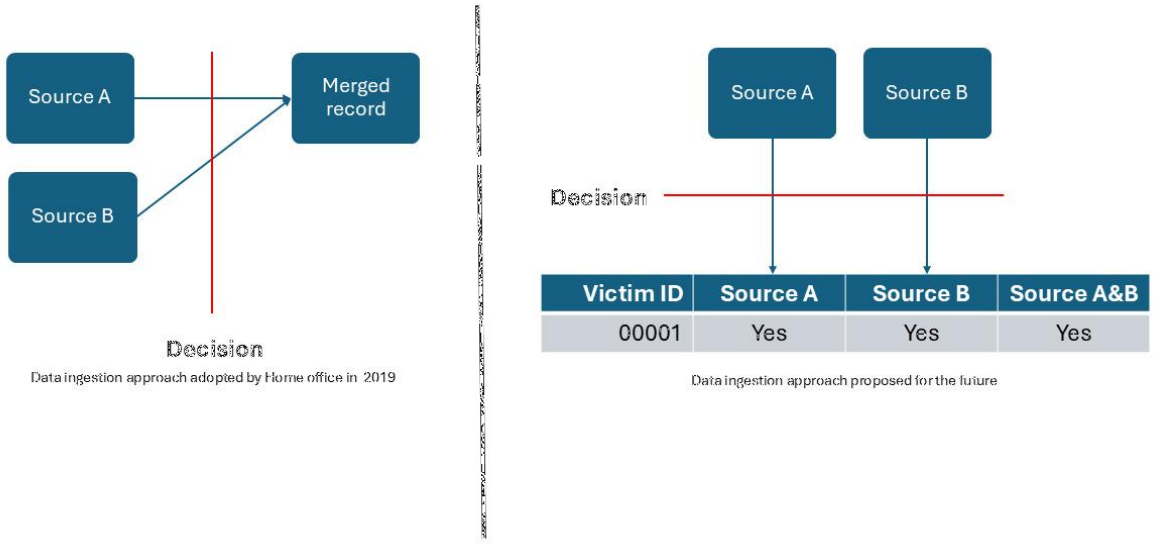

***Figure 7**. Data ingestion processes for the NRM, post 2019 and preferred approach*

Overall, MSE offers an effective, efficient, and low-cost method of modern slavery prevalence estimation. It relies on data that have already been collected and that are collected on a regular basis; however, the robustness of the method relies on

[66] Home Office, Modern Slavery Research & Analysis. (2025). *National Referral Mechanism and Duty to Notify Statistics, 2014-2025*. [data collection]. 16th Edition. UK Data Service. SN: 8910, DOI: http://doi.org/10.5255/UKDA-SN-8910-16; see also, Cockbain, E., Ashby, M., Bowers, K., & Zhang, S. X. (2024) 'Concentrations of harm: Geographic and demographic patterning in human trafficking and related victimisation,' *Criminology & Criminal Justice*, 25(1), 147-170; https://doi.org/10.1177/17488958241245311.

the ability for collation, record linkage, and analysis that harnesses the different features of the method. There are profound data protection issues for the initial collation and record linkage phases of any application of MSE, where data controllers need to work in secure data environments to collate and link the records across the different sources, which must then be followed by a systematic anonymisation process that allows for the application of MSE that does not risk victim re-identification. As MSE is a form of secondary analysis, its results will always be reported as aggregate totals, broken down across different features where possible. Any analysis needs to ensure that the categories adopted for further breakdown do not do so in ways that allow for re-identification. It is also imperative that there is sufficient overlap across the lists for different types of modern slavery.

A report by the Office for National Statistics (ONS) argues that future application of MSE for modern slavery prevalence estimation is not possible owing to the difficulty in obtaining administrative lists of the kind that were used in the 2014 estimation.[67] Based on the stakeholder survey and workshops, we suggest that it may be premature to reach this conclusion. A slight modification in the way the Home Office collates and prepares NRM data and designs its case management system could assist in maintaining multiple independent administrative lists of victims suitable for MSE. Moreover, the UK government has established the National Data Library (NDL)[68] that seeks to consolidate, cross-reference, and link data sources, and many of the stakeholders that were part of this project (including a project team from the Alan Turing Institute that has been exploring a modern slavery data catalogue) argue that the creation of a modern slavery and human trafficking data warehouse[69] is an idea worth pursuing. The establishment of such a warehouse would be beneficial for modern slavery prevalence estimation using MSE or the other methods contained in this report.

Sampling and Surveys

Different combinations of sampling strategies and well-designed survey instruments are a second set of methods for modern slavery prevalence estimation. Samples and surveys are staples of social science and marketing research which have seen considerable development over the past several decades with increasingly sophisticated and innovative methods for deriving samples and designing survey instruments.[70] Samples and surveys have been used extensively

[67] Office for National Statistics (ONS) (2020) Modern Slavery in the UK: March 2020, London: Office for National Statistics, p. 6; available online: https://www.ons.gov.uk/peoplepopulationandcommunity/crimeandjustice/articles/modernslaveryintheuk/march2020.

[68] United Kingdom Research and Innovation (UKRI) has approved renewed funding for the Administrative Data Research (ADR), which provides separate and linked administrative data sets, including for criminal justice data, which is both useful for modern slavery risk mapping and will contribute to the advance of the National Data Library (NDL). See: https://www.ukri.org/news/168m-boost-for-public-data-project-improving-lives-across-the-uk/.

[69] A human trafficking data warehouse has been established at Southern Methodist University in Texas [https://www.smu.edu/dedman/research/htdr], while the Final Report of the House of Lords Modern Slavery Act Inquiry has advised that the UK also establish such a warehouse.

[70] There is a vast academic and private sector literature on the use of samples and surveys, including many NGO and academic studies on human rights, that is simply too large to review for the purposes of this report. We concentrate rather on the different ways in which samples and surveys can be used for modern slavery prevalence estimation.

to capture both the perceptions and experiences of human rights from respondents and in contrast to MSE do not rely on administrative lists, but rather *respondents* who have either direct or indirect knowledge concerning the research topic.[71] As our review of extant prevalence estimation studies demonstrates, samples and surveys have been used across a variety of studies on modern slavery and human trafficking. Using this approach comes with many different choices and a range of trade-offs that relate to fundamental questions of representativeness, and internal and external validity.[72]

Figure 8 shows the overall data process for sampling and survey approaches, which includes the specification of the target population, the sampling strategy, survey design, data collection, and prevalence estimation. The most straightforward sampling approach is to use a random probability sample, where each person in the study population has an equal chance of being selected as part of the sample. The respondents that make up the sample are then presented with the survey instrument, which has been designed to include a bank of questions that represent indicators of modern slavery. The Global Slavery Index adopts this approach and has collected household survey data across 70 'high prevalence' countries using random samples.

***Figure 8**. Overview of the sampling ad survey data process*

For the UK context, where prevalence is likely to be relatively low, the use of a simple random sample means that the survey will be unlikely to 'find' potential victims of modern slavery. One solution, as our stakeholders advised, is to use a much larger sample, which naturally increases the cost and time of an estimation project, or to use a different kind of sampling strategy more appropriate for capturing seldom heard and often hidden populations as we have seen in our review of extant studies, including a well specified and smaller target population and a narrower focus on particular modern slavery offences.

The Global Slavery Index

The most well-known example of a sampling and survey approach for modern slavery prevalence estimation is the *Global Slavery Index* (GSI), which uses household surveys administered by the Gallup polling agency across up to 70 'high prevalence' countries using questions pertaining to forced labour and forced

[71] Landman, T. and Carvalho, E. (2009) *Measuring Human Rights*, London: Routledge: pp. 91-106; Landman, T. and Garrington, C. (2022) *The Rights Track: Sound Evidence on Human Rights and Modern Slavery*, New York and London: Anthem Press.
[72] Internal validity refers to the coherence of a research design and its completeness in providing systematic explanation of variance in the phenomenon under scrutiny (in this case, types of modern slavery). External validity refers to the extent to which the results of any study can be generalised beyond the sample to other populations, contexts, time, and measures.

marriage.[73] Walk Free uses the results of the surveys from these high prevalence countries for secondary analysis through what it calls its 'vulnerability model' to extrapolate their estimates to countries that are not part of the original sample. Over different releases of the index, however, Walk Free has changed the secondary modelling approach that underpins the full country level estimations, rendering any over time comparisons problematic.[74] The core of the approach that uses household surveys in 70 countries remains sound and thus some studies use only the data collected for this sample in their research.[75]

The GSI is frequently used and cited by policymakers, academics, NGOs, and other organisations, while 18 of 49 (38%) of our stakeholder survey respondents were familiar with sampling and survey approaches, such as the GSI, where they were very familiar with the GSI and its underpinning methodology. For the GSI, respondents expressed concerns over its use of high prevalence countries only, the limited specification of forced labour and forced marriage to the exclusion of other forms of modern slavery, the change in methodology over time and its sensitivity to small variances in extrapolating to countries not included in the household survey, its inability to capture hard to find populations, its exclusion of China, and its indirect inclusion of India.

Sampling Strategies

More focussed national and subnational prevalence studies recognise the problem of seldom heard and often hidden populations and tend to use a variety of random and non-random sampling strategies that are suitable for the target population of interest. These strategies include respondent-driven sampling (RDS), linked tracing sampling (LTS), snowball sampling, time-location sampling (TLS), adaptive sampling, cluster sampling, and other techniques.[76] Table 7 sets out these different strategies, which are related to the research questions the studies are seeking to answer and the target population they are seeking to reach. The first three strategies in the table are known as 'purposive' and are based on a random approach to initial respondents followed by contact with additional respondents in what is known as a 'chain-referral' structure across multiple waves.[77] Adaptive sampling and time and location sampling are based on geographical areas related to the likely presence of the target population, where initial sample units are explored with the view to also exploring adjacent locations.[78] Cluster sampling

[73] Walk Free (2018) Global Slavery Index 2018; Walk Free (2023) Global Slavery Index 2023; see https://www.walkfree.org/global-slavery-index/.
[74] Walby, S., Francis, B. (2025) 'Improving the Estimate of Trafficking in Human Beings and Modern Slavery by Integrating Data From ILO/Walk Free/IOM and UNODC,' *Social Indicators Research*, 176, 669–693 https://doi.org/10.1007/s11205-024-03474-w.
[75] Landman, T., & Silverman, B. (2019) 'Globalization and Modern Slavery,' *Politics and Governance*, 7(4), 275-290. https://doi.org/10.17645/pag.v7i4.2233; see also Seymour, R. G., & Silverman, B. W. (2023) 'How Can We Estimate Modern Slavery Globally?' *CHANCE*, 36(4): 22–29. https://doi.org/10.1080/09332480.2023.2290950.
[76] Thompson, S. (2012) *Sampling*, Third Edition, Wiley; Tyldum, G. and Johnston, L.G. (2014) *Applying Respondent Driven Sampling to Migrant Populations*, London: Palgrave.
[77] Thompson, S. (2012) *Sampling*, Third Edition, Wiley; Tyldum, G. and Johnston, L.G. (2014) *Applying Respondent Driven Sampling to Migrant Populations*, London: Palgrave.
[78] Thompson, S. (2012) *Sampling*, Third Edition, Wiley.

constructs groups of the population based on geography, socio-economic variables, or other characteristics from which random samples are drawn.[79]

***Table 7**. Popular sampling strategies for prevalence estimation*

Type of Sampling Strategy	Description
1. Respondent driven 2. Linked tracing 3. Snowball	A random sample of Initial 'seeds' are contacted and interviewed who then identify 'referrals' who are then contacted to be surveyed The initial wave of surveys and referrals are then repeated across multiple waves to reach the target sample size
4. Adaptive	A random sample of Initial locations are trialled and then lead to other adjacent areas in which the target population is likely to be found. The strategy assumes that the target population is clustered geographically
5. Time and location	Different locations are identified for structured times for observation and enumeration
6. Cluster	Random samples are drawn from larger groups in a population based on a specified set of characteristics or geospatial units

Source: Thompson (2012); Thompson and Seber (1996); Lohr (2021); Latpate, et al. (2022).

Survey Instruments and Indicators

The different strategies generate a sample of respondents who are then administered the survey instrument. The principles of survey design include (1) the use of well-crafted, contextually informed, and unambiguous questions, (2) logical response categories (binary or multiple choice) and the ability to have free text answers for some questions, and (3) efficiency in the number of questions to reduce the time it takes to complete the survey to avoid survey fatigue among respondents. In human trafficking research, surveys typically include (1) a set of screening questions, (2) a bank of socio-economic questions, (3) a bank of demographic questions, and (4) a bank of questions that address indicators for different types of modern slavery and human trafficking depending on the focus of the study (see Table 8). The construction of the questions reflects in-depth country context research, literature reviews, key informant interviews, and co-

[79] Lohr, S.L. (2021) *Sampling: Design and Analysis*, Third Edition, CRC Press.

design across project partners, collaborators, survivors, and those with lived experience.

Inclusion of survivors and those with lived experience is crucial in the co-design phase of any sampling and survey-based study. For example, they can inform the study on the sensitivities of approaching potential victims, advise on ways to avoid creating undue stigma during the interview process, engage in training enumerators in the use of trauma-informed surveying techniques, help create distress protocols to mitigate risks associated with questions on difficult issue areas, and can help interrogate and improve the language and choice of words adopted within a survey instrument. Words such as 'facilitate,' 'threaten,' 'force,' 'coerce,' among many other terms, require very careful consideration before being included in a survey instrument. Moreover, when a study anticipates inclusion of respondents from multiple language groups, survivors from these different language groups can assist in further consideration of terms and expressions used in a survey instrument and how these are best translated from English to the different languages anticipated in the study.[80] In addition, our stakeholder survey respondents observed that the co-design of survey instruments should also include law enforcement, policy makers, NGOs, and private companies.

***Table 8**. Examples of banks of question topics in human trafficking prevalence studies*

1. **Screening**	2. **Socio-economic**	3. **Demographic**	4. **Modern Slavery†**
Typically related to the target population, e.g. migrant population, manual labourers, people in poverty, adults, ethnic minority groups, etc.	Income Level of education Literacy Occupation Industry/sector	Age Sex Gender Sexual orientation Marital status Number of children Language Religion Ethnicity/race Migration status Origin country Transit country Destination country	Use of violence or threat of violence Verbal abuse Contract status Working conditions Hazardous work Free to leave place of work Agreed pay Wage deductions Pay frequency Hourly or piece rate pay Excessive working hours Breaks during the working day Paid leave Paid sick leave

[80] For example, in its work on human trafficking among cross-border migrant in the United States, the project team including colleagues from the Rights Lab has held meetings with its Community Advisory Board (CAB) over many iterations to review and revise the survey instrument, including individual words and how they would be translated into Spanish to capture their appropriate meaning.

			Freedom to leave place of work Use of recruitment agency Retention of identity documents Quality and provision of accommodation

†This is an illustrative list of topic areas and indicators, which includes general indicators for modern slavery and human trafficking and those most relevant to forced labour trafficking.

For prevalence estimation, answers to questions framed around the topics in column 4 of Table 8 can be aggregated into a scale. Drawing on the insights from ontological and 'family resemblance' approaches,[81] the scale can be taken in its totality (i.e., respondents who have replied affirmatively to all questions are deemed to be victims of human trafficking) or can be broken down through a series of thresholds that subdivide the distribution into reduced sets, where the analysis can estimate prevalence based on the research team's selection of thresholds that are sufficient for making a determination of human trafficking. If the threshold is set low (e.g., a score of 2 and above), then the prevalence estimation will be higher than if the threshold is set high (e.g., a score of 6 and above).[82] Figure 9 illustrates these different approaches using a stylised scale of human trafficking ranging from 0 (no trafficking indicators) to 10 (all trafficking indicators) across a total sample of 3250 respondents.

The figure depicts a skewed distribution with the least number of respondents exhibiting no human trafficking indicators and then a decreasing number of respondents with multiple human trafficking indicators.[83] The figure also shows that the number of respondents having a score of 2 and above (n = 2000, 61%) is much larger than the number of respondents having a score of 6 and above (n = 1080, 18%). In this way, decisions within the research team about these different thresholds can profoundly affect the prevalence estimation.

[81] Ontological approaches specify the *necessary and sufficient conditions* required for a modern slavery or human trafficking determination to be made, while a 'family resemblance' approach specifies that some minimum number of indicators need to be observed to make such a determination, see Goertz (2006), *Social Science Concepts: A User's Guide*, Princeton: Princeton University Press, pp. 39-44.
[82] In its specification of forced labour indicators, the International Labour Organisation (ILO) argues that one positive response to one question on forced labour is sufficient to be concerned that there is a high likelihood of forced labour. See ILO (2012) *Forced Labour Indicators*, Geneva: International Labour Organization. Rights Lab projects in India, Malaysia, Romania, Bulgaria, and the United States have adopted this threshold approach, producing different prevalence estimations derived from the use of these different thresholds.
[83] It is typical for frequency responses to exhibit a skewed distribution in human trafficking research that uses more general and random samples, since the phenomenon remains rare in the whole population, where we expect it to be rare for respondents to answer 'yes' to the indicators questions and it is further expected that there is a diminishing frequency of 'yes' responses across the human trafficking indicator questions. In studies that use samples for a more focussed population, it is possible for responses to approximate a more normal distribution.

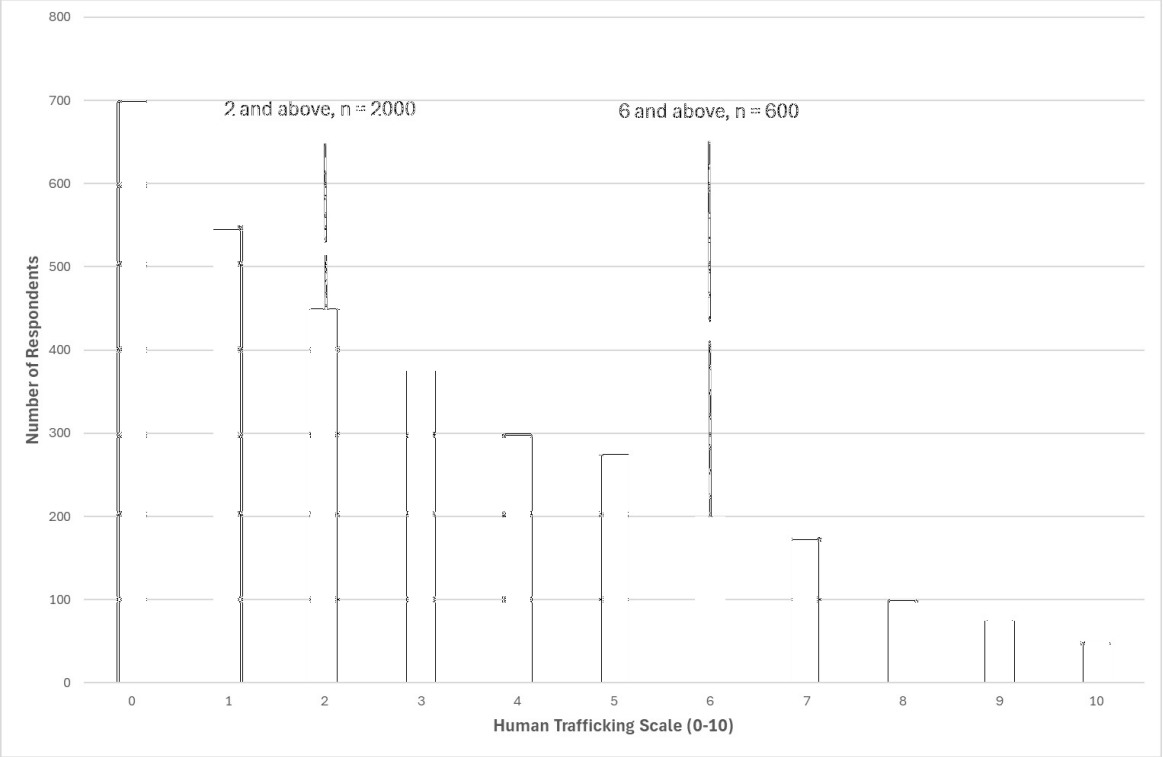

***Figure 9**. Human trafficking scale and the effect of setting different thresholds*

In addition to distributions of responses to human trafficking indicators questions, there is also an expectation that response rates in general will vary by country and topic, where it can be assumed that in human trafficking research response rates will be relatively low. This is particularly the case in the UK. For example, with a response rate of 20% for a target sample of 4,000 respondents who complete the survey, a total of 20,000 potential respondents will need to be approached. There are additional risks in human trafficking research in terms of the health and safety of enumerators and respondents, and higher levels of fear and timidity among respondents which may affect their willingness to participate in a survey. Survey techniques include human supervised completion and self-completion using hard copy or electronic survey tools, such as Computer Assisted Personal Interview (CAPI) technologies.[84]

Network Scale-Up Method

A final additional option for survey-based approaches to prevalence estimation is the 'network scale-up method' (NSUM), which uses a specially designed module in a survey instrument to understand the size of the personal networks of each respondent in the sample who completes the survey and their knowledge of victims and survivors within this network. NSUM leverages information about how many people respondents know in specific subpopulations, including those defined by experiences and practices falling under the concepts of modern slavery

[84] see, e.g. Heinritz, F., Will, G., Gentile, R. (2022). Surveying Illiterate Individuals: Are Audio Files in Computer-Assisted Self-Interviews a Useful Supportive Tool? In: Pötzschke, S., Rinken, S. (eds) Migration Research in a Digitized World. IMISCOE Research Series. Springer, Cham. https://doi.org/10.1007/978-3-031-01319-5_6

and human trafficking. The technique was initially developed to estimate the number of people who died in the 1985 earthquake in Mexico.[85] Personal network size (within and between groups) of respondents is probed using a question such as:

> *How many people do you know by name and with whom you could imagine sitting down and having a coffee, drink, or a meal from your family, work, or school?*

This kind of question does not ask for any identifying information of people in the network and is thus not a link-tracing or chain-referral mechanism typical of Respondent Driven Sampling (RDS) approaches. Rather, it merely asks for an estimation of the size of the personal network for each respondent. NSUM questions could also reference different groups of people in a respondent's personal network, such as:

> *How many people do you know who are: (1) taxi drivers, (2) doctors, (3) lawyers, (4) academics, (5) small business owners, (6) large business owners [and/or other occupational reference categories to be determined in the study appropriate for the country context]*

The final question that relates to the phenomenon of interest, which in our case is human trafficking, such as

> *How many people do you know who have been a victim of trafficking?*

Again, as in the other NSUM questions, this final question does not require respondents to reveal identifying information on anyone else, but their own estimation of the number of people who the respondent knows across the different occupational categories and as having been trafficked. Josephs et al. (2024) explain how NSUM allows for prevalence estimation:

> *Each respondent reports the number of others they know in the general population (or the number they know in several subgroups of the general population so that the number of others they know in the general population may be estimated) and also the number they know in the target population. The ratio of these average counts is multiplied by the known size of the general population to estimate the size of the target population.*

NSUM recognises that no one respondent has a network that is representative of the population and thus the average of responses across all respondents is used as it relates to the overall population to estimate prevalence of the target population.

[85]Bernard, H.R., Johnsen, E.C., Killworth P.D., and Robinson, S (1989) 'Estimating the size of an average personal network and of an event subpopulation,' *In The small world*, Ablex Press, pp. 159–175; Clay-Warner, J., Kawashima, T., Edgemon, T.G. (2022) 'Measure of Personal Network Size Using the Known Population Method: A Methodological Guide,' *American Journal of Public Health*. 112(5):747-753.

NSUM can be also combined with additional data to make prevalence estimations in ways that address the problem of hard-to-reach populations.[86]

NSUM thus adopts an indirect approach for estimating the prevalence of an unknown or seldom heard population and can be adapted to fit a variety of country contexts and different target populations. For the UK, the combination of a targeted sampling strategy (RDS or LTS) and NSUM is a particularly appropriate method for estimating the prevalence of specific modern slavery offences as set out in the Modern Slavery Act 2015 and its accompanying statutory guidance. The method does require complementary administrative data on the relative size of the subpopulation to which the respondent belongs. NSUM has been used for a variety of modern slavery and human trafficking studies, such as the estimation of child trafficking victims in Sierra Leone[87] and the number of victims and traffickers involved in on-line child sexual exploitation in the Philippines, among others.[88]

The United Nations has endorsed the method for prevalence estimation in human trafficking research[89] and it features as a key method for prevalence estimation in a guide published by the Global Fund to End Modern Slavery.[90] Across studies that use NSUM, there is focus on specific target populations and specific practices. The combination of targeted sampling and NSUM is thus not appropriate for prevalence estimation of all practices and offences under the modern slavery umbrella term, which we argue is better achieved through the use of MSE.

Natural Language Processing

A final and innovative approach to prevalence estimation already used in the UK applied Natural Language Processing (NLP),[91] machine learning, and AI to a corpus (i.e., 'free text fields') of police log records from the West Midlands.[92] The approach

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[86] Clay-Warner, J., Kawashima, T., Edgemon, T.G. (2022) 'Measure of Personal Network Size Using the Known Population Method: A Methodological Guide,' *American Journal of Public Health*. 112(5):747-753.; Nyarko-Agyei, A., Boyd, D., Brewster, B., Landman, T., Li, S., Weir, E. and Wyman, E. (2024) 'A Partially Pooled NSUM Model: Detailed estimation of CSEM trafficking prevalence in Philippine municipalities,' *Journal of the Royal Statistical Society Series C: Applied Statistics*, Oxford: Oxford University Press.

[87] Yi, H., Vincent, K., Okech, D., Clay-Warner, J., Li, J., Kawashima, T., Edgemon, T. G., Aletraris, L., & Hassan Konteh, F. (2023 'An Empirical Comparison of a Traditional Strategy and Network Scale-Up Method for Prevalence Estimation of Child Trafficking in Sierra Leone,' *Crime & Delinquency*, 71(5), 1558-1580. https://doi.org/10.1177/00111287231170122

[88] Nyarko-Agyei, A., Boyd, D., Brewster, B., Landman, T., Li, S., Weir, E. and Wyman, E. (2024) 'A Partially Pooled NSUM Model: Detailed estimation of CSEM trafficking prevalence in Philippine municipalities,' *Journal of the Royal Statistical Society Series C: Applied Statistics*, Oxford: Oxford University Press.

[89] Shelton JF (2015) 'Proposed utilization of the network scale-up method to estimate the prevalence of trafficked persons.' *Forum on Crime & Society*, volume 8.

[90] Global Fund to End Modern Slavery (2021) *Prevalence Estimation: Methods Brief*, https://www.gfems.org/wp-content/uploads/2021/10/Revised_GFEMS_MethodologiesBooklet.pdf

[91] This approach has also been used to detect human trafficking within on-line advertising platforms. See H. Alvari, E. Shaabani, and P. Shakarian (2017) 'Semi-supervised learning for detecting human trafficking,' in Proceedings of the 2017 IEEE/ACM International Conference on Advances in Social Networks Analysis and Mining. ACM, 2017, pp. 459–466; S. S. Esfahani, H. Firouzi, R. K. Chakrabortty, and M. J. Ryan (2019) 'Context-specific feature extraction and classification for identifying human trafficking,' *Computers and Industrial Engineering*, 138: 106109; Tong, E., Zadeh, A., Jones, C., and Morency, L-P (2017) 'Combatting Human Trafficking with Deep Multimodal Models,' ACL Anthology; efaidnbmnnnibpcajpcglclefindmkaj/https://aclanthology.org/P17-1142.pdf.

[92] Centre for Social Justice and Justice and Care (2020) *It Still Happens Here: Fighting UK Slavery in the 2020s*, London: Centre for Social Justice and Justice and Care, available online: https://www.centreforsocialjustice.org.uk/wp-content/uploads/2020/07/It-Still-Happens-Here.pdf.

led by National Data Analytics Solutions (NDAS)[93] was predicated on the idea that call logs contain multiple reports of events and incidents that may have additional markers and information relating to different modern slavery offences. The NLP approach focusses on text and language used to record these events and incidents to create a training set that is then used to interrogate the full data base of police log records held within the West Midlands police jurisdiction. The key element to this approach is to code events and incidents that may have been missed by human interaction with the records (i.e., false negatives) while cross checking and verifying those records that have been identified as comprising modern slavery offences (i.e., avoiding false positives).

The approach focussed on text-derived markers for (1) labour exploitation, (2) criminal exploitation, (3) domestic servitude, (4) sexual exploitation, (5) human trafficking, and (6) other, or 'undetermined typology.' The project developed a vocabulary of words using input from anti-slavery organisations to train the initial model, which when applied to the full data set yielded a total of 4,197 victims in the West Midlands. The project assumed that the West Midlands population is a fraction of the whole UK population and thus multiplied the number of victims in the study by the ratio of the West Midlands population to the UK population to achieve the total estimate (N = 4,197*23.7 = 99,469).[94]

While promising, this approach rests on a number of assumptions that can be queried and which concerned many of the respondents in our stakeholder survey. First, it assumes that the rate in the commitment of modern slavery offences identified in the West Midlands is the same across all police jurisdictions when in fact this rate could vary tremendously across different jurisdictions, depending on multiple factors (see next section of this report). Second, the calculation is based on officially reported and identified cases of victims held by the police and are thus part of a single source 'convenience sample,' the inferences from which are far less robust than using multiple sources, as is done in the case of using MSE.[95] Third, the analysis assumes that the victims are part of a 'closed system' limited to the West Midlands police jurisdiction, when it is entirely possible that a proportion of the identified victims may have been exploited in other parts of the UK before being reported in the West Midlands and thus the analysis may suffer from the problem of double counting. Fourth, the application of NLP approaches rests on (1) the quality of the raw corpus of information that is available and (2) the quality of the vocabulary or lexicon used to extract and identify victims from the corpus.

Taking these concerns into account, it is our view that the best solution for adopting this approach in future is to replicate it across all police jurisdictions and issue findings that are limited to reported cases by jurisdiction only and not to extrapolate to the whole population since none of the sources have been selected randomly and the reports and records are not representative.

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[93] NDAS comprises a partnership of nine law enforcement agencies.
[94] Centre for Social Justice and Justice and Care (2020) *It Still Happens Here: Fighting UK Slavery in the 2020s,* London: Centre for Social Justice and Justice and Care, available online: https://www.centreforsocialjustice.org.uk/wp-content/uploads/2020/07/It-Still-Happens-Here.pdf, 20-21.
[95] Landman, T. (2006) *Studying Human Rights*, London: Routledge, pp. 109-110. See also Landman, T. and Carvalho, E. (2099) *Measuring Human Rights*, London: Routledge.

Out of Sample Projection

In addition to making statistical inferences from a known sample of people to an unknown population of people using either MSE or survey-based approaches, there is also the possibility for out of sample projections across geospatial units. For example, in the Rights Lab and International Justice Mission (IJM) *Scale of Harm* project, an initial random sample across 150 municipalities yielded 3,600 household surveys with Network Scale-Up Method (NSUM) questions on traffickers and victims involved in the production of on-line sexual exploitation of children materials in the Philippines. Using a partially pooled NSUM analysis, the project was able to estimate the prevalence of traffickers and victims across these 150 municipalities.[96] Applying Random Forest modelling[97] across these 150 municipalities, which also incorporated over 200 explanatory variables, allowed the project to then project the estimation across all 1650 municipalities and generate a national prevalence estimation (174,403 < **232,444** < 290,484 traffickers and 424,741 < **471,416** < 518,090 victims).[98]

Machine learning and artificial intelligence (AI) techniques such as Random Forest models (and many others) offer a valuable and promising set of methods for enhanced modern slavery prevalence estimation in the UK. The techniques mean that smaller samples of data on specific modern slavery practices can be collected across geospatial units with a high spatial resolution, which can then be combined with a collection of explanatory variables to conduct an out of sample projection of prevalence for the whole of the UK.

[96] Nyarko-Agyei, A., Boyd, D., Brewster, B., Landman, T., Li, S., Weir, E. and Wyman, E. (2024) 'A Partially Pooled NSUM Model: Detailed estimation of CSEM trafficking prevalence in Philippine municipalities,' *Journal of the Royal Statistical Society Series C (Applied Statistics)*, Oxford: Oxford University Press.

[97] Random Forest modelling is a decision tree approach to data analysis that is trained on known data to learn as it progresses in making classifications, regression, and other elements and tasks that form part of multiple decision trees. It uses known data to match and classify unknown data. In human rights research, the Human Rights Data Analysis Group (HRDAG) applied random forest models capture text data on drug cartel member phones to enhance the classification and location of clandestine grave sites in Mexico (*fossa clandestinas*). The original approach can be found in Ho, T.K. (1995) *Random Decision Forests*, Proceedings of the 3rd International Conference on Document Analysis and Recognition, Montreal, QC, 14–16 August 1995. pp. 278–282. For its application in Mexico, see https://hrdag.org/2017/11/23/new-clandestine-graves-mexico/.

[98] International Justice Mission and Rights Lab (2023) Scale of Harm: Estimating the Prevalence of Trafficking to Produce Child Sexual Exploitation Material in the Philippines, available online: https://www.nottingham.ac.uk/research/beacons-of-excellence/rights-lab/resources/reports-and-briefings/2023/september/scale-of-harm-summary-report-.pdf.

Beyond Prevalence

The previous sections of this report have focussed their attention on modern slavery prevalence estimation; however, with the increase in data availability, continued investment in data infrastructure,[99] and the continued development of new and innovative research methods and data analytic techniques, the UK has every opportunity to move *beyond* prevalence and develop data modelling strategies that estimate and demonstrate the risks of modern slavery, either as whole or across the different modern slavery offences. This section of the review first looks at risk mapping methods known as comparative judgment and crime linkage and then considers the wide range of extant data within the UK that could be used for larger effort at engaging in robust and statistically rigorous risk and vulnerability mapping.

Comparative Judgment

Comparative judgment is a survey-based method that originally used a large number of respondents,[100] but more recently has been used with a smaller number of participants combined with a geospatial focus on a limited geographical area to understand the likely presence of forced marriage across the 76 wards that make up Nottinghamshire.[101] The method asks respondents (also known as *judges*) to estimate the relative quality of objects in a set through pairwise comparisons, effectively presenting the judges with two objects and asking them which of the two has a higher quality. For the study on forced marriage in Nottinghamshire, the objects were *wards*, the quality was the *risk of forced marriage*, and the judges were 'people who support victims of forced marriage and have knowledge of the victims' locations.'[102] The method allows for the estimation of the risk of forced marriage, but not its prevalence, even though quantities were presented to judges.[103]

The analysis factored in additional attention to risk clusters across multiple wards and additional modelling simulations to test the overall robustness in the derivation of geospatial judgments. Overall, the 12 judges made a total of 1,848 comparisons, comprised of different sets of pairs drawn from the 76 different

[99] United Kingdom Research and Innovation (UKRI) primarily through the Economic and Social Research Council (ESRC) has made and will continue to make large investments in data infrastructure, including the UK Data Service (UKDS), Administrative Data Research (ADR), Smart Data Research (SDR), Understanding Society (USS)J and other investments.
[100] See, e.g., Seymour, R.G., Sirl, D., Preston, S.P., Dryden, I.L., Ellis, M.J.A., Perrat, B. et al. (2022) 'The Bayesian Spatial Bradley–Terry model: Urban deprivation modelling in Tanzania,' *Journal of the Royal Statistical Society: Series C (Applied Statistics)*, 288–308. Available from: https://doi.org/10.1111/rssc.12532. Seymour, R.G., Sirl, D., Preston, S.P., Dryden, I.L., Ellis, M.J.A., Perrat, B. et al. (2022) The Bayesian Spatial Bradley–Terry model: Urban deprivation modelling in Tanzania. Journal of the Royal Statistical Society: Series C (Applied Statistics), 288–308. Available from: https://doi.org/10.1111/rssc.12532. The study estimates deprivation measures for 452 subwards of Dar es Salaam in Tanzania using comparative judgment and a series of Random Forest models and simulations.
[101] Seymour, R., Nyarko-Agyei, A., McCabe, H., Severn, K., Sirl, D., Kypraios, T. and Taylor, A. (2025) 'Comparative judgement modelling to map forced marriage at local levels,' *Annals of Applied Statistics*, 19 (1): 419-439. Previous comparative judgment studies have used > 200 judges, while the study in Nottinghamshire used 12.
[102] Seymour et al. (2025), op. cit. 420.
[103] Seymour et al. (2025), op. cit. 423.

wards, which revealed clusters of high, medium, and low risk wards and significant differences between urban, suburban, and rural wards. Our view is that comparative judgment represents a novel and innovative method for estimating the different risks associated with different modern slavery and human trafficking practices. While the illustrative case study example included here focussed on forced marriage, it seems reasonable to suggest that this method can be used to estimate the risk of other practices, and it represents a cost-effective and relatively efficient method with much promise for risk mapping modern slavery and human trafficking in the UK.

Crime Linkage

Crime linkage is an emerging area of research primarily in criminology and among law enforcement analysts that shows promise for modern slavery research. In a turn away from a focus on victims and survivors, crime linkage initially focusses on perpetrators and seeks to link two or more crimes committed on the basis of identifiable crime scene behaviours, where analysts seek to distinguish between 'behaviour consistency' and 'behavioural distinctiveness.'[104] There is no single approach to conducting crime linkage but is has been used for the analysis of crimes such as burglary, personal and commercial robbery, sexual assault, car theft, arson, and homicide.[105] Crime linkage is also amenable to the application of artificial intelligence, machine learning techniques, and increasingly sophisticated algorithms that can match patterns in perpetrator behaviours.[106]

In the UK, The Serious Crime Analysis Section (SCAS) at the National Crime Agency (NCA) carries out analysis to support police forces across the devolved nations, where detailed crime information, including offender behaviour, is coded into the Violent Crime Linkage Analysis System (ViCLAS), which includes the offences committed and the known or unknown offenders. Cases within the ViCLAS are then subjected to comparative case analysis to identify similar offences with potential links to possible suspects.[107] The focus of its work is primarily confined to sexual offences, but its method holds promise for analysing modern slavery offences. It is not unreasonable to assume that a modern slavery offender commits multiple offences against multiple victims and thus represents a potentially inverse and lateral method understanding more about modern slavery prevalence and other features using the perpetrator as its starting point. Dr Rowland Seymour at the University of Birmingham is currently exploring the application of crime linkage approaches to modern slavery, including prevalence estimation.

[104] Davies, K. and Woodhams, J. (2019) 'The practice of crime linkage: A review of the literature,' *Journal of Investigative Psychology and Offender Profiling*, 16 (3): 169-200, https://doi.org/10.1002/jip.1531.
[105] Ibid., 170.
[106] Tonkin, M., Lemeire, J., Woodhams, J. et al. (2025) 'Building the Statistical Evidence Base for Crime Linkage Decision-Support Tools with Sexual Offences,' *Journal of Quantitative Criminology*, https://doi.org/10.1007/s10940-025-09622-w
[107] National Crime Agency: https://www.nationalcrimeagency.gov.uk/what-we-do/how-we-work/providing-specialist-capabilities-for-law-enforcement/serious-crime-analysis.

Risk Mapping

Empirical research from academics and work carried out by a large number of anti-slavery and anti-trafficking non-governmental organisations (NGOs) have identified an array of drivers and factors that explain the variation in modern slavery and human trafficking. These include factors at the micro and individual level, the meso- and community level, and at the macro and structural level. Such factors and drivers have proved useful for the kind of out of sample projections described above and suggest further that in a data rich environment such as the UK, hold much promise for advanced analysis on modern slavery risks, which appear to be heterogeneously distributed across the geography of the UK.

The International Organisation for Migration (IOM) has developed a Determinants of Migrant Vulnerability Framework (DoMV), which includes (1) individual factors, (2) household and family factors, (3) community factors, and (4) structural factors.[108] The framework is designed to help practitioners working to assist 'migrants vulnerable to violence, exploitation and abuse, or to mitigate and reduce factors contributing to migrant vulnerability.' Whilst the framework has been developed for migrants only (many modern slavery victims and survivors in the UK are indeed migrants), its division of factors into four broad categories is useful in identifying and categorising potential data sources in the UK for modern slavery risk and vulnerability mapping for migrant and non-migrant populations. It should also be noted that there are inter-relationships between and among these different levels of analysis.

In addition to the IOM framework, a global comparative study analysed a total of 106 different factors that help explain the variation in modern slavery prevalence using the GSI estimates for high prevalence countries for the years 2016 and 2018.[109] The analysis showed that the strongest explanatory factors included democratic rule, armed conflict, physical security of women, social inequality and discrimination, access to resources, and religious and political freedoms. Since this was a global analysis, it is clear that some of these factors are less relevant (or irrelevant) for the UK context; however, the method of collating a large number of factors and then analysing them using advanced machine learning techniques is very promising for producing risk and vulnerability maps for the UK. Of the main factors identified in the global study, there are some which seem reasonable to include for the UK context, including physical security of women (or domestic violence against women), social inequality and discrimination, and access to resources, each of which can be operationalised using data sources already available for the UK.

[108] International Organisation for Migration (IOM) (2012) *The Determinants of Migrant Vulnerability*, Geneva: IOM, available online: https://www.iom.int/sites/g/files/tmzbdl486/files/our_work/DMM/MPA/1-part1-thedomv.pdf.
[109] Lavelle-Hill, R., Smith, G., Mazumder, A. et al. (2021) Machine learning methods for "wicked" problems: exploring the complex drivers of modern slavery. Humanities and Social Science Communications, 8, 274, https://doi.org/10.1057/s41599-021-00938-z; See also Reiner, V., Malik, A., and Murray, J. (2025) 'Can Global Slavery be Footprinted for Corporate Due Diligence? A Data Review and Analysis,' *Journal of Industrial Ecology*, https://doi.org/10.1111/jiec.70037.

A recent report and evidence review commissioned by the IASC on 'multiple overlapping vulnerability factors' examined 29 different factors related to modern slavery, where the most crucial factors among them include low income, being female, mental ill health, alcohol or drug dependency, insecure housing, and immigration status (see Appendix 5 for a full list of vulnerabilities).[110] This study builds on other work on a framework for modern slavery resilience at the local level,[111] the connections between cognitive impairment and modern slavery,[112] as well as the quality of local authority services.[113] The identification of local resilience factors can be inverted[114] and draws on a much larger literature on the social determinants of modern slavery, while cognitive impairment has more recently been identified as a risk factor at the individual level.

Finally, the Global Commission on Modern Slavery and Human Trafficking (GCMS) has identified a series of general and specific risk factors.[115] The general risk factors – armed conflict and instability, serious violations of human rights, and weakness of state structures – are less relevant to the current UK context. The specific risk factors align with the other resources outlined here and comprise (1) vulnerabilities arising from personal and family background, (2) established cultural practices and behaviours, (3) extreme poverty, deprivation, and harsh living environments, (4) displacement, smuggling, and the breakdown of family networks, (5) lack of effective humanitarian prevention,[116] (6) poor border controls and law enforcement and prosecution of victims.[117]

Reading across these different studies and frameworks allows for the specification of a preliminary list of key modern slavery risk and vulnerability factors at the individual, household, community, and structural levels that could be used to create new modern slavery risk maps for the UK (Table 9). Risk in this sense should be conceived as inherent, while vulnerability arises from the interaction between inherent risk as it is situated in context, which can increase vulnerability. Combining data at these different levels of analysis can build a greater understanding of the patterns in modern slavery risk across the UK.

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[110] Rights Lab and IASC (2025) *Overlapping Threats to Freedom: Understanding Vulnerability to Modern Slavery*, University of Nottingham: Rights Lab and London: IASC, available online: https://www.antislaverycommissioner.co.uk/media/otrprxxx/overlapping-threats-to-freedom_insight-briefing.pdf.
[111] Gardner, A., Northall, P., and Brewster, B. (2020) 'Building Slavery Free Communities: A Resilience Framework,' *Journal of Human Trafficking*, 7(3): 338-353.
[112] Lambert, I., Wright, N., Gardner, A., Fyson, R., Abubakar, A., & Clawson, R. (2024) 'Cognitive Impairment as A Vulnerability for Exploitation: A Scoping Review,' *Trauma, Violence, & Abuse*, *26*(3), 468-482. https://doi.org/10.1177/15248380241282993.
[113] See, e.g., Sunkin, M and Calvo, K and Platt, L and Landman, T (2007) 'Mapping the Impact of Judicial Review on the Quality of Local Authority Services in England & Wales,' *Public Law*, Autumn. pp. 545-567.
[114] The absence or low level of these resilience factors can be classed as possible risk and vulnerability factors. As the IOM (2012: 6) notes, 'individual characteristics are a central element of *vulnerability and resilience*' (emphasis added), a point which can be expanded to include household, community, and structural characteristics.
[115] Thompson, A., Vagge, C., and Tiburcio-Carneiro, M. (2025) *Framework of Analysis for Modern Slavery and Human Trafficking: A tool for Prevention*, London: Global Commission on Modern Slavery and Human Trafficking, available online: https://www.modernslaverycommission.org/gcms_prevention_framework.pdf.
[116] This is not relevant to the UK context.
[117] There is a recognition of the continued tension between UK immigration law and policy and modern slavery legislation, evident in the previous government's contested assertion that a large proportion of irregular migrants were 'gaming the system' in using modern slavery protections to gain entry into the UK. See Landman, T., Brewster, B., & Thornton, S. (2024). Taking Back Control: Human Rights and Human Trafficking in the United Kingdom, *Societies*, 14(4), 47. https://doi.org/10.3390/soc14040047.

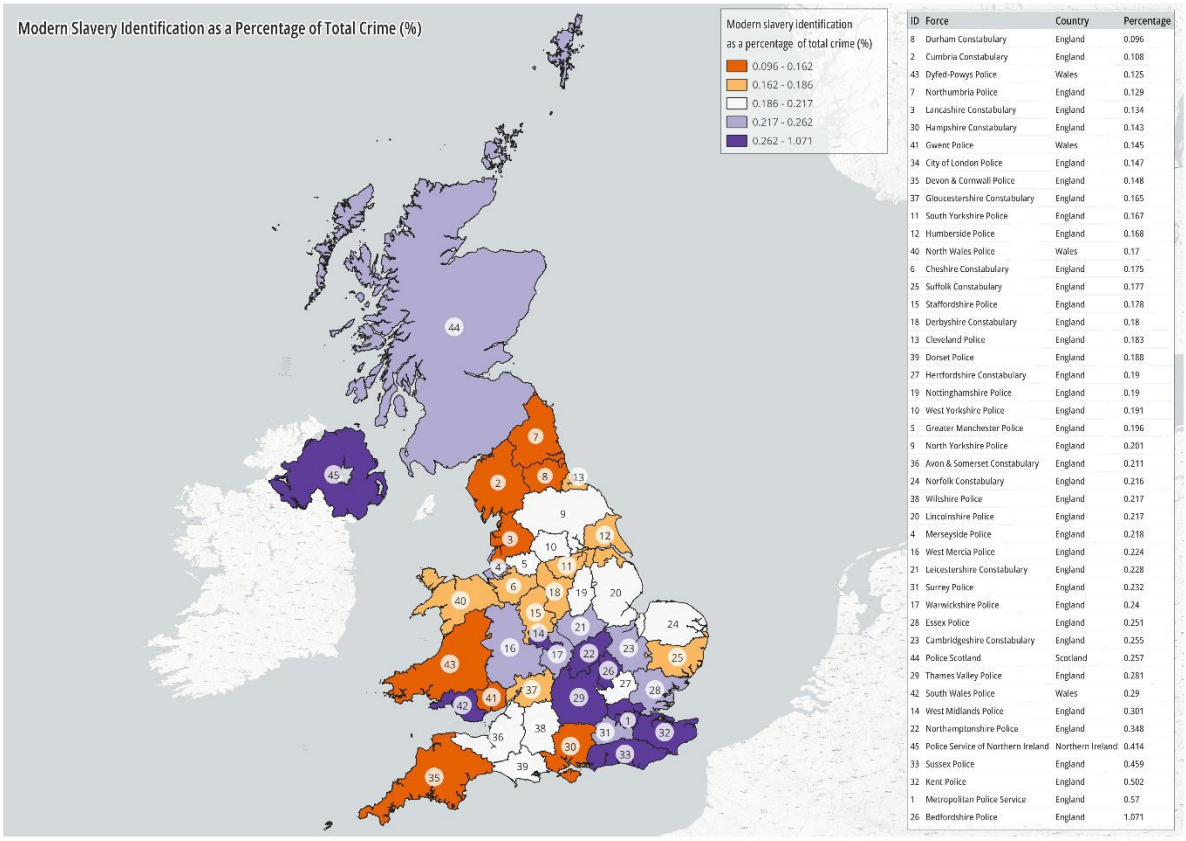
***Table 9**. Modern slavery risk factors at different levels of analysis*

	Levels of Analysis			
	Individual	**Household**	**Community**	**Structural**
Factors	Domestic abuse Mental ill health Gender Low income Unemployment Previous victim Immigration status Ethnicity Nationality Personal debt Insecure housing Lack of education Level literacy Religious affiliation Alcohol or drug dependency Age Physical disability Cognitive impairment Previous criminal convictions or forced criminality Women's reproductive health Consumer expenditure	Houses of multiple occupancy Total household income Family structure Family size Electricity usage Gas usage Council tax bands	Crime rates Local government quality Local social services provision School quality Law enforcement quality	Deprivation Poverty Inequality Sectoral composition Youth unemployment Unemployment
Data types	Administrative Survey Smart data	Administrative Survey Smart data	Administrative Crime reporting data Crime survey data	Administrative

Methodologically, geospatial analysis collects and analyses data at high levels of spatial resolution (i.e., the smallest units of analysis) across a wide range of topic areas and across different geographies. These methods can be used to build quite detailed and robust modern slavery risk maps for the UK through the careful layering of data within each of the geospatial units. Risk patterns will range from low to high and vary across geospatial units.

For example, the NRM data are now broken down by police jurisdiction and using data from 2022-2023, it is possible to show a map for the identification of modern slavery victims as a ratio to all other reported crime by police jurisdiction (Figure 10).[118] The figure shows the variation in victim identification as a ratio of total recorded crimes by police jurisdiction using a simple choropleth map.[119] This is an illustrative figure only, but it does show how geospatial analysis can provide useful insights for modern slavery mapping.[120]

[118] There is a strong correlation ($r = .93$, $p < .001$) between total recorded crime and modern slavery victim identification across all police jurisdictions ($n = 45$).
[119] A choropleth map is standard method in geospatial analysis to plot variation ranges using different colours across spatial units.
[120] We are grateful to Cristina Vrinceanu for assisting in the preparation of this map.



ID	Force	Country	Percentage
8	Durham Constabulary	England	0.096
2	Cumbria Constabulary	England	0.108
43	Dyfed-Powys Police	Wales	0.125
7	Northumbria Police	England	0.129
3	Lancashire Constabulary	England	0.134
30	Hampshire Constabulary	England	0.143
41	Gwent Police	Wales	0.145
34	City of London Police	England	0.147
35	Devon & Cornwall Police	England	0.148
37	Gloucestershire Constabulary	England	0.165
11	South Yorkshire Police	England	0.167
12	Humberside Police	England	0.168
40	North Wales Police	Wales	0.17
6	Cheshire Constabulary	England	0.175
25	Suffolk Constabulary	England	0.177
15	Staffordshire Police	England	0.178
18	Derbyshire Constabulary	England	0.18
13	Cleveland Police	England	0.183
39	Dorset Police	England	0.188
27	Hertfordshire Constabulary	England	0.19
19	Nottinghamshire Police	England	0.19
10	West Yorkshire Police	England	0.191
5	Greater Manchester Police	England	0.196
9	North Yorkshire Police	England	0.201
36	Avon & Somerset Constabulary	England	0.211
24	Norfolk Constabulary	England	0.216
38	Wiltshire Police	England	0.217
20	Lincolnshire Police	England	0.217
4	Merseyside Police	England	0.218
16	West Mercia Police	England	0.224
21	Leicestershire Constabulary	England	0.228
31	Surrey Police	England	0.232
17	Warwickshire Police	England	0.24
28	Essex Police	England	0.251
23	Cambridgeshire Constabulary	England	0.255
44	Police Scotland	Scotland	0.257
29	Thames Valley Police	England	0.281
42	South Wales Police	Wales	0.29
14	West Midlands Police	England	0.301
22	Northamptonshire Police	England	0.348
45	Police Service of Northern Ireland	Northern Ireland	0.414
33	Sussex Police	England	0.459
32	Kent Police	England	0.502
1	Metropolitan Police Service	England	0.57
26	Bedfordshire Police	England	1.071

Figure 10. *Modern slavery case identification as ratio of all crime identified by police jurisdiction*

In addition to collecting individual, household, community, and structural data for geospatial analysis, it is also possible to use remotely sensed data capture for earth observation (EO) to identify physical sites where there is a high probability of modern slavery. This approach has been developed to analyse physical sites relating to including brick kilns, places of crop harvesting, raw mineral extraction, charcoal production, and fish processing.[121] This kind of analysis is predicated on the assumption that human activity leaves physical traces and occurs on physical sites that are susceptible to detection using satellite EO data analysis with machine learning and AI approaches over time and space.

Physical sites have markers, objects (e.g., brick kilns), and other features, which can be captured, mapped, and integrated with other data sources to provide robust and systematic risk and vulnerability maps. This approach comprises six main stages: (1) geographical identification, (2) feature extraction, (3) machine learning

[121] Brown, C. et al. (2020) 'Investigating the Potential of Radar Interferometry for Monitoring Rural Artisanal Cobalt Mines in the Democratic Republic of the Congo,' *Sustainability* 12 (23): 9834; Kougkoulos, I., et al. (2021) 'A Multi-Method Approach to Prioritize Locations of Labor Exploitation for Ground-Based Interventions,' *Production and Operations Management*, 30 (12): 4396-4411; Jackson, B., et al. (2020a) 'Remote sensing of fish-processing in the Sundarbans Reserve Forest, Bangladesh: an insight into the modern slavery-environment nexus in the coastal fringe,' *Maritime Studies*, 19: 429-444; Jackson, B. et al. (2020b) 'Understanding the co-occurrence of tree loss and modern slavery to improve efficacy of conservation actions and policies,' *Conservation Science and Practice*, 2 (5): 183.

application to images, (4) spatial and temporal analysis, (5) secondary analysis, and (5) results.[122] For the UK, there are numerous reports of forced labour in the construction industry, agricultural sector, block paving industries, fishing, road haulage, and other sectors, where earth observation can be used to capture high resolution data on objects and features associated with these sectors, and can then be combined with other geospatial data for risk and vulnerability mapping.
There are thus strong precedents in scholar and practitioner communities working on modern slavery, forced labour, and human trafficking, as well as those who work in cognate areas, such as social sustainability, human rights, and development that provide both the content and the methods for building modern slavery risk and vulnerability maps for the UK.

Data Sources for Beyond Prevalence

Our review of data sources (Table 10) across the UK data infrastructure revealed different kinds of data which have either direct or indirect bearing on modern slavery, including administrative data, survey data, and novel data from variety of different organisations. Appendix 4 provides a full list of the data sources, many of which are regularly updated, while others are for discrete time periods and or are not updated regularly. The table shows that indirect administrative data sources comprise the largest proportion of available data. Any effort at collating, amalgamating, and analysing these data requires careful specification of the levels of analysis and the smallest unit for which data are available, aggregation to the lowest possible level of analysis, and possible transformation and normalisation to make the data comparable in ways that provide useful insights for risk and vulnerability mapping.

***Table 10**. Data sources for moving beyond prevalence*

	Direct	Indirect	Total
Administrative	5	52	57
Survey	1	4	5
External-Organization	1	1	2
Total	7	57	/

[122] Landman, T., Boyd, D., Trodd, Z., and Goulding, J. (2024) 'Seeing the Unseen World: Modern Slavery, Machine Learning, and AI,' in Mira Lane and Arathi Sethumadhavan (eds.) *Collaborative Intelligence: How Humans and AI are Transforming Our World*, Cambridge, MA: MIT Press, 143-172.

Prevalence Estimation Methods Assessment

This scoping review has considered a range of different prevalence estimation methods – multiple systems estimation (MSE) and a combination of sampling and surveys – and has also made the case that in the data rich environment of the UK, the possibility to create modern slavery risk and vulnerability maps. Table 10 provides an overall assessment of prevalence estimation methods in terms applicability, assumptions and requirements, investment of time and financial resources, reliability, and limitations. The assessment shows that there is not one method that is necessarily best for the UK, but that MSE is the best method for an overall prevalence estimation for the umbrella concept of modern slavery and that some combination of sampling and surveys is best for specific modern slavery offences within specific sub-populations in the UK.

***Table 10**. Assessment of main prevalence estimation methods*

Assessment Dimensions	Main Prevalence Estimation Methods	
Approach	Multiple Systems Estimation (MSE)	Sampling and Surveys
Applicability	Can be used for national or sub-national prevalence estimation	More appropriate for subnational estimation and the estimation of particular modern slavery offences
Assumptions	Multiple and independent administrative lists of victims Capability for record linkage across multiple sources A closed system of victims	Random probability sample preferred Purposive sampling with appropriate estimators can mitigate potential biases Well designed survey instruments with appropriate indicators for each type of modern slavery offence NSUM holds much promise for prevalence estimation
Time	Provided data requirements are met, MSE is relatively fast to perform	Response rates and sample sizes require relatively more time for data collection and analysis
Relative cost	MSE is relatively cost effective and efficient	Survey costs are high and currently increasing in the UK Survey co-design with survivors and other stakeholders adds time and cost
Reliability	Victim identification already completed Estimations come from different modelling strategies Estimations are more reliable and have less uncertainty if there is more overlap across sources	The overall reliability is a function of the type of sample, type of modern slavery offence, and determination of thresholds and criteria for analysing indicators to determine the likelihood of offence identification and enumeration
Limitations	Independence of lists assumption often violated Constrained by time boundedness and the lack of a closed system	Response rates can be quite low Social desirability problem difficult to overcome No direct identification but only a likelihood calculation Cannot easily be aggregated to national level or to the umbrella concept of modern slavery

Appendix 1: Prevalence Estimation Literature

1. Barrick, K. and Lattimore, P. and Pitts, W. and Zhang, S. (2014) 'When farmworkers and advocates see trafficking but law enforcement does not: challenges in identifying labour trafficking in North Carolina,' *Crime Law Social Change*, 61(1): 2015-214.
2. Alliance 8.7 (2017) 'Global Estimates of Modern Slavery: Forced Labour and Forced Marriage Executive Summary.'
3. Anderson, V. R. and Kulig, T. C. and Sullivan, C. J. (2019) 'Estimating the prevalence of human trafficking in Ohio, 2014-2016,', *American Journal of Public Health*, 109(10): 1396-1399.
4. Atteraya, M. and Ebrahim, N. and Gnawali, S. (2018) 'Determinants of Child Maltreatment in Nepal: Results from the 2014 Nepal Multiple Indicator Cluster Survey,' *Child Abuse & Neglect*, 76(1): 400-407.
5. Bales, K. and Hesketh, O. and Silverman, B. (2015) Modern Slavery in the UK: How many victims?. London, United Kingdom: Her Majesty's Stationary Office.
6. Bales, K. and Murphy, L. T. and Silverman, B. W. (2020) 'How many trafficked people are there in Greater New Orleans? Lessons in measurement,' *Journal of Human Trafficking*, 6(4): 375 - 387.
7. Barrick, K. and Pfeffer, R. and Tueller, S. and Tibaduiza, E. and Galvan, T. (2023) 'Exploring Gaps in Identification: Estimating the Prevalence of Sex Trafficking in Sacramento County', *Journal of Human Trafficking*, 1-18.
8. Bharadwaj, S. and S.M. Balasubramaniam (2019) 'Victims without a voice: Measuring worst forms of child labor in the Indian State of Bihar,' *Victims & Offenders*, 14(7): 832-858.
9. Bhatia, A. and Krieger, N. and Victoria, C. and Tuladhar, S. and Bhabha, J. and Beckfield (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 & Neglect*, 101(1), pp. 1-14.
10. Busch-Armendariz, N and Nale, N. and Kammer-Kerwick, M. and Kellison, B. and Torres, M. and Heffron, L. and Nehme, J. (2016) *Human trafficking by the numbers: The initial benchmark of prevalence and economic impact for Texas*. Texas, United States: University of Texas.
11. Cruyff, M. and van Dijk, J. and van der Heijden, G. (2017) 'The Challenge of Counting Victims of Human Trafficking: Not on the Record: A Multiple Systems Estimation of the Numbers of Human Trafficking Victims in the Netherlands in 2010-2015 by Year, Age, Gender, and Type of Exploitation,' *Chance*, 30(3): 41-49.
12. CSJ (2020) *It Still Happens Here: Fighting UK Slavery in the 2020s*. London, United Kingdom: The Centre for Social Justice.
13. Diego-Rosell, P. and Larsen, J. (2018) 'Modelling Risk of Modern Slavery,' Perth, Australia: Walk Free Foundation.
14. Farrell, A. and McDevitt, J. and Pfeffer, R. and Fahy, S. and Owens, C. and Dank, M. and Adams, W. (2012) *Identifying challenges to improve the investigation and prosecution of state and local human trafficking cases*. Final report submitted to the U.S. Department of Justice
15. Farrell, F. and Dank, M. and Kafafian, M. and Lockwood, S., and Pfeffer, R. and Hughes, A. and Vincent, K. (2019) *Capturing Human Trafficking Victimization Through Crime Reporting*. Washington, DC: National Institute of Justice.
16. Gilbert, L. and Reza, A. and Mercy, J. and Lea, V. and Lee, J. and Xu, L. and Marcelin, L. and Hast, M. and Vertefeuille, J. and Domercant, J. (2018) 'The experience of violence against children in domestic servitude in Haiti: Results from the Violence Against Children Survey, Haiti 2012,' *Child Abuse & Neglect* 76(1): 184–193.
17. ICF (2012) *Child labour in agriculture in the Northern Province of Rwanda*. Calverton, United States: ICF International.
18. IJM and Rights Lab (2023) Scale of Harm, Washington DC: International Justice Mission and Nottingham: Rights Lab.
19. ILO, Walk Free and International Organization for Migration (2017) *Global Estimates of Modern Slavery: Forced Labour and Forced Marriage Executive Summary*. Geneva, Switzerland: International Labour Organization.
20. ILO, Walk Free and International Organization for Migration (2022) *Global Estimates of Modern Slavery: Forced Labour and Forced Marriage*. Geneva, Switzerland: International Labour Organization.

21. International Justice Mission (2013) *Commercial Sexual Exploitation of Children in Cambodia: A venue-based application of time-space sampling to measure prevalence in Phnom Penh, Siem Reap and Sihanoukville*.
22. International Justice Mission (2014) *Commercial Sexual Exploitation of Children in Dominican Republic*.
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Appendix 2: Stakeholder Survey Questions

No.	Question	Responses
Q1	In which type of organisation do you work?	Research Institute Non-Governmental National Non-Governmental Organisation International Central Government Wider Public Sector Private Sector Politician/Parliamentarian Local Government Inter-governmental Organisation Voluntary, Community, and Faith Sector
Q2	In which role do you work?	Research Policy Advocacy Senior leadership Other, please describe
Q3	Do you know and understand multiple systems estimation ('MSE'), which was used to produce an estimate of human trafficking in the UK in 2014? If you answer No to this question, please move to Question 6.	Yes No
Q4	If you answered Yes to the previous question on MSE, are there any limitations to this methodology?	Free text
Q5	What is the best way to reduce uncertainty of prevalence estimation using MSE? i.e., how could the MSE method be improved?	Free text
Q6	Do you know and understand prevalence estimates that use survey and sampling methodologies? For example, the methodology underpinning the Global Slavery Index. If you answer **No** to this question, please move to **Question 8**.	Yes No
Q7	If you answered **Yes** to the previous question on sampling and survey approaches such as in the **Global Slavery Index**, are there any limitations to this methodology?	Free text
Q8	Aside from the **Global Slavery Index**, are you aware of other prevalence estimation studies that used survey and sampling methodologies? If **Yes**, please provide details.	Yes No
Q9	What is the best way to **reduce uncertainty** of prevalence estimation using surveys? i.e., how could sampling approaches be improved and how can survey instruments be better designed?	Free text
Q10	Do you know and understand **National Data Analytics Solution (NDAS)** methodology, as applied in the West Midlands, which uses machine learning to identify networks of people and events linked to modern slavery, and applies **Natural Language Processing (NLP)** to identify additional, previously unrecognised modern slavery events, and the people linked to those events? If your answer to this question is **No**, please move to **Question 13**.	Yes No

Q11	If you answered **Yes** to the previous question about **NDAS** and the **West Midlands**, are there any limitations to this methodology?	Free text
Q12	What is the best way to **reduce uncertainty** of prevalence estimation using this approach? i.e., how could this method be improved?	Free text
Q13	What other methodologies are you aware of that could be used to estimate prevalence of modern slavery in the UK? Please describe them, including any limitations.	Free text
Q14	To date, have you used any national/global prevalence estimate(s) of modern slavery/human trafficking in your work? If your answer to this question is **No**, then please move to **Question 17**.	Yes No
Q15	If your answer to the previous question was **Yes**, please describe which prevalence estimate(s) you have used, and how you have used it/them.	Free text
Q16	For which of the following purposes are prevalence estimates useful? Please tick all that apply.	Awareness raising Advocacy Policy making Assessing effectiveness of interventions For research purposes None of the above Other
Q17	If a new modern slavery prevalence estimate were to be undertaken in the UK, which methodology should be used?	Multiple systems estimation (MSE) Sampling and Surveys Machine Learning and Natural Language Processing Other
Q18	Are you aware of any further studies that attempt to 'move beyond prevalence'? If so, please can you describe them and, where possible, share links to them.	Free text
Q19	What data sources could be used to provide indirect measures of the drivers of modern slavery?	Free text
Q20	In October 2024, the House of Lords Modern Slavery Act 2015 Committee recommended that 'The Government should improve information and data sharing mechanisms across multiple agencies, including between the police and the NHS, through establishment of a modern slavery data warehouse'. Do you agree with this recommendation?	Yes No
Q21	Please explain your answer.	Free text
Q22	If a new prevalence estimate were to be developed in the UK, please state the ways in which you/your organisation may be able to support its development.	Free text

Appendix 3: Cabinet Office Leadership College Organisational Representation

CEOs	D-CEOs
Suffolk New College	Defence Infrastructure Organisation
Torbay Council	West Yorkshire Police
Royal United Hospitals Bath NHS Foundation Trust	E-ACT
Bradford Diocesan Academies Trust	Northamptonshire Healthcare NHS Foundation Trust
Reach2 Academy Trust	West Yorkshire Fire and Rescue Service
Barnsley College	Staffordshire Fire and Rescue Service
Gateshead College	University of Chester
Gloucestershire Health and Care NHS Foundation Trust	United Colleges Group
Welsh Revenue Authority	Royal Air Force
James Paget University Hospitals NHS Foundation Trust	Oxfordshire Fire and Rescue Service
University of Cumbria	Wellspring Academy Trust
NHS Education for Scotland	Cambridge Regional College
Liverpool City Region Combined Authority	College of West Anglia
Lincolnshire Fire and Rescue Service	Argyll and Bute Council
Cheshire Police	Ministry of Defence
Merseyside Fire and Rescue Authority	Birkbeck, University of London
Suffolk Constabulary	Northern Ireland Ambulance Service Trust
Crown Commercial Service	Our Lady of Lourdes Catholic Multi-Academy Trust
House of Commons	Gloucestershire Fire and Rescue Service
Shropshire, Telford & Wrekin ICS	Scottish Ambulance Service
Bishop Hogarth Catholic Education Trust	University of Greenwich
	Ministry of Defence
	Calderdale and Huddersfield NHS Foundation Trust
	Derby City Council
	Lewisham Council
	Cabinet Office
	Department for Digital, Culture, Media and Sport
	Sussex Partnership NHS Foundation Trust
	NHS Blood and Transplant

The Leadership College was held on the Jubilee Campus at the University of Nottingham, 24 March 2025.

Appendix 4: Data Sources

Source	Category	Type	Temporal Coverage	Spatial Coverage	URL
National Referral Mechanism Statistics	Direct	Administrative	2009-2024	UK	https://www.gov.uk/government/collections/national-referral-mechanism-statistics
Local Government Authorities	Direct	Administrative	Unknown	Unknown	Unknown
Administrative Data Research (ADR)	Direct	Administrative	2011-2024 released	England & Wales	https://datacatalogue.adruk.org/browser/dataset/1408722/1 - access to be requested.
Office for National Statistics (ONS)	Direct	Administrative	2009-2021	UK	https://www.ons.gov.uk/file?uri=/peoplepopulationandcommunity/crimeandjustice/datasets/childvictimsofmodernslaveryintheuk/march2022/childvictimsofmodernslaveryfinaltablesv2.xlsx
Office for National Statistics (ONS)	Direct	Administrative	2010-18/19	UK	https://www.ons.gov.uk/peoplepopulationandcommunity/crimeandjustice/datasets/modernslaveryintheukappendixtables
Consumer Data Research Centre (CDRC)	Direct	Administrative	Unknown	UK	https://data.cdrc.ac.uk/dataset/consumer-vulnerability
Achilles	Direct	Survey	2021-2024	UK	https://www.achilles.com/
The Salvation Army	Direct	Administrative	Most recent publication 2024.	England & Wales	https://www.salvationarmy.org.uk/modern-slavery/modern-slavery-latest-reports
Office for National Statistics (ONS)	Indirect	Administrative	2006-2024	England & Wales	https://www.ons.gov.uk/generator?uri=/peoplepopulationandcommunity/crimeandjustice/articles/domesticabusevictimcharacteristicsenglandandwales/yearendingmarch2024/d92c87cf&format=xls https://www.ons.gov.uk/generator?uri=/peoplepopulationandcommunity/crimeandjustice/articles/domesticabusevictimcharacteristicsenglandandwales/yearendingmarch2024/bbf350f0&format=xls
Office for National Statistics (ONS)	Indirect	Administrative	2015-2017	England & Wales	https://www.ons.gov.uk/file?uri=/peoplepopulationandcommunity/crimeandjustice/datasets/wo

					menmostatriskofpartnerabuse/yearsendingmarch2015to2017/appendixtablesfinal.xls
Office for National Statistics (ONS)	Indirect	Administrative	2021	England	https://www.ons.gov.uk/file?uri=/peoplepopulationandcommunity/healthandsocialcare/healthinequalities/adhocs/1126additionaldatarelatingtoestimatingthenumberofpeoplelivinginpovertyathealthriskincoldweatherduetocardiovascularorrespiratoryconditionsengland2021/datadownload20230517accessible.xlsx https://www.ons.gov.uk/file?uri=/peoplepopulationandcommunity/healthandsocialcare/conditionsanddiseases/adhocs/1597additionaldatarelatingtoestimatingthenumberofpeoplelivinginpovertyathealthriskincoldweatherduetocardiovascularorrespiratoryconditionsengland2021/datadownload20231020accessible.xlsx
Consumer Data Research Centre (CDRC)	Indirect	Administrative	January 2019 – July 2024	UK	https://data.cdrc.ac.uk/dataset/access-healthy-assets-hazards-ahah
Consumer Data Research Centre (CDRC)	Indirect	Administrative	Unknown	UK	https://data.cdrc.ac.uk/dataset/index-multiple-deprivation-imd
Consumer Data Research Centre (CDRC)	Indirect	Administrative	Unknown	England	https://data.cdrc.ac.uk/dataset/ageing-place-classification-aipc (only relevant for those aged 50 or over)
Consumer Data Research Centre (CDRC)	Indirect	Administrative	Safeguarded	England	https://data.cdrc.ac.uk/dataset/local-morbidity-rates-global-burden-disease-and-alcohol-related-conditions
Consumer Data Research Centre (CDRC)	Indirect	Administrative	October 2013 – September 2023	UK	https://data.cdrc.ac.uk/dataset/energy-deprivation-classification
Consumer Data Research Centre (CDRC)	Indirect	Administrative	January 1997 – January 2023	UK	https://data.cdrc.ac.uk/dataset/cdrc-residential-mobility-and-deprivation-rmd-index-lad-geography
Consumer Data Research Centre (CDRC)	Indirect	Administrative	Unknown	UK	https://data.cdrc.ac.uk/dataset/priority-places-food-index-version-2

Centre for Social Justice (CSJ)	Indirect	Administrative	2000 - 2020	UK	https://socialjusticedatatracker.org.uk/addiction/
Ministry of Housing, Communities & Local Government (MHCLG)	Indirect	Administrative	2005 - 2024	England	https://www.gov.uk/search/research-and-statistics?parent=/housing-local-and-community/homelessness-rough-sleeping&content_store_document_type=statistics_published&topic=dad5f9c9-410f-4320-aa14-860ccba2273e&order=updated-newest
Ministry of Justice (MoJ) & Legal Aid Agency	Indirect	Administrative	Unclear, impression between 2005 - 2024	England & Wales	https://app.powerbi.com/view?r=eyJrIjoiYjI5ZjUxNjktODAxYS00ZTQ3LTliMTUtZGIyYjA2MjkwZDQ3IiwidCI6ImM2ODc0NzI4LTcxZTYtNDFmZS1hOWUxLTJlOGMzNjc3NmFkOCIsImMiOjh9
Healthy and Sustainable Places Data Service	Indirect	Administrative	Unknown	Great Britain	https://data.hasp.ac.uk/browser/dataset/5276/0/5994
Geographic Data Service (GDS)	Indirect	Administrative	2009 – 2014	UK	https://data.geods.ac.uk/dataset/nhs-hospital-admission-rates-by-ethnic-group-and-other-characteristics
Youth Justice Board	Indirect	Administrative	Most recent publication 2023/24	England & Wales	https://www.gov.uk/government/statistics/youth-justice-statistics-2023-to-2024/youth-justice-statistics-2023-to-2024
Geographic Data Service (GDS)	Indirect	Administrative	1997 - 2023	UK	https://data.geods.ac.uk/dataset/residential-mobility-index
Ministry of Housing, Communities & Local Government (MHCLG)	Indirect	Administrative	Most recent publication 2022 - 2023	UK	https://www.gov.uk/government/publications/delivery-of-support-in-domestic-abuse-safe-accommodation-annual-progress-report-2022-23/annual-progress-report-from-the-domestic-abuse-safe-accommodation-national-expert-steering-group-2022-to-2023#:~:text=In%202022%2D23%2C%20local%20authorities,specialist%20characteristic%20in%20safe%20accommodation.
Achilles	Indirect	Survey	2022 - present	UK	https://www.achilles.com/
Office for National	Indirect	Administrative	Varies	UK	https://www.nomisweb.co.uk/

Statistics (ONS) & NOMIS					
Department for Education (DfE)	Indirect	Administrative	2009 - 2023	England	https://www.gov.uk/government/collections/statistics-pupil-absence
Office for National Statistics (ONS)	Indirect	Administrative	2014 - 2023	UK	https://www.ons.gov.uk/businessindustryandtrade/business/activitysizeandlocation/bulletins/businessdemography/previousreleases
Office for National Statistics (ONS)	Indirect	Administrative	2016 - 2023	UK	https://www.ons.gov.uk/employmentandlabourmarket/peoplenotinwork/unemployment/bulletins/childrenlivinginlongtermworklesshouseholdsintheuk/previousreleases
Centre for Social Justice (CSJ)	Indirect	Administrative	Unknown	UK	https://socialjusticedatatracker.org.uk/education/
Office for National Statistics (ONS)	Indirect	Administrative	1995 - 2022	England & Wales	https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/articles/milestonesjourneyingthroughmodernlife/2024-04-08
Office for National Statistics (ONS)	Indirect	Administrative	2017	England	https://www.ons.gov.uk/file?uri=/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/adhocs/009787occupationsinareaswithhighestandlowestriskofautomationengland2017/occupationinplaceworkhighestlowestriskautomation.xls
Office for National Statistics (ONS)	Indirect	Administrative	2024	England & Wales	https://www.ons.gov.uk/peoplepopulationandcommunity/wellbeing/datasets/numberofatmsinlocalareasenglandandwales
Office for National Statistics (ONS) & Department for Energy Security & Net Zero (DESNZ)	Indirect	Administrative	2024	UK	https://www.gov.uk/government/publications/postcode-level-domestic-gas-and-electricity-consumption-about-the-data/postcode-level-domestic-electricity-consumption-notes See also: https://www.ons.gov.uk/peoplepopulationandcommunity/housing/articles/energyefficiencyofhousinginenglandandwales/2024

Consumer Data Research Centre (CDRC)	Indirect	Administrative	Unknown	England & Wales	https://data.cdrc.ac.uk/dataset/classification-multidimensional-open-data-urban-morphology-modum
Consumer Data Research Centre (CDRC)	Indirect	Administrative	January 2016 – December 2024	UK	https://data.cdrc.ac.uk/dataset/county-court-judgements-ccjs
Consumer Data Research Centre (CDRC)	Indirect	Administrative	1997 - 2022	UK	https://data.cdrc.ac.uk/dataset/cdrc-residential-property-counts
Urban Big Data Centre (UBDC)	Indirect	Administrative	2016 - 2024	UK	https://data.ubdc.ac.uk/datasets/adzuna
Office for National Statistics (ONS)	Indirect	Administrative	2001 - 2023	UK	https://www.ons.gov.uk/datasets/suicides-in-the-uk/editions/2023/versions/1
Department for Education (DfE)	Indirect	Administrative	Latest release March 2025	UK	https://explore-education-statistics.service.gov.uk/find-statistics/pupil-absence-in-schools-in-england/2023-24
Chartered Institute of Environmental Health	Indirect	Administrative	Latest release 2020/21	England & Wales	https://www.cieh.org/policy/campaigns/noise-survey/
Office for National Statistics (ONS)	Indirect	Administrative	Latest release November 2022	UK	https://www.ons.gov.uk/datasets/TS029/editions/2021/versions/1
Data 8: The Data Quality Company	Indirect	Administrative	2025	UK	Not legally mandatory, but contains over 26 million records: https://www.data-8.co.uk/data-sources/the-national-change-of-address/
Office for National Statistics (ONS)	Indirect	Administrative	1997 - 2025	England	https://www.ons.gov.uk/economy/economicoutputandproductivity/publicservicesproductivity/datasets/publicserviceproductivityadultsocialcare
UK Data Service	Indirect	Administrative	2007 - 2022	UK	Safeguarded data, available upon request: https://beta.ukdataservice.ac.uk/datacatalogue/studies/study?id=9237#:~:text=The%20CORE%20lettings%20data%20include,5%20on%20a%20voluntary%20basis.

Office for National Statistics (ONS) & NOMIS	Indirect	Administrative	Latest release 2021	England & Wales	Available through request: https://www.nomisweb.co.uk/datasets/c2021rm194#:~:text=Dataset:RM194%20%2D%20Number%20of%20households%20in%20houses%20in%20multiple%20occupation&text=API%20reference:,C2021RM194
Department for Transport (DfT)	Indirect	Administrative	Latest release June 2025	UK	https://www.gov.uk/government/statistical-data-sets/port-and-domestic-waterborne-freight-statistics-port#port-level-statistics
Home Office (HO)	Indirect	Administrative	Latest release June 2025	UK	https://www.gov.uk/government/publications/home-offices-county-lines-programme-data/county-lines-programme-data
Centre for Cities	Indirect	Administrative	April 2020	UK	https://www.centreforcities.org/wp-content/uploads/2020/04/Household-debt-and-problem-debt-in-British-cities-1.pdf
Citizens Advice	Indirect	Survey	January 2024	UK	https://www.centreforcities.org/wp-content/uploads/2020/04/Household-debt-and-problem-debt-in-British-cities-1.pdf
Office for National Statistics (ONS)	Indirect	Administrative	2024	England & Wales	https://www.ons.gov.uk/peoplepopulationandcommunity/crimeandjustice/bulletins/crimeinenglandandwales/yearendingdecember2024
YouGov	Indirect	Survey	Latest release June 2025	UK	https://yougov.co.uk/topics/politics/trackers/how-much-confidence-brits-have-in-police-to-deal-with-crime
Home Office (HO)	Indirect	Administrative	Latest release January 2025	UK	https://www.gov.uk/government/publications/returns-from-the-uk-and-illegal-working-activity-since-july-2024/illegal-working-activity-since-5-july-2024#illegal-working-visits-and-arrests-by-region
YouGov	Indirect	Survey	Survey conducted in 2022	UK	https://d3nkl3psvxxpe9.cloudfront.net/documents/YouGov_-_Period_poverty.pdf

nPerf	Indirect	Administrative	Live updates	UK	https://www.nperf.com/en/map/GB/-/-/signal?ll=20&lg=0&zoom=3
Ministry of Housing, Communities and Local Government (MHCLG)	Indirect	Administrative	Latest release 2022/23	England & Wales	https://www.gov.uk/government/statistical-data-sets/fire-statistics-data-tables#smoke-alarms
UK Visas and Immigration	Indirect	Administrative	Latest release 2025	UK	https://www.gov.uk/csv-preview/686ce04d81dd8f70f5de3c40/2025-07-08_-_Worker_and_Temporary_Worker.csv
Department of Health & Social Care (DHSC)	Indirect	Administrative	Latest release November 2024	England	https://fingertips.phe.org.uk/profile/dental/data#page/1
The Trussell Trust	Indirect	Administrative	2024/2025	UK	https://www.trussell.org.uk/news-and-research/latest-stats/end-of-year-stats#parcels-by-postcode
Children's Commissioner	Indirect	Administrative	Published in 2019	UK	https://dera.ioe.ac.uk/id/eprint/32954/1/CCO-Gangs.pdf
National Crime Agency (NCA)	Indirect	Administrative	2022/2023	UK	https://www.nationalcrimeagency.gov.uk/images/mpu/downloads/UKMPU%20Annual%20Data%20Report%202022-23.pdf
National Crime Agency (NCA)	Indirect	Administrative	2022/2023	UK	https://www.nationalcrimeagency.gov.uk/images/mpu/downloads/UKMPU%20Statistical%20Report%202022-2023.pdf
YouGov & Fabian Society	Indirect	Survey	2023	UK	https://d3nkl3psvxxpe9.cloudfront.net/documents/Fabians_PovertyResults_230512_W2.pdf
Understanding Society	Indirect	Survey	Various	UK	https://www.understandingsociety.ac.uk/

Appendix 5: Multiple Overlapping Risk Factors for Modern Slavery in the UK

1. Domestic abuse in the household
2. Insecure housing
3. Unaccompanied asylum seeking (child)
4. Mental ill health
5. Low-income status
6. Lack of education and technical skill training
7. Gender (male)
8. Gender (female)
9. Barriers to services
10. Ethnicity (minorities)
11. Cultural religious barriers
12. Alcohol or drug dependency
13. Immigration status
14. Lack of modern slavery awareness
15. Deprived living environment
16. Age (underage)
17. Children in care
18. Physical disabilities
19. Insecure employment
20. Family routes – being born out of slavery
21. Age (retired)
22. School exclusion
23. Cognitive impairment
24. Unemployment
25. Covid 19 lockdown
26. Previous convictions/forced criminality
27. Victim of modern slavery in the past
28. LGBTQ+
29. Policy changes