



Examining the geographies of human trafficking: Methodological challenges in mapping trafficking's complexities and connectivities

Ella Cockbain^{*}, Kate Bowers, Oli Hutt

University College London (UCL), Department of Security and Crime Science, United Kingdom

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ABSTRACT

There is relatively little empirical research into the geographies of human trafficking, despite its inherent spatiality and the clear benefits of geographical perspectives. An emerging but vibrant body of qualitative work explores different aspects of trafficking's spatiality and spatio-temporality in depth and nuance, but equivalent quantitative analyses are notably lacking. What exists is largely limited to crude maps and broad-brushed assessments of patterns and trends. Yet, rigorous quantitative work is also vital in advancing understanding, informing responses and increasing accountability. In this paper, we present a novel, empirically-substantiated examination of methodological challenges in mapping trafficking. We draw on analysis of data extracted from the case files of 450 formally identified labour trafficking victims (accessed via the UK's National Crime Agency). We identify and illustrate five characteristics of the data creating particular challenges for geospatial analysis: data integrity (regarding completeness, accuracy and consistency); geographical uncertainty (regarding spatial accuracy and specificity); managing multiple geographies (trafficking is a complex process with various stages, each potentially involving numerous locations); diversity and disaggregation (important geographical variations can be masked in aggregated analysis); and unclear journeys (analysing trafficking routes proved particularly complicated). We also consider possible solutions and explore implications for future research, policy and practice.

1. Introduction: human trafficking is a fundamentally spatial issue

Human trafficking¹ (hereafter trafficking) involves people being moved within, through or between countries for the purposes of exploitation: as such, it is a fundamentally spatial phenomenon (Blazek, Esson, & Smith, 2019; Yea, 2021). Although still relatively marginal, there is an emergent body of scholarship that demonstrates how geographical perspectives and analyses can enable more nuanced understanding of trafficking, challenge assumptions and orthodoxies, inform responses and, crucially, increase scrutiny and accountability

around anti-trafficking activities (see, e.g., Blazek, et al., 2019; Boyden & Howard, 2013; Choi, 2014; McGrath & Watson, 2018; Yea, 2015, 2020b, 2021). This research literature on the complex and varied geographies of trafficking and anti-trafficking involves diverse conceptual and empirical contributions. It is striking, however, that such research is overwhelmingly qualitative in nature. With this paper, we aim to help stimulate similarly nuanced and context-sensitive quantitative research into trafficking's spatial patterns, distributions and networks. Our work speaks to a clear and longstanding need for both improved routine collection of geospatial data and more effective use of existing sources (see, e.g., Kangaspunta, 2003; Parmentier, 2010; Smith, 2018).

; GIS, Geographic Information System.

^{*} Corresponding author. UCL Department of Security and Crime Science, 35 Tavistock Square, London WC1H 9EZ, United Kingdom.

E-mail address: e.cockbain@ucl.ac.uk (E. Cockbain).

¹ We used the standard international definition of human trafficking from the United Nations (2000, p. 42) that underpins most laws, policies and research: 'the recruitment, transportation, transfer, harbouring or receipt of persons, by means of the threat or use of force or other forms of coercion, of abduction, of fraud, of deception, of the abuse of power or of a position of vulnerability or of the giving or receiving of payments or benefits to achieve the consent of a person having control over another person, for the purpose of exploitation. Exploitation shall include, at a minimum, the exploitation of the prostitution of others or other forms of sexual exploitation, forced labour or services, slavery or practices similar to slavery, servitude or the removal of organs'. Notably, where under 18-year-olds are concerned, such activity can constitute trafficking even if no explicit 'means' of manipulation are used, which can blur the conceptual boundaries between child trafficking and independent child migration and child labour and result in problematic responses (Boyden & Howard, 2013).

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Given the complexities of trafficking and the limited relevant foundational research, we took a case-study approach, examining geospatial data for 450 people officially recognised as victims of labour trafficking in the UK. This dataset is large for this field and uniquely geographically-nuanced. We used empirical analysis as a tool to identify key methodological challenges for geospatial analysis of trafficking and suggest ways these challenges might be mitigated. We took this approach rather than simply analysing geospatial patterns in our data because understanding the nature of these methodological and data-related issues is fundamental to effectively conducting, interpreting and using such research. Although our focus throughout is on quantitative analysis and, in particular, geographic information system (GIS) mapping, many of the findings can apply to qualitative approaches too. Overall, our findings are relevant not just for academics but also for other parties who collect, hold and analyse trafficking-related data, including governmental agencies, transnational organisations, law enforcement and non-governmental organisations (NGOs).

The remainder of the article is structured as follows. First, we contextualise our contribution against the existing literature on the geographies of trafficking and introduce our specific research focus and questions. Next, we present our materials and methods, detailing our source, sampling, data, ethical considerations and the processes by which we extracted, cleaned, coded and analysed our data. Then, we present our core results: the five main methodological challenges we identified for geospatial analysis, together with illustrative examples and suggestions to address these challenges. We finish with a discussion and conclusions, situating our findings against the existing literature and exploring their implications for future research, policy and practice.

2. Context: the under-researched geographies of trafficking

Alongside growing political, media and public attention around human trafficking from the 1990s onwards, the research literature on trafficking and anti-trafficking has expanded rapidly (Cockbain, Bowers, & Dimitrova, 2018; Goździak, Graveline, Skippings, & Song, 2015; Sweileh, 2018). It is now a vibrant field, characterised by diverse multi- and inter-disciplinary work and varied conceptual, theoretical and methodological contributions, including from geography and adjacent disciplines (Esson, 2020; Yea, 2021). Nevertheless, many early and longstanding critiques of the field still apply, particularly regarding the relative dearth of high quality empirical research in general, and quantitative such work in particular (Cockbain et al., 2018; Goździak et al., 2015).

The extent to which trafficking is a neglected topic in geography is contested (Laurie & Richardson, 2021). Some researchers have argued that trafficking and overlapping issues such as ‘modern slavery’ and forced labour² have been largely overlooked within geography in general (Blazek et al., 2019; Kangaspunta, 2003; Yea, 2012, 2015) or within specific sub-disciplines like population geography (Smith, 2018) and labour geography (Strauss, 2012). Recently, however, researchers have argued that the geographies of trafficking are no longer so acutely under-researched, pointing both to growing scholarly attention within geography and a broader multi-/inter-disciplinary critical literature on trafficking and anti-trafficking (Blazek et al., 2019; McGrath & Watson, 2018; Yea, 2021). Although it remains a fairly marginal subject in geography – especially in comparison to other aspects of migration and/or labour market dynamics – there is certainly increased recognition of trafficking’s fundamental spatiality and thus the benefits of geographical perspectives and geospatial/spatiotemporal analyses (Blazek et al., 2019; Laurie & Richardson, 2021; McGrath & Watson, 2018; Yea, 2017,

2021). As McGrath and Watson (2018) stress, critical engagement from geographers is all the more important now that trafficking is increasingly framed not just as a criminal justice issue but a matter of and for development.

One key focus of the burgeoning geographical literature on trafficking/anti-trafficking is the agency of people who are trafficked (e.g. Blazek & Esson, 2019; Boyden & Howard, 2013; Choi, 2014; Laurie & Richardson, 2021), including how agency and exploitation can co-exist (Esson, 2020) and how resistance strategies are deployed (Yea, 2016). These nuanced understandings of agency unsettle its dominant conceptualisation in media and political discourse as ‘discrete individuated “choices” divorced from wider structural conditions’ (Blazek & Esson, 2019, p. 329). Geographers’ contributions also help challenge reductive binaries like those of the ‘good’ trafficking victim versus ‘bad’ irregular migrant (particularly migrant sex workers) (e.g. Anderson, 2010; Esson, 2020; Yea, 2012) and the assumed stark dichotomy between trafficker and trafficked person (e.g. Blazek & Esson, 2019; Izcara Palacios & Yamamoto, 2017). This work resonates with the wider critical literature on trafficking (e.g. Doezeema, 2010) in unsettling the ‘iconic victim’ narrative: a highly racialised and gendered depiction of trafficked people as powerless and passive (see, e.g., Yea, 2021).

Another key theme involves challenging the tendency to exceptionalise trafficking (see O’Connell Davidson, 2015) and emphasising instead how broader social and structural conditions work to constrain mobility, limit options and produce exploitation. Examples here include consideration of the roles of border and migration controls, labour market and supply chain dynamics and geographies of inequality, (e.g. Boyden & Howard, 2013; FitzGerald, 2016; Izcara Palacios & Yamamoto, 2017; McGrath, 2013; McGrath & Watson, 2018; Mendel & Sharapov, 2016; Vandergeest & Marschke, 2020). Since problem framing affects proposed solutions, another focus is critiques of anti-trafficking policies and practices. Such work helps to interrogate assumptions, surface power structures, expose ‘shared lies’ and challenge ignorance production (Boyden & Howard, 2013; Choi, 2014; Esson, 2020; McGrath & Watson, 2018; Mendel & Sharapov, 2016; Vandergeest & Marschke, 2020; Yea, 2015, 2020a, 2021). Concrete examples include detailed empirical work engaging with the dangers of conflating independent child migration (Blazek & Esson, 2019; Boyden & Howard, 2013) and debt-financed migration (Lainez, 2020) with trafficking. Researchers have challenged the dominant ‘politics of rescue’ (McGrath & Watson, 2018, p. 25) and highlighted how anti-trafficking can have detrimental effects (Blazek & Esson, 2019; Vandergeest & Marschke, 2020), often serving the interests of states rather than trafficked people and resting on faulty assumptions, for example that ‘real’ trafficking victims should be willing to return to their country of origin (Blazek & Esson, 2019; Choi, 2014; Esson, 2015, 2020; Yea, 2015, 2020a). Focusing on specific geopolitical contexts, geographers have highlighted concerns around selective approaches to victim identification, a lack of access to economic and legal justice, forced repatriation, inadequate support for trafficked returnees and experiences of post-trafficking stigmatisation (see, e.g., Blazek & Esson, 2019; Choi, 2014; Esson, 2020; Laurie & Richardson, 2021; Yea, 2015, 2020a, 2020b).

While some of the geographical scholarship is primarily or purely conceptual or commentary-based (e.g. Manzo, 2005; Mendel & Sharapov, 2016; Yea, 2015), novel empirical research also features heavily. Trafficking and anti-trafficking are commonly approached as being highly contingent on context: in contrast to the universalist approaches that often dominate at policy-level, here the ‘localised and situated realities’ evolving from actual experiences of human trafficking tend to be prioritised (Blazek & Esson, 2019, p. 326). Perhaps unsurprisingly, therefore, qualitative approaches dominate and the research is often case-study based, focusing on particular locations and/or particular forms of trafficking/anti-trafficking (e.g. Boyden & Howard, 2013; Esson, 2020; Izcara Palacios & Yamamoto, 2017; McGrath, 2013; Yea, 2012, 2016). Such work typically draws on in-depth interviews,

² For a discussion of the conceptual overlaps and distinctions between the related concepts of human trafficking, ‘modern slavery’, forced labour and unfree labour, see, e.g., O’Connell Davidson (2015), McGrath and Watson (2018) and Yea (2017).

ethnographic fieldwork and/or analysis of documentary material: usually open-source material like emblematic anti-trafficking texts (Choi, 2014; McGrath & Watson, 2018; Vandergeest & Marschke, 2020) and media coverage (Vandergeest & Marschke, 2020; Yea, 2020a, pp. 1–22). The use of archival material from actual trafficking investigations/cases is very rare (McGrath, 2013 is an exception), perhaps reflecting barriers to data access.

In contrast to the small but rich body of qualitative scholarship on the geographies of trafficking/anti-trafficking, very few quantitative geospatial analyses exist (Cockbain, Bowers, & Vernon, 2019; Kangas-punta, 2003; Parmentier, 2010). Instead, knowledge-production here is dominated by governmental, intergovernmental and non-governmental organisations. Yet, few publications go beyond providing crude lists or macro-level visualisations of the number of victims identified as coming from or found within various countries (e.g. United Nations Office on Drugs and Crime, 2012; 2014, 2016), sometimes including large arrows denoting flows (rare, more detailed exceptions include Unseen, 2021). Some of the most high-profile maps come from the Global Slavery Index (GSI)³: produced by the prominent billionaire-funded NGO Walk Free. Yet, their colour-coded maps of the alleged prevalence of, vulnerability and government responses to ‘modern slavery’ are based on notoriously opaque methods and weak data, such as dubious projections and extrapolations, questionable proxies etc (Gallagher, 2017). The framing and discursive strategies underpinning the GSI’s ‘visual imagery’ of trafficking has also been sharply critiqued: McGrath and Watson (2018, p. 26) argue that choosing to map (estimated) prevalence at source rather than destination encourages colonial ‘geographical imaginings of good and bad places’. Thus responsibility is deflected away from rich ‘destination’ countries in the Global North towards poorer ‘source’ countries in the Global South, discouraging questions around how labour market regimes in advanced neoliberal capitalism can produce exploitation, locating instead the solutions in development and border control and reinforcing a ‘politics of rescue’ (McGrath & Watson, 2018, p. 22).

Within the scholarly literature, quantitative geospatial analysis of any aspects of trafficking that is disaggregated even to regional or categorical level are extremely rare: (notable exceptions include: Cockbain, Bowers, & Vernon, 2019; Izcaro Palacios & Yamamoto, 2017; Kragten-Heerdink, Dettmeijer-Vermeulen, & Korf, 2017). Despite the obvious potential of GIS mapping to analyse the spatial dynamics of trafficking (and anti-trafficking), we could not find any examples in the peer-reviewed literature (although its use is mentioned in Hudlow’s (2015) paper on ‘transit monitoring’ in Nepal, no detail or examples are provided). Some recent studies have leveraged novel spatial techniques such as satellite remote sensing (Boyd et al., 2018) and combined social and spatial network analyses (Ibanez & Suthers, 2014). Although methodologically interesting, they conflate trafficking with broader labour issues and lack the ‘ground truth’ of any confirmed cases of trafficking (Volodko, Cockbain, & Kleinberg, 2019). Quantitative analyses of the geographies of trafficking (and anti-trafficking) have valuable but largely untapped potential in, for example, identifying and examining patterns and trends at scale and interrogating relationships between trafficking and broader socio-economic and geopolitical conditions (e.g. migratory flows, labour market conditions). Such work has much to offer in advancing understanding of trafficking, informing more nuanced and targeted responses and increasing accountability.

Although Smith (2018, p. 299) focuses specifically on why trafficking has ‘bypassed the research agenda(s) of population geography’, his arguments also help explain the general lack of quantitative geospatial research on trafficking. His first main reason is the blurring of key constructs and resultant confusion about what distinguishes trafficking from other migration. Trafficking is difficult to disentangle from broader migration statistics, themselves often limited and weak (Anderson,

2010). Indeed, while trafficking (or ‘modern slavery’) is often treated as a clear-cut and easily-measured phenomenon, this conceptualisation has been robustly challenged (O’Connell Davidson, 2015). Instead, it is more accurately understood as a fuzzy-edged, socially-constructed part of a broader ‘continuum of exploitation’ (Skrivankova, 2010), whereby perceptions, priorities and politics all affect who and what receives the ‘trafficking’ label (Cockbain & Bowers, 2019; FitzGerald, 2012, 2016; Quirk, 2011); as Esson (2020, p. 3) argues, ‘who is and can be constructed as a trafficked human being is nuanced’. Smith’s (2018) second reason is a lack of data, particularly reliable, large-scale, pre-existing national datasets. Trafficking is a sensitive topic and many of those involved belong to ‘hidden populations’: whose precise parameters and characteristics are unknown (Cockbain & Bowers, 2019; Cockbain, Bowers, & Vernon, 2019; Tyldum & Brunovskis, 2005). Although various governmental, non-governmental and other agencies collect data on trafficking, these datasets are notoriously partial, sensitive to fluctuations in funding, prioritisation etc. and non-generalisable (Cockbain & Bowers, 2019; Cockbain, Bowers, & Vernon, 2019; Tyldum, 2010). Victim-focused datasets are generally the best available source of information on trafficking, meaning even less information is available about other parties involved (Cockbain, 2018; Wijkman & Kleemans, 2019). Notably, these data-related challenges impede trafficking research in general, not just geographical studies (Cockbain & Kleemans, 2019; Goździak et al., 2015).

Our paper therefore responds to calls for more – and better – geographical research on trafficking by extending the focus specifically to quantitative geospatial/spatio-temporal analysis, in particular GIS mapping. Our aims with this study were to advance understanding of trafficking’s spatial dynamics and stimulate further geospatial research. Addressing Smith’s (2018, p. 304) calls to ‘shed fuller light on the diverse processes and geographies of trafficking’, we took a case-study approach and focused on an issue and dataset for which we could produce a fuller geographical picture: namely, labour trafficking of European Union (EU) nationals in the UK. Aggregating different ‘types’ of trafficking – e.g. for sex, domestic servitude or other labour – risks obscuring important differences (Cockbain & Bowers, 2019; Rose, Howard, Zimmerman, & Oram, 2021). The choice of scale mattered too: taking a meso-level approach, using bottom-up data helped us generate higher-resolution data and zoom in on localised patterns. Like Izcaro Palacios (2017), we took the relatively unusual but productive approach of using extensive qualitative material to generate quantifiable data. Our analytical approach helped disentangle a complex phenomenon and examine its spatial interconnectivities in detail and at scale. Such work bridges the gap between in-depth qualitative studies and generic, top-down ‘one-size-fits-all’ analyses and interventions.

We capitalised on a novel, extensive and geographically-detailed dataset generated from in-depth case files for EU nationals formally identified in the UK as labour trafficking victims ($n = 450$). Through close empirical analysis, we explore two broad and interlinked questions:

- 1 What are key methodological challenges for geospatial analysis of human trafficking?
- 2 What are some possible solutions to these challenges?

We recognise that ‘labour trafficking’ is nevertheless still a broad umbrella, potentially manifesting in different ways across different sectors (Cockbain & Bowers, 2019; Cockbain et al., 2018; Geddes & Scott, 2010). Consequently, we distinguished between exploitation contexts wherever possible. Our choice to focus on intra-EU trafficking was partly pragmatic: we sought but could not secure equivalent data for labour trafficking victims from outside the EU. It also had other benefits: there is comparatively little research into trafficking via regular migratory channels (Cockbain & Kleemans, 2019; van Meeteren & Wiering, 2019); and the majority of identified victims in both the UK (Cockbain & Bowers, 2019) and the EU overall (Eurostat, 2015) are EU

³ See, <https://www.globalslaveryindex.org>.

nationals. As surprising as that might seem, trafficking is as much about exploitation as movement: precarious EU nationals may be particularly attractive targets precisely because they could⁴ move freely and readily enter the regular labour market (Geddes & Scott, 2010). The data are also likely skewed, for example because irregular migrants face additional barriers to reporting abuse such as fears of deportation (Stepnitz, 2012). Furthermore, migration to the UK from newer EU countries in East-Central Europe is particularly crucial in understanding the shifting labour landscape and trafficking/exploitation within it, as these inflows have been particularly 'substantial, remarkably geographically dispersed and ... have taken place over a relatively short period' (McCollum & Findlay, 2015, p. 428).

3. Materials and methods

3.1. Source of data

Our data came from the National Referral Mechanism (NRM): the UK's central system for formally identifying trafficking victims and managing support service provision. Various organisations (e.g. police, children's services and some NGOs) are designated 'first responders'. If they encounter someone they suspect has been trafficked they can submit a referral, with consent (consent needed for adults only) and using a standardised proforma. Until recently,⁵ the National Crime Agency (NCA) received all referrals, processing virtually all for European Economic Area (EEA)⁶ nationals and transferring the rest to UK Visas and Immigration (UKVI). Decision-making involves a two-stage process: people are only *officially* recognised as trafficked upon receiving a positive final decision.

Recent reforms followed a highly critical review of the NRM (Home Office, 2014) and longstanding concerns around immigration authorities' involvement in decision-making and broader deficiencies in victim support (The Anti-Trafficking Monitoring Group, 2010, 2012; Harvey, Hornsby, & Sattar, 2015; Stepnitz, 2012; The Anti-Trafficking Monitoring; The Slavery Working Group, 2013). Reforms notwithstanding, the NRM has clear limitations and provides an inevitably partial picture. Nevertheless, it is also a valuable and under-utilised resource for research: it is the UK's largest trafficking dataset and contains extensive and empirically-rich data. For further discussion of the system, its research potential and biases, see Cockbain & Bowers (2019); Cockbain, Bowers & Vernon (2019).

3.2. Sampling

We requested access to *detailed case files* for everyone: i) referred to the NRM over the two-year period 01/01/12–31/12/13; ii) categorised under 'labour trafficking'; and iii) officially designated a trafficking victim by 23/06/14, when our data collection began. In total, 585 cases met these inclusion criteria. We secured access to all 453 held by the NCA, representing 77.4% of all qualifying cases and 99.3% of those involving EEA nationals. The UKVI held the remaining 132 and denied access.⁷ After filtering out repeat referrals of the same person ($n = 3$), we

reached our final study sample of 450 unique individuals. We refer to them as 'victims' here for brevity and in line with their official classification: it is not our intent to reduce people who have been trafficked to those experiences alone.

3.3. Data

The case files contained diverse material received or actively collected by case managers to inform their decision-making, most of which was in unstructured and/or qualitative formats. Given the predominance of free-form data, it is not possible to give an overview of the fields covered but only the types of documents included (with the exception of the referral form, detailed shortly). The files from 2012 were accessed as hard-copy folders of documents, whereas those from 2013 were in digital form (mostly word docs., PDFs and other text and image files). The precise type, quantity, quality and utility of materials available varied greatly between cases. Typically, those case files that were more voluminous also provided a more detailed and nuanced picture of people and their trafficking experiences, including the geographies involved.

Certain documents (e.g. referral forms, minutes sheets, records of correspondence between agencies) were universally present, whereas others were not (e.g. records of police investigative interviews, criminal record histories for suspected victims and/or traffickers). The referral forms themselves involved a standardised proforma about the person being referred and their experiences of trafficking, featuring some questions of a yes/no, tick box or other short-format answer and many that were much more open-ended in nature. These referral forms were originally word files and had been completed by the referring party in a free-form data entry format by hand or on a computer (for a blank copy of the form used at the time, see Appendix A).

None of the data we used for this study were in a database format. There is, however, a structured overview of NRM referrals, which features key information about potential victims of trafficking thus identified, case management information and official decisions. We have used this structured (Excel) dataset⁸ in prior research (e.g. Cockbain & Bowers, 2019), but decided against including it here as we knew it to be limited in the range, detail and resolution of spatial data it contained and this information would be present in the case files themselves, plus far more additional spatial data of interest.

3.4. Ethics

UCL Research Ethics Committee approved the study (reference: 5160/001). We took great care throughout to uphold high ethical and data protection standards. The people featuring in this study gave informed consent to enter the NRM. A key ethical priority for us was ensuring we protected participants' anonymity (e.g. by anonymising our research data at the earliest possible stage) and confidentiality (e.g. by ensuring no potentially identifying information was included in this publication). High-level national security vetting was required to access the source data and we extracted, stored and used data securely, in accordance with the legal requirements of our data sharing agreement with the NCA and the practices detailed in our data management plan, which was peer-reviewed during the grant application.

3.5. Data extraction

Since the case files were classified and contained sensitive and personal data, we were granted access on NCA premises only. The first author reviewed the full corpus there between June 2014 and June 2015, systematically anonymising and extracting research-relevant

⁴ The situation in the UK has, of course, changed since Brexit.

⁵ The NRM was introduced in 2009 to meet the UK's responsibilities under international law (Council of Europe, 2005). It was expanded in 2015 to cover other forms of 'modern slavery' (HM Government, 2014). In April 2019, it was transferred to the Home Office and decision-making consolidated into a single 'competent authority'.

⁶ EU countries plus Iceland, Norway and Liechtenstein. EEA nationals' cases were very occasionally passed on to the UKVI, namely when subject to active immigration enquiries.

⁷ UKVI cases were overwhelmingly for people from Asia ($n = 100$), with the remainder from Africa ($n = 19$), non-EEA Europe ($n = 8$), the EEA ($n = 3$) and the Americas ($n = 2$).

⁸ At the time of our research, it was in the form of an Excel spreadsheet whereas it is now a database.

information into detailed coding frameworks (see Appendix B). Developed iteratively,⁹ the frameworks covered socio-demographic variables, pathways into and out of trafficking, trafficking-related experiences, key timings, and, central to this paper, information on key geographical locations in the trafficking process. The data extraction phase was very resource-intensive – approximately seven months full-time work – due to sheer volume and complexity. In February 2016, we were authorised to transfer the anonymised research data to the Jill Dando Institute (JDI) Research Laboratory at UCL, which is accredited to hold sensitive data.

3.6. Data cleaning, coding and analysis

From the 450 case files, we extracted 4,327 locations in total¹⁰. Each victim was linked to a median of nine locations (range: 3–38), with the variation reflecting differences in actual experiences, recall and record-keeping. Although trafficking is often described as a ‘process’ crime involving recruitment, movement, exploitation *etc.*, the dearth of prior quantitative geospatial analyses meant there was no standard set of locations to consider. Informed by our data, therefore, we selected the following categories:

1. Place of birth
2. Place of residence when the initial recruitment occurred
3. Place where the initial recruitment itself occurred (which might or might not be the same as 2)
4. Place(s) where victim was ‘harboured’ (housed) by traffickers
5. Place(s) where victim was exploited for their labour
6. Place(s) where victim was re-recruited on a later occasion by the same offender(s), *e.g.* after escaping or being thrown out.
7. Place(s) where victim was recruited on a later occasion by a different offender(s)
8. Place where victim was encountered by the referral-maker (the ‘first responder’)

Locational specificity varied greatly, from exact addresses to records referencing an entire country (*e.g.* ‘recruited in Poland’). We geocoded all locations extracted, matching each with a pair of latitude and longitude coordinates. Where locations were insufficiently specific for an exact coordinate (*e.g.* ‘Manchester’), we geocoded the centre point of the location (*e.g.* Manchester city centre) and included an expected uncertainty (*e.g.* ‘within 8.5 km’) and we included them only in analyses aggregated to a suitable spatial resolution (*e.g.* thematic maps at regional levels) or where the uncertainty of the location was incorporated into the analysis (see Section 4.5). We also categorised all locations in terms of their spatial accuracy, comprising specificity and confidence measures (both assigned at point of geocoding). The specificity measure helps determine the appropriate level of spatial aggregation, by giving an approximate potential distance from the ‘true’ location. Using the ‘Manchester’ example, the accuracy measure is 8500 as the distance from Manchester city centre to the M60 motorway encircling it is approximately 8500 m. The confidence measure provides an indication of reliability: it is a coder-estimated percentage of how certain we are in a locational assignment, *e.g.* we might be 80% sure the true location fell within a particular area. All geocoding was done manually due to the poor locational specificity and other data integrity concerns (see Section 4). We used various mapping services, such as Google Maps, Open Street Maps and Ordnance Survey MasterMap files.

⁹ We began by extracting data from the 2013 files. Since we were unsure exactly what to expect, we developed a more open coding template in Microsoft Word that allowed for the capture of narrative information. When we moved on the 2012 files, we extracted data directly into an Excel template that mirrored the design of the word template but mostly comprised closed categories.

¹⁰ The locations are not unique since, for example, multiple victims could be exploited at the same place.

3.7. Overview of the sample

As shown in Table 1, four fifths of victims were male and the vast majority were adults at referral, thus diverging from the traditional ‘iconic victim’ narrative of trafficking discussed previously. The median age was 32.1 years (IQR: 23.3–42.1)¹¹, but the overall age range was wide: from a few-month-old baby used for benefit fraud to an 84-year-old subject to fraud and theft. Only eleven nationalities featured, with most victims (94%) coming from new EU member states in Central and Eastern Europe. Of the top five nationalities (constituting 79% of the sample), four were A8¹² and the fifth A2.¹³ Around two thirds spoke no

Table 1
Basic information about the sample (n = 450)^{a,b}.

Variable	Frequency	Percentage
Gender		
Male	363	81%
Female	87	19%
Age group at referral		
Adult	427	95%
Child	23	5%
Nationality		
Polish	107	24%
Lithuanian	88	20%
Slovak	61	14%
Hungarian	55	12%
Romanian	45	10%
Czech	29	6%
Latvian	29	6%
British	27	6%
Bulgarian	7	2%
Portuguese	1	<1%
Irish	1	<1%
Type of trafficking		
International	385	86%
Domestic only	55	12%
Unknown	10	2%
Pathways out of trafficking		
Escaped of own accord	278	62%
Rescued by authorities	115	26%
Thrown out by offenders	21	5%
Combination of the above	9	2%
Other	8	2%
Unknown	19	4%

^a Here, as throughout, percentages may not add up to 100% exactly due to rounding.

^b Here, as throughout, percentages are given to 1 decimal place and hence may not sum to 100% exactly.

English, which likely exacerbated their precarity. Contrary to stereotypes, only a quarter were rescued by outside parties, whereas over 60% escaped independently. The vast majority were trafficked internationally: overwhelmingly into the UK (*n* = 372) rather than from it (*n* = 18), although a handful experienced both (*n* = 5). Of those only trafficked domestically (*i.e.* within the UK only), many but far from all were British (17 of 55).¹⁴

We identified nineteen different contexts in which at least ten victims were exploited – some fairly broad, others quite specific (see Fig. 1). We

¹¹ Based on the 99% of cases where known.

¹² A8 refers to eight of the ten countries that joined the EU in May 2004: Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia (*i.e.* excluding Cyprus and Malta).

¹³ A2 refers to Bulgaria and Romania, which joined in January 2007.

¹⁴ The rest were EU nationals recruited once they were already in the UK.

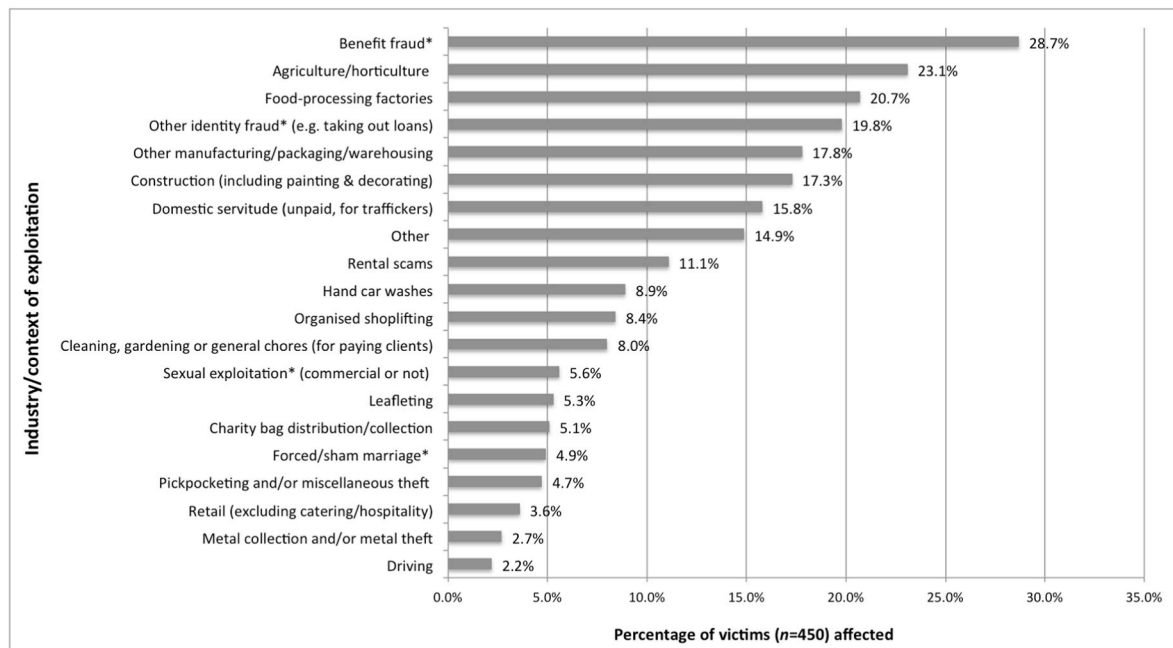


Fig. 1. Industries and other contexts of exploitation by prevalence¹⁶.

then captured numerous less common contexts¹⁵ under ‘other’. Almost two thirds (65%, $n = 292$) were exploited in two or more different contexts, likely reflecting how offenders sought to extract maximum profits, varied job opportunities in the low-wage labour market in general and the dynamic nature of agency work in particular. The three most prevalent contexts were benefit fraud, agriculture/horticulture and food-processing factories. Although UK authorities categorise trafficking for sex, domestic servitude and other labour as three separate trafficking types (Cockbain & Bowers, 2019), some overlap was evident in our data: of these 450 people officially designated as labour trafficking victims, a significant minority had experiences also spanning domestic servitude (16%) and/or sexual exploitation (6%).

4. Results

Collecting and processing these spatial data allowed us to map the geographies of trafficking in a novel manner, which is hopefully clear from the maps and charts that follow. Although our geospatial analyses generated results that are interesting in their own right, the process also demonstrated considerable barriers to be overcome to ensure rigorous and reliable results in this space. We identified five main methodological challenges for geospatial analysis, examining them in turn: data integrity; geographical uncertainty; managing multiple geographies; diversity and disaggregation; and unclear journeys. We provide

illustrative empirical examples and visualisations throughout, also highlighting recommendations to address these challenges where possible.

4.1. Limits to the data integrity

Data integrity is a measure of the data’s completeness, accuracy (both in terms of geographical specificity and confidence in its veracity) and consistency. Challenges surrounding the integrity of available geographical information were the main reason we needed to geocode locations manually. We identified several major issues in the data, which together featured in approximately 15% of all locations extracted from the case files.

First, we encountered numerous apparent errors in recall and/or recording, where locations as recorded did not exist. Further investigation sometimes revealed similar-sounding locations nearby, indicating that one or more of those providing information (e.g. victims, first responders or case managers) had misheard and/or misrecorded a place name(s). Examples – chosen carefully to avoid revealing specific addresses – included an address in Market *Harborough* originally recorded as being in ‘Market *Arbor*’ and *Princes* Street recorded as ‘*Princess* Street’. Another common issue involved one standard road suffix (e.g. Street, Park, Hill, Terrace or Lane) being mixed up with another: e.g. *X Road* did not exist in the town in question, but *X Street* did. We encountered similar issues with international addresses but these proved even more challenging to address. Some such issues were resolved during data extraction, whereby the first author’s knowledge of Slavic languages proved useful: identifying, for example, that ‘*Saca*’, ‘*Shadsa*’ and ‘*Shatsa*’ were common misspellings of *Saca* in Slovakia. Even after significant manual investigation, however, we were unable to resolve several UK and international addresses.

Second, recorded addresses sometimes contained contradictory or implausible information. Examples included: postcodes not matching the street address; infeasible accounts of locations (e.g. reported exploitation in a shopping centre car wash, whereby the address proved to be an empty green field); or building numbers not present on the street specified. In one instance, an airport recorded as a victim’s point of entry did not exist and the nearest commercial airport to the supposed location was approximately 50 km away.

¹⁵ The category other also included four people (1%) yet to experience any of these exploitative contexts, typically as they had arrived but not yet been put to work.

¹⁶ Only those categories affecting ≥ 10 people shown separately. Rental scams were when victims were housed in overcrowded accommodation, charged exorbitant rent and provided scant work, trapping them in a cycle of ever-increasing debt. The * indicates categories that also include suspected, planned and/or intended exploitation, included for the sake of a maximally nuanced analysis when dealing with contexts that are particularly stigmatised and/or tending to lack supporting evidence (e.g. because victims themselves were unsure). The respective breakdown of exploitation reported as having occurred vs. being suspected vs. having been intended/attempted varied by category: benefit fraud ($n = 62$; 61; 6); other ID fraud ($n = 59$; 27; 3); sexual exploitation ($n = 10$; 3; 12); marriage ($n = 5$; 1; 16).

Third, changes in land-use proved challenging. They were, in part, a function of working with case files from several years previously and accounts of exploitation that could date back several years further (more in some cases). Land-use changes particularly applied to police stations and shops mentioned that had since closed or changed ownership. Identifying the correct location at this later date was difficult, especially where there was no indication of (roughly) when the original trafficking-related event had happened. For example, the location recorded might specify a particular supermarket brand on a specific road but when we searched for that store it did not appear to exist. Automated solutions to find the nearest store for the same brand often threw up results that were several miles away and thus not necessarily reliable.

Fourth, some locations were insufficiently complete to let us narrow down beyond a *set* of possible locations distributed fairly widely. For instance, providing only the building number and street name was problematic for popular road names like ‘*High Street*’ or ‘*London Road*’, which exist in many towns across the UK. Meanwhile, some locational data was provided in a relative form, for example reports of being exploited ‘about a 30-min drive’ from address X’ (which could potentially fall in various different counties, for example).

Faced with such data integrity challenges, we employed several tactics to (attempt to) determine the true addresses – since the better the geographic resolution, the more valuable spatial data are in enabling analyses ranging from micro-to macro-levels. First, sometimes it sufficed simply to inspect a map; for example, in the aforementioned Market Harborough example other available information adequately indicated an approximate area, and upon a visual inspection of it the error was obvious. Second, we searched for alternative spellings and near homophones (similar sounding words), which was more easily done for UK than international addresses (the coder was British). Third, we cross-referenced with other known information. For example, if two linked victims shared near-identical trafficking location histories but for one of them an exploitation location was given as an address of a given factory and for the other the exploitation location only specified the *type* of factory work (e.g. ‘leek factory’), they were assumed to be the same place if the types matched. Finally, and perhaps most unusually, we used Google Street Maps to perform visual inspections of locations and their surroundings. This approach was particularly useful for verifying locations of the form ‘car wash on X Road’, or where a house name rather than number was specified or apparent changes in land-use had occurred. Here, the ability to see historic imagery of locations through Street View History proved especially valuable.

4.2. Issues with geographical uncertainty

Given the variation in geographical specificity in the data, during geocoding we assigned locations i) a categorical value representing the spatial resolution to which they could be specified and ii) a numerical (percentage) value of how confident we could be that the actual location was within this area. In broadly descending order of specificity, Table 2 describes the different categories of spatial resolution encountered and their overall frequency.

The most common categories were exact property and large urban area, each contributing roughly a third of cases, followed by the far more general country-level (around one in five). This finding indicates a split between accounts (or parts thereof) that were quite precise about where particular events occurred and ones that provided only a very broad-brushed picture. During coding, we noted that the non-specificity in many accounts appeared to arise for three main reasons. First, the files did not have fixed format recording of key geographical locations. Relatively few locations were asked about as standard on the referral form and even those exceptions (e.g. place of birth) had no stipulation around the specificity required, leaving the referrer to decide whether to name a precise address, town/city, region or just a country. Second, there was typically little evidence of concerted attempts to ascertain – let alone verify – specific locations in the trafficking process. It appeared

Table 2

Overall specificity of the locational data by category (n = 4,327).

Category	Percentage of overall sample	Description
Property	31%	Exact address recorded or reasonably established
Neighbourhood	7%	The location’s road or micro-geographic location (e.g. on a small industrial estate) identified.
Small community	5%	Usually specifies a village or in some cases a well-defined and geographically delineated area of a larger suburban area, no more than 2.5 km across.
District	0.6%	Location within a well-defined area of a large city, e.g. a certain London borough.
Large urban area	33%	Location specified only at town- or city-level (e.g. ‘in Manchester’)
Region	2%	Location specified only at a regional level of a country (e.g. ‘in Cornwall’) or close proximity to a large urban area. (e.g. ‘just outside Manchester’)
Country	22%	Location specified only at country-level (e.g. ‘in Poland’) or where a location was specified only in a vague and relative sense (e.g. ‘commutable distance from London’)

that neither those making nor those managing/assessing referrals placed particular value on precise locational data, likely reflecting the nature and function of the NRM (the system hinges on assessing whether someone has been trafficked, not rigorously documenting or investigating the specifics of the trafficking process). Victims also typically appeared to have been asked far more specifically about UK-based harbouring (housing) and exploitation locations than about their original recruitment locations, especially those overseas. Third, even where victims evidently had been asked where various events occurred, they did not necessarily know. Numerous reasons were evident why specifying locations could be hard for victims, including: not being told place names or being able to establish them easily from available information (common, say, for routes of overland travel to the UK combined with being generally unfamiliar with the surroundings as evidenced by multiple entries in the format ‘X minutes’ drive from [harbouring location]’); being moved around between numerous harbouring and/or exploitation locations (sometimes each for short periods); struggling to remember places from several years previously; and the effects of trauma or other factors (e.g. substance abuse). Given the reasons outlined above, there are clearly limitations to how accurate and complete such datasets can be. Improvements are, however, possible and we provide some suggestions in the discussion.

Disaggregation by type of location showed considerable variation in levels of geographical specificity (see Table 3). As might be expected, harbouring locations were the most accurately specified: two thirds could be geocoded to an exact address. In contrast, where people were living when recruited and – crucially – the original recruitment locations themselves were very rarely recorded to any real geographical specificity. While we appreciate it is not always feasible to record certain locations precisely (e.g. someone may never know an exploitation address, even if there a long time), more specific recording of recruitment-related locations would likely improve understanding of the provenance of trafficking activity and support more nuanced interventions upstream.

The substantial variation in specificity poses real challenges when attempting to map trafficking-related locations. If working to a high spatial resolution (i.e. for more precise analyses), then much of the data

Table 3

Specificity of locational data, broken down by different locations in the trafficking process (n = 4,327).

Category of location	Sample size	Distribution of locations by specificity						
		Property	Neighbourhood	Small community	District	Large urban area	Region	Country
Exploitation	1404	24%	3%	4%	0%	39%	4%	26%
Harbouring	1001	64%	5%	4%	1%	20%	1%	4%
Place of birth	447	0%	0%	6%	1%	52%	2%	39%
Original recruitment	431	7%	3%	10%	0%	38%	1%	42%
Encounter with referrer	414	61%	5%	1%	1%	20%	3%	9%
Place where living when recruited	357	13%	1%	12%	1%	43%	1%	30%
Entry point into the UK	193	0%	96%	0%	0%	4%	0%	0%
Subsequent recruitment by a different offender(s)	48	4%	6%	4%	0%	58%	0%	27%
Subsequent re-recruitment by the same offender(s)	32	38%	0%	3%	0%	31%	0%	28%

must be excluded, which potentially skews results.¹⁷ Using a low spatial resolution, however, risks making maps less informative and potentially introduces serious ecological fallacy issues.¹⁸ To illustrate, Fig. 2 contains three different hotspot maps of places in the UK where victims were reportedly housed¹⁹. They are aggregated to three different spatial resolutions, based on the Nomenclature of Territorial Units for Statistics (NUTS) code: a geocoding standard developed and regulated by the EU (European Parliament, 2003). Fig. 2a, at the lowest resolution (NUTS-1), includes all locations except those codeable only at country-level and thus incorporates the most data (96% of UK-based harbouring locations). According to this map, harbouring locations concentrated in the region of Yorkshire and the Humber – which is true but masks further variation. Fig. 2b is at NUTS-2 resolution and consequently loses slightly more cases, but provides much more nuanced insights into the spatial distribution. It clearly shows most such locations in Yorkshire and the Humber were situated in West Yorkshire: the area's most densely-populated sub-region (with a population density three times higher than the region's overall) and where 2.23 million of the region's 5.28 million inhabitants live (ONS, 2011). Fig. 2c, the NUTS-3 resolution map, also shows substantial variation at an even higher resolution but by now lack of specificity meant a significant amount of data had to be excluded: a quarter (n = 215) of locations mapped in Fig. 2a do not feature in Fig. 2c, which raises concerns about internal validity. Whilst there is no fixed rule for completeness requirements in geocoded data, an empirical evaluation using crime data in New South Wales (Australia) found 85% completeness was the minimum acceptable 'hit rate' before significant differences emerged in the results (Ratcliffe, 2004). Without a similar study using trafficking data, it is unclear what threshold might exist for this domain: for most locational categories in our data, caution clearly must be applied to inferences drawn at geographic concentrations below country-level.

4.3. Managing multiple geographies for a single case is challenging

Not only was each victim linked to multiple different locational categories (e.g. recruitment and exploitation locations) but one person often contributed multiple data-points to a single category (e.g. because they were exploited at different places). The geographical complexity of trafficking can complicate spatial analysis in various ways. For example, Fig. 3a and b depict exploitation locations and Fig. 3c and d shows

harbouring locations. At first glance, the two place types appear to have similar spatial concentrations. Closer examination, however, reveals that certain sub-regions contained more of one or the other place type. While subtle, these distinctions caution against assuming harbouring and exploitation geographies are equivalent or treating them as such in analysis and interventions. Numerous factors might explain such variation, including differences in both actual trafficking behaviour (e.g. if some places provide more, or more attractive, housing than labour opportunities) and in data integrity (e.g. as Table 3 showed, data specificity varied by location type).

Additionally, while Fig. 3a/3b and Fig. 3c/3d are mainly similar, slight differences still exist *within* these pairings. Fig. 3a and c shows *all* harbouring/exploitation locations recorded at sufficient specificity, whereas Fig. 3b and d are restricted to *one* such location per person (the most recent). Which of these datasets to map depends on one's aims and the intended application, but it should be recognised that such analytical decisions can affect results. There are pros and cons to each, e.g. mapping the most recent location could reduce some bias associated with the clustering²¹ but also loses information on known trafficking locations.

4.4. Diversity means disaggregation is important

Even though our sample was limited to one trafficking 'type' (labour trafficking), within it, individuals' characteristics and trafficking experiences varied substantially – including in spatial terms. We found that analysing the sample as a whole risked masking systematic differences within it, particularly in relation to victims' geographical origins. A growing literature on aggregation bias in criminological analysis demonstrates that overlooking such variation can lead to problematic conclusions (e.g. Townsley & Sidebottom, 2010). Additionally, recent studies have identified significant differences between different trafficking 'types' (Cockbain & Bowers, 2019; Rose et al., 2021) and it is hardly surprising that variation should also exist within these broad 'types'. To illustrate the need to disaggregate, we present two tables exploring variation in spatial patterns. Notably, some (but far from all) of the variation between groups was linked to large cases involving lots of victims of the same nationality exploited in the same context(s) and/or same regions (another form of clustering).

First, Fig. 4 shows how the specific industries/contexts associated with the exploitation locations varied by victims' country of birth.²² The figure reveals substantial variation between national groups. For example, Lithuanians²³ were most frequently exploited in agriculture or

¹⁷ Note that we suggest recording at point level where possible to provide maximum flexibility. More localised analysis than that presented here might look at point patterns. Moreover, estimating distances between different locations in the trafficking process (see below) requires reliable estimates of location to maximise accuracy.

¹⁸ When assumptions regarding a whole area are based on average or total counts and mask substantial variation within the area.

¹⁹ 956 of the 1001 harbouring locations were in the UK.

²⁰ © EuroGeographics for the administrative boundaries in this and all maps in this article.

²¹ If one person contributes two or more data-points in a single category, these are not independent observations. This form of clustering would be addressed by limiting the analysis to one place per person, but not others (e.g. clustering due to linkages between different victims or different types of locations).

²² We only show data for people born in countries contributing 15 or more victims to the sample.

²³ For concision the term Lithuanian, for example, refers here to someone born in Lithuania.

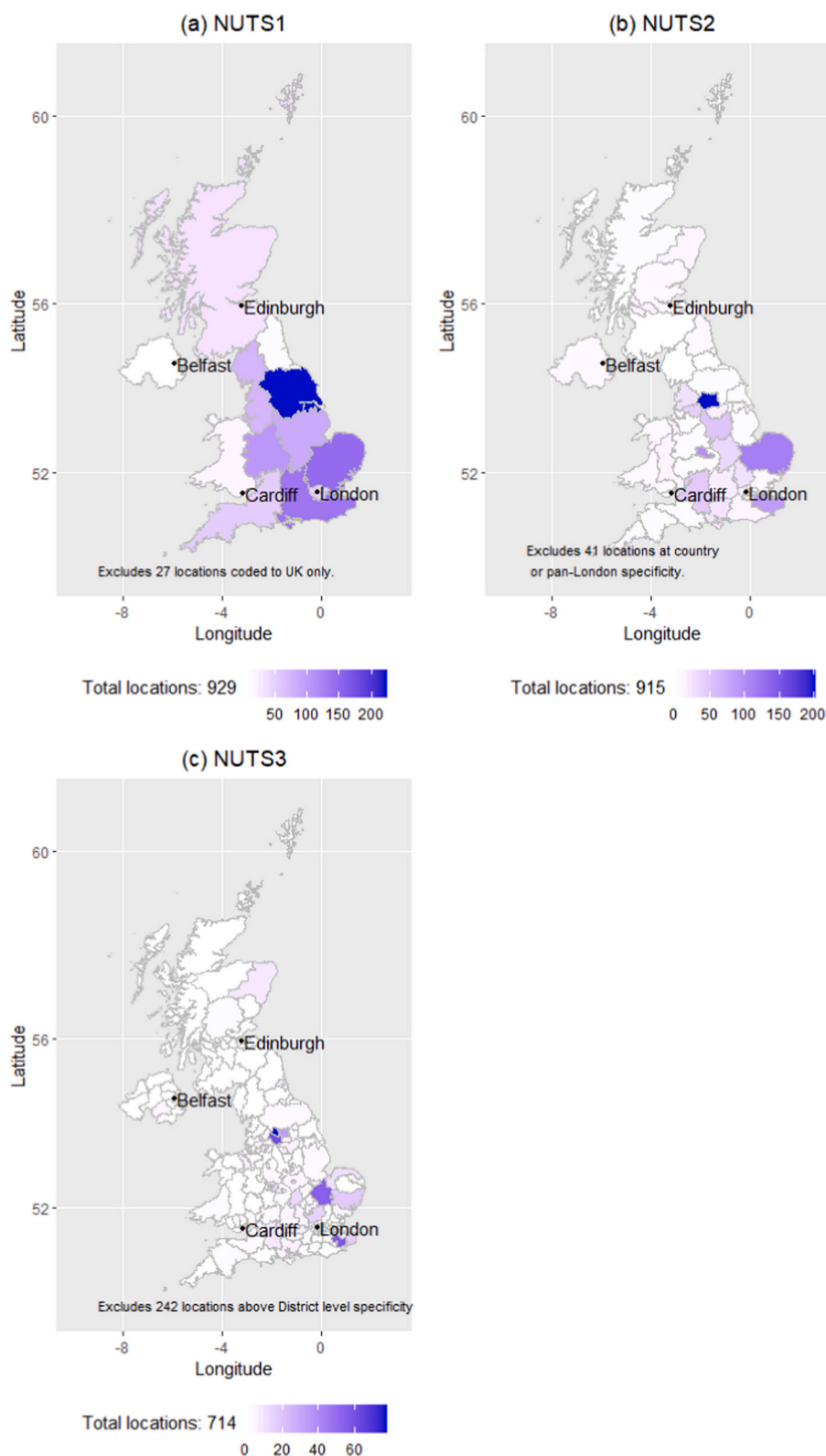


Fig. 2. Harbours locations by different geospatial²⁰ resolutions.

door-to-door work like leafleting or charity bag distribution/collection. Meanwhile, Slovaks were most commonly exploited in food processing, Hungarians in non-food-related factory work and Britons in

construction.

Second, Fig. 5 shows a cross-tabulation of harbouring locations with country of birth, again revealing differences between groups: for

²⁴ Totals refer to entire sample, not just top 10 locations – see Appendix C.

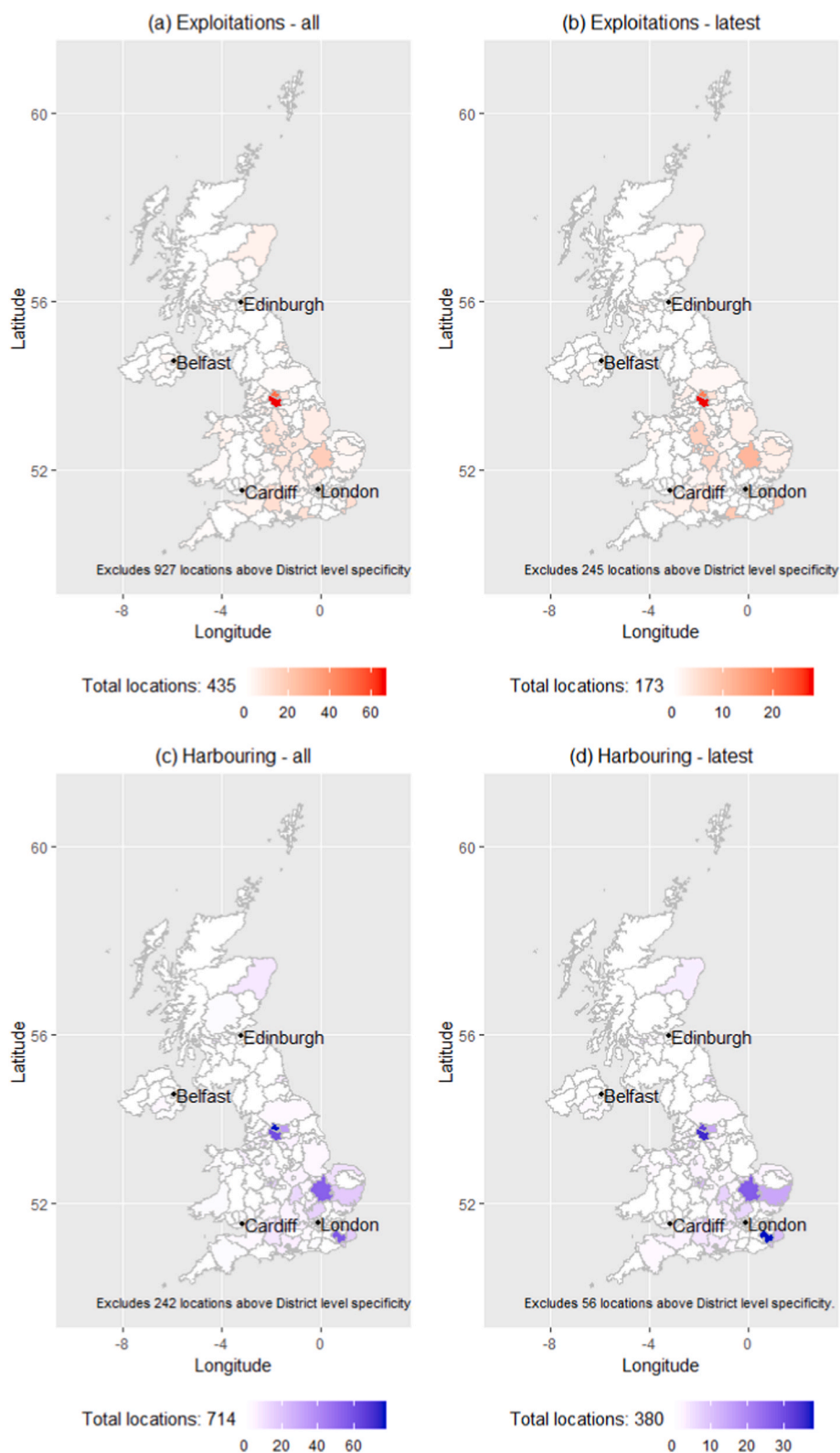


Fig. 3. Panel (a) All exploitation locations; panel (b) most recent exploitation locations only; (c) all harbouring locations; panel (d) most recent harbouring locations only.

concision, only the top ten locations are depicted graphically (see [Appendix C](#) for the full version). Lithuanians were most commonly harboured in Kent or East Anglia (Latvians in the latter too), Poles in the West Midlands and both Slovaks and Hungarians in West Yorkshire.

These disaggregated analyses show there were clear associations

between country of birth and how and where victims were exploited. The results almost certainly reflect many different spatial processes, which might include variations in migration patterns between diaspora communities, the locations of various industries and differences in police intelligence, priorities and activity.

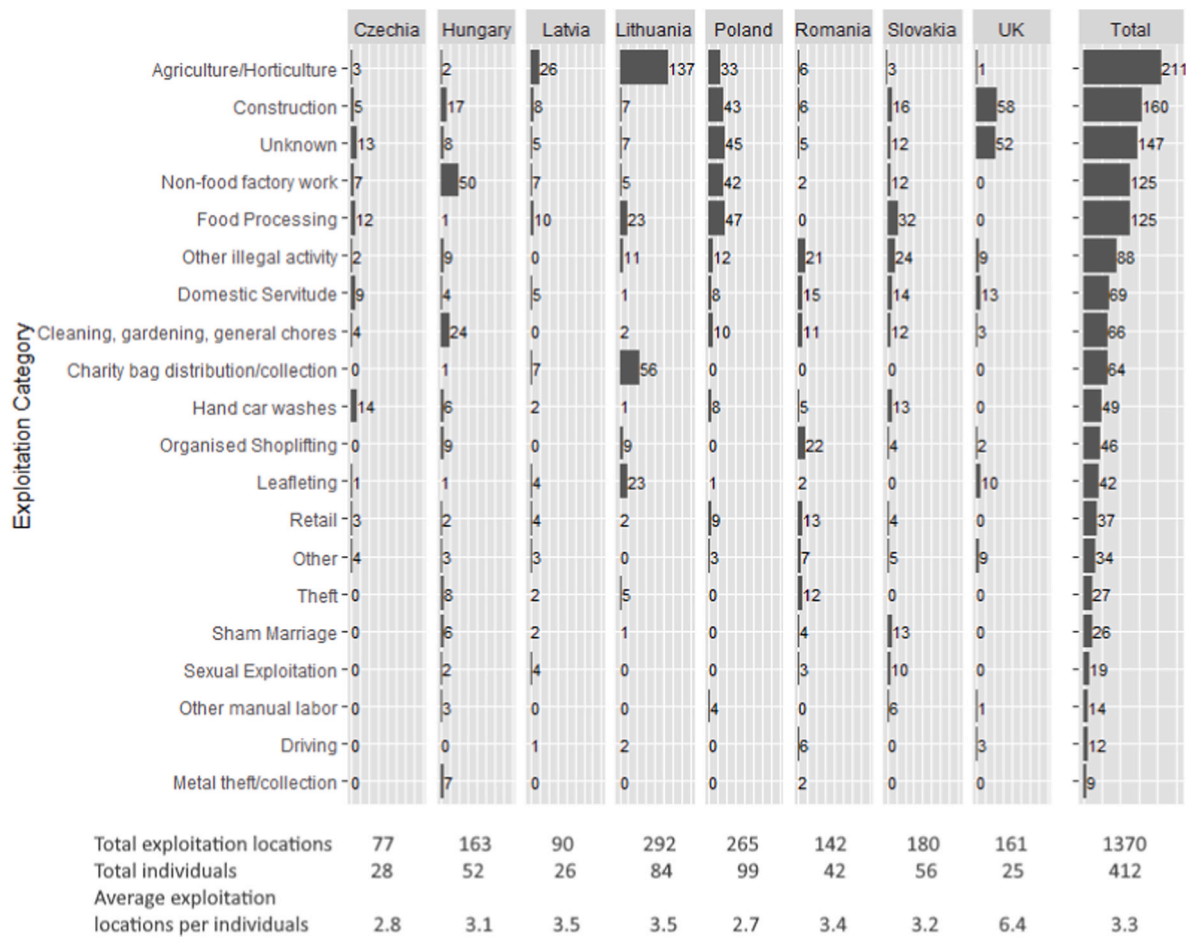


Fig. 4. Exploitation locations, by category of exploitation and victims' countries of birth (n = 1370).

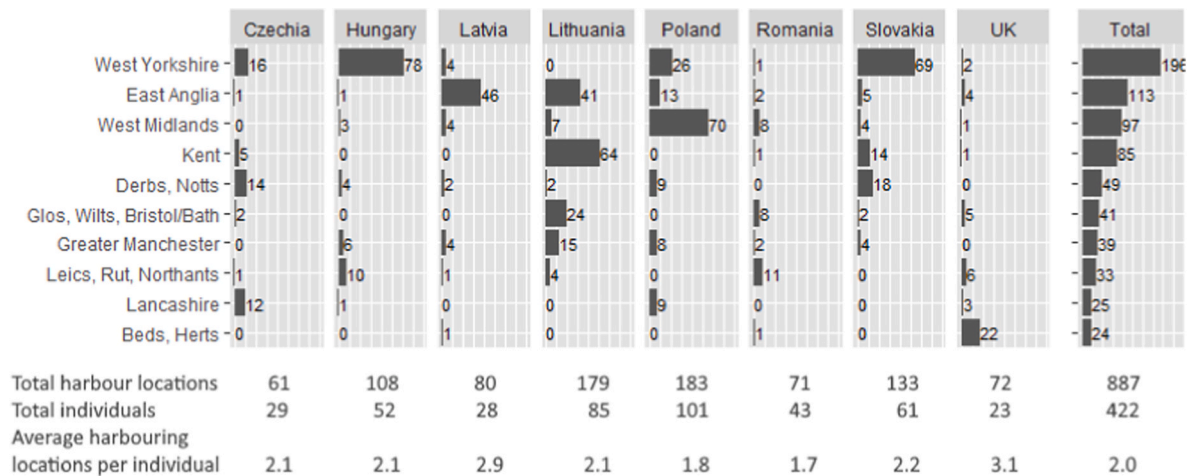


Fig. 5. Ten most common regions of harbouring locations (at NUTS2 resolution) by victims' country of birth (n = 887²⁴).

4.5. Trafficking journeys are particularly challenging to analyse

The lack of geospatial research into trafficking journeys leaves many unanswered questions concerning the distances these journeys span, the routes they take and how they vary between individuals and groups (including depending on whether regular and/or irregular channels are used). In general, we struggled to derive much information about exact routes due to poor data specificity, especially for locations earlier in the trafficking process. In general, accounts of journeys are notably rare in

the geographical literature on trafficking (key exceptions include [Blazek et al., 2019](#); [Kuschminder & Triandafyllidou, 2020](#)).

Given the numerous locations involved in each trafficking process, many combinations of journey points could be compared, so we give two illustrations here.

First, we examined the relationship between where victims were born and where they were initially recruited. Our analysis of cases where both were known (n = 356) revealed four broad categories of information:

1. **Non-specific locations for birth and/or recruitment (44%):** the two sub-cases outlined below effectively constitute the ‘too uncertain to say anything’ portion of our sample.
 - a. **Both specified only to country-level:** 43 individuals (12%) had the same location recorded as birthplace and recruitment location – but specified only at country-level, making it impossible to ascertain how close they lay.
 - b. **At least one poorly-specified:** For another 114 people (32%), at least one location was better defined than country-level but establishing whether the locations of birth and recruitment are in fact close or distant is still not possible and only a range of *possible* distances can be given. We used a threshold of 25 km to define what might constitute ‘distant’ so while the shortest possible distance was always 0 km, the greatest was anything between 25 and 515 km, thus precluding reliable conclusions about distance even if one location was well-specified.
2. **Specific and nearby (27%):** 97 people had birthplaces and recruitment locations that were both well-specified and within 25 km of one another (even when accounting for maximum possible uncertainty), meaning we could safely conclude that they were recruited close to their birthplace. Here, recruitment often happened in the nearest large urban area to their birthplace (if born in a smaller community) or the same large urban area where they were born.
3. **Specific but not near (14%):** 49 people had birth and recruitment locations well-specified enough to know that they were not recruited near (within 25 km) of their birthplace, although still within the same country. There were clear cases of individuals being recruited up to several hundred kilometres from their birthplaces.
4. **International (15%):** Finally, 53 people were born and recruited in different countries, which is obviously still clear even when locations were only specified at country-level.

These results illustrate that it is sensible to assume variation between birthplace and first recruitment. With over half the victims (where the locational information was specific enough for analysis) recruited a substantial distance from their original birthplace, treating the two as equivalent is clearly unsafe.

To illustrate the variation within the data, Fig. 6 represents the distances between birthplace and initial recruitment location graphically. Each data point depicts the ‘journey’ between the two for one individual, plotted from the shortest to the longest along the x axis. The vertical lines demonstrate the total uncertainty for each journey.²⁵ The figure highlights both the considerable variation between individuals and the extent of uncertainty within the data.

As a second exploration of trafficking journeys, we examined distances between where victims were harboured and exploited. Since temporally-coded data were unavailable, we used the most recent exploitation and harbouring location for each person, giving us 419 cases where both were known. Following the same approach just described, we found:

1. **Non-specific locations for harbouring and/or exploitation (22%):** For 94 individuals, one or both of these locations was too geographically vague to draw useful conclusions about the distance between them (and three had both locations specified at country level only). The proportion in this category of ‘too uncertain to say anything’ was markedly lower than in the previous analysis, however.
2. **Specific and nearby (64%):** 268 individuals were last exploited within 25 km of their last harbouring location. In fact, the median distance was just 2 km and levels of uncertainty were far lower here: for 114 of them both locations were specified to at least street-level.

²⁵ Uncertainty in locational specificity is always calculated as the distance to the edge of the potential area.

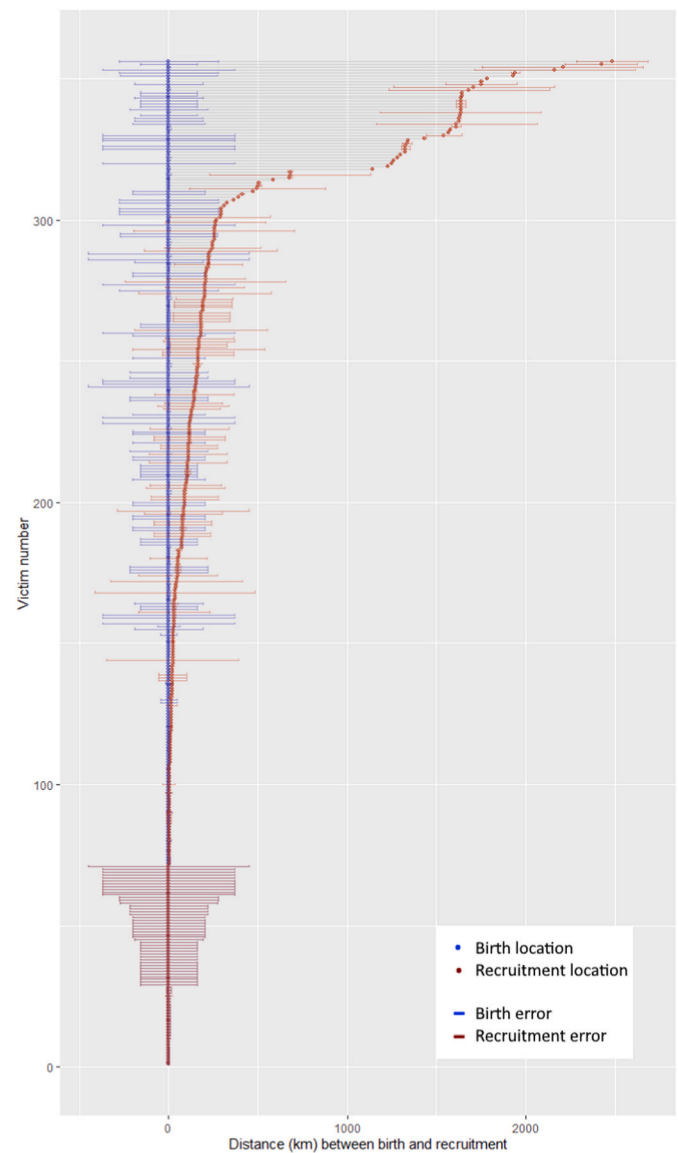


Fig. 6. Distance between place of birth and first recruitment location (n = 356).

3. **Specific but not near (14%):** 57 people were last harboured more than 25 km away from their last exploitation location.
4. **International (0%):** Unsurprisingly, nobody had their last harbouring and exploitation locations recorded as being in different countries.

Fig. 7 depicts the distances between last harbouring and exploitation locations, plus the associated uncertainty. While considerable uncertainty existed in some cases, a clear majority of victims were evidently exploited near to where they were harboured. This result makes sense from a practical point of view, as there are obvious advantages in minimising the time and effort associated with transport to and from ‘work’.

Our final illustrations of the challenges in mapping journeys concern how (mode of transport) and where (entry point) these victims were trafficked into the UK, factors we strongly suspected would be associated with country of recruitment. Importantly, and contrary to stereotypes of trafficking, virtually everyone in our sample who entered the UK did so legally (unsurprising given freedom of movement for EU citizens) and willingly, in the expectation of work (see Cockbain, Bowers, & Vernon, 2019). In some cases, they even arranged and paid for their own

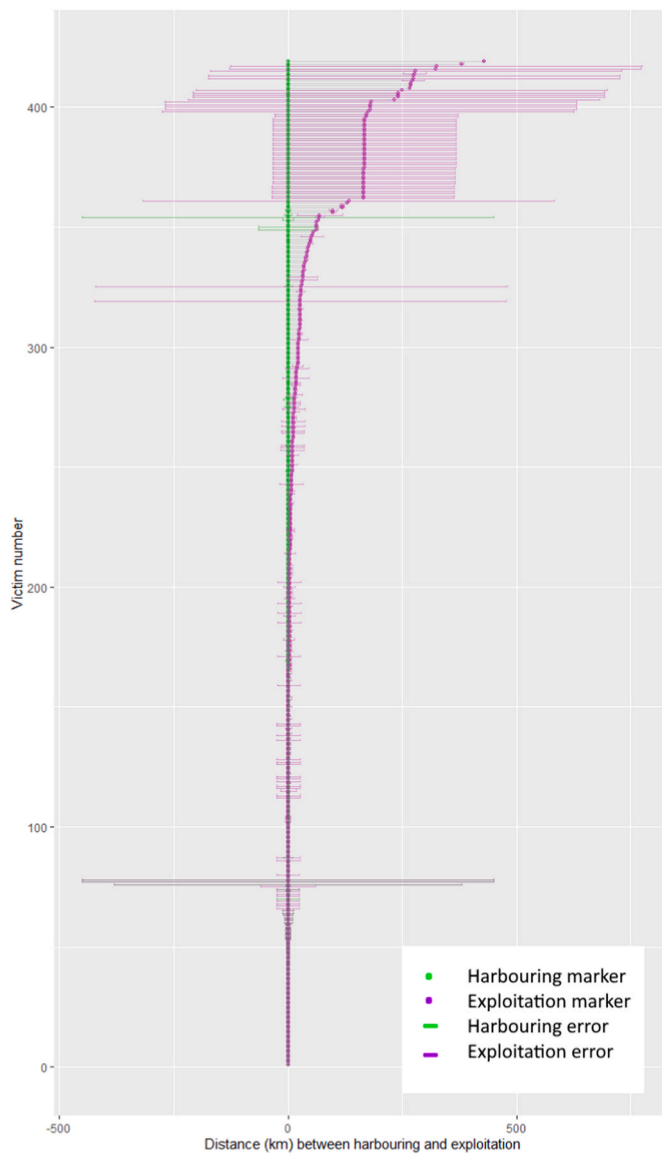


Fig. 7. Distance between last exploitation location and last harbouring location ($n = 419$).

transport. As a rule, it was the deception involved about what awaited them and the subsequent exploitation that led to the official designation of 'trafficking victim'. In many cases, there was also evidence of abuse of a position of vulnerability at the time of recruitment, such as homelessness, unemployment or other economic compulsion.

Fig. 8 shows where people were recruited overseas and how they travelled to the UK: again emphasising data integrity issues, it only includes half of those trafficked into the UK ($n = 185$) as the mode of transport was not recorded for the rest. Interesting variations were evident here. For example, victims recruited in Latvia all flew into the UK, whereas those travelling from Lithuania more commonly entered by land/sea. Meanwhile, people recruited in Poland, Czech Republic and Slovakia travelled by air and land/sea in roughly equal proportions. This variation may be at least partially explained by pricing, frequency and closeness to low-cost air routes, although the influence of different offenders' personal preferences and clustering of cases cannot be discounted.

Although we only had data on specific entry points into the UK for just over half (52%, $n = 193$) of relevant victims, this information was generally geographically well-specified (see Table 3). In total, our data set contained 185 individuals for whom we had both their point of entry

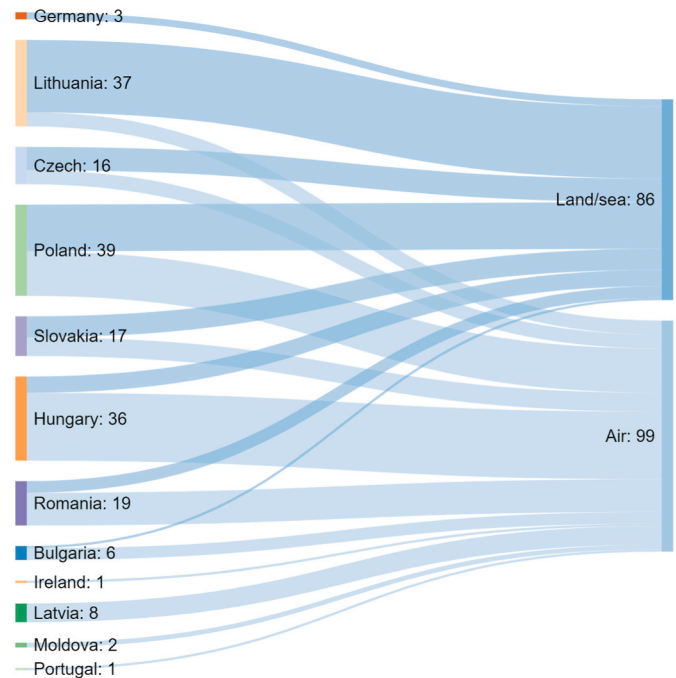


Fig. 8. The relationship between country of recruitment and mode of transport to the UK ($n = 185$).

(and specifically, the type of port – e.g. airport, rail terminal, or seaport) and their recruitment location (outside of the UK). While most land-based entries (70 out of 86) came through the port of Dover, air-based routes were much more varied, with 11 different airports featuring (many regional). Entry points are significant as they can be 'pinch-points' for intervention. Our data suggested people travelled through a fairly limited number of seaports and airports, although there may be biases in people's ability to recognise and recall smaller, less well-known locations and patterns may well be dramatically different for non-EU nationals. There are important practical and ethical issues to consider around trying to detect trafficking at the borders (Hadjimatheou & Lynch, 2017, 2020; McAdam, 2013). Even had they been easily detectable, it seems highly unlikely that many people in our sample would have welcomed being 'rescued' at the border, especially if they were not supported in finding alternative work. After all, the vast majority entered the UK travelling voluntarily and through regular channels in the expectation of (better-paid) work.

5. Discussion and conclusions

This paper represents an important step towards developing the literature on the geographies of trafficking. We have demonstrated that there are both clear benefits to examining trafficking quantitatively through a spatial lens and substantial data-related barriers to realising the full potential of such research. We have also discussed ways some of these challenges can be mitigated, although certain issues are likely to persist regardless due to trafficking's inherent spatial complexity and gaps in memory/knowledge of geographical information. Our results are not intended as a definitive or exhaustive list of methodological challenges for geospatial research into trafficking, but rather are based on bottom-up analysis of a very particular dataset: NRM data from 2012 to 2013 on labour trafficking of EU nationals in the UK ($n = 450$). The extent to which these issues are shared with other datasets, trafficking 'types', times and places remains uncertain. We would also reiterate that official datasets like the NRM are liable to various biases that must be considered in any analysis, geospatial ones included (see Cockbain & Bowers, 2019; Cockbain, Bowers, & Vernon, 2019).

We hope, however, that this exploratory paper helps stimulate

further interest and development around GIS mapping and other quantitative analyses in this space. Although our spatial analyses were included first and foremost to illustrate methodological challenges (a necessary first step for the underdeveloped quantitative literature), the results indicate that there are likely important links between trafficking-related labour exploitation, migration patterns and industry-specific demands for labour. It would be fruitful to explore these issues further in future data collection and research, helping examine at scale how 'geographies of uneven development' (Esson, 2020, p. 4) and labour market dynamics (see, e.g., Crane, LeBaron, Phung, Behbahani, & Allain, 2018; McGrath, 2013) correlate with trafficking-related events. Using larger samples – preferably with greater data integrity too – one could explore relationships between the distribution in space and time of various trafficking-related locations and diverse potential correlates at the micro, meso and macro level. Examples of correlates might include spatially/temporally relevant datasets around policy and spending decisions, law enforcement activity, land use, transport networks, work opportunities, the distribution of diaspora communities and various other socio-demographic data. Importantly, the reference to diasporas is not to stigmatise or generalise, rather is made in recognition that social networks underpin migration and employment opportunities at large (see, e.g., Massey, 1990). Our on-going research into labour trafficking suggests that similar holds for traffickers and their victims too. Fine-grained analysis conducted at scale would help examine oft-stated but rarely-tested associations between trafficking and 'wider patterns of mobility relating to migration and development' (Laurie & Richardson, 2021, p. 123). Future quantitative research into the geographies of trafficking could also benefit from closer analysis not just of the spatial and temporal dimensions to trafficking but also the intersecting social systems involved, drawing for example on techniques like social network analysis (see, e.g., Campana, 2016; Cockbain, 2018).

Although not conducted within a relational geographies framework, our study resonates with recent such work on trafficking (e.g. Blazek & Esson, 2019; Blazek et al., 2019; Laurie & Richardson, 2021; Yea, 2020b). Although perspectives and approaches diverge, the relational approach broadly centres around the recognition that trafficking involves complex geographies and situated experiences that are distributed and evolve across space and time. Relational perspectives encourage attention, therefore, to 'the wider set of social, economic, institutional and material relations that underpin and facilitate exploitation across different temporalities and spatialities' (Blazek et al., 2019, p. 64). Like Blazek et al. (2019) and others, we also see trafficking as a process rather than a one-off event and agree that the traditional three-stage linear model of trafficking (recruitment-transfer-exploitation) is overly reductive (see also Cockbain, 2018). We also agree with Yea (2020a, p. 12) that it is valuable to see 'trafficking as a series of interconnected events across space and time with colluding actors'. We think it is important both to recognise, explore and account for interconnectivities in the trafficking process and to address the fact that specific events *do* occur in specific places and at specific times. In mapping trafficking's complex components, however, methodological decisions, their underpinning rationale and implications all need to be carefully considered and made explicit since different choices can yield very different results, as shown here. Importantly, pinpointing specific events in space and time does not preclude an appreciation that trafficking-related actions, relations and decisions can also be situated within broader past experiences, present connections and future aspirations (see, e.g., Laurie & Richardson, 2021; Yea, 2016, 2020b).

Rather than approach trafficking as a unified whole, geospatial analyses benefit from sensitivity to different contexts and variation between and within different trafficking 'types' (Cockbain & Bowers, 2019; Rose et al., 2021). Operating conditions in particular sectors and modes of work (e.g. outsourcing, agency work *etc*) can foster different opportunities for exploitation across the spectrum of severity (see, e.g., Davies, 2018; LeBaron, 2013). Taking a spatial lens, differences in the geospatial distribution, socio-demographics and dynamics of various

industries/occupations underline why sector-specific analysis is so important. In our data, the food industry notably contributed two of the three most prevalent exploitation settings (agriculture/horticulture and food-processing factories). The UK food industry has intensified markedly and is increasingly reliant on low-wage migrants (Geddes & Scott, 2010), potentially fuelling opportunities for trafficking too. That there were so many A8/A2 nationals in our (EEA only) sample is unsurprising since virtually all victims started out as willing (albeit deceived) economic migrants: it makes sense therefore that they came from places with substantial migratory flows into the UK in general (McCullum & Findlay, 2015) and where wages are relatively lower. Like many migrants to the UK from these countries in general, members of our sample tended to speak little English and worked (in our case, were exploited) in low-wage jobs. Notably, our sample diverged markedly from the 'iconic victim' archetype in trafficking, indicating a certain level of inclusivity in victim identification. The fact everyone in our study had regular immigration status is important, however, as it may well have reduced barriers to disclosure (e.g. less fear of deportation). Moreover, there are longstanding concerns about potential differential decision-making in the NRM, whereby EEA nationals are sometimes said to be more readily accorded trafficking victim status than their non-EEA counterparts (see, e.g., Stepnitz, 2012; TheAnti-Trafficking Monitoring Group, 2010). Amid well-documented tensions between the UK's anti-trafficking and immigration-control agendas (Gadd & Broad, 2018; Hadjimatheou & Lynch, 2017), it remains to be seen how Brexit might affect NRM referrals and outcomes. Similar uncertainty exists around the potential impact of a recent High Court ruling that all those officially recognised as trafficking victims should have the right to remain in the UK (Taylor, 2021).

Within our data, probably the greatest issue we encountered related to uncertainty and inaccuracy. In the short term, various 'fixes' can help ensure any analysis is robust, including the two we demonstrated: first, restricting analysis to data points with a high level of certainty and specificity; second, adding explicit information on uncertainty where data of different standards are combined. Another overarching challenge complicating geospatial analysis is that trafficking, as explained previously, is a complex process rather than a one-off event represented by a single spatial reference (unlike, say, domestic burglary). Thus, there are a whole series of trafficking-related geographies and their linkages to consider. While we examined ways of addressing certain forms of clustering (e.g. restricting analysis to each person's most recent exploitation location), more sophisticated techniques (e.g. multi-level modelling to control for clustering of linked victims) are possible but were beyond the remit of this dataset/paper. Such techniques may nevertheless be important in future spatial analyses, particularly larger-scale ones, to ensure clusters arising from large police operations, for example, do not skew overall results. While geospatial analysis of burglaries and various other crimes are commonplace, and sometimes use quite sophisticated techniques, the underlying data tend to be of better quality. Rushing to plot trafficking data and produce equivalent maps *etc.* without accounting for considerable limitations risks unreliable and misleading outputs that could undermine anti-trafficking strategy, policy and practice. For analysis in this space, therefore, good contextual understanding, careful examination of the data, and firm caveats are crucial.

For the reasons outlined above, it is difficult to see how automated techniques or data science methods could substantially help with the geospatial analysis of current trafficking datasets. The information for a small but significant number of locations was insufficient on its own to uniquely identify a place and required an appreciation of the contextual information within the case files to confidently identify a specific location. The requirement for such substantial manual checking and coding make us doubtful that any robust or meaningful insights could be drawn from current such datasets using automated processes without substantial risk of misinterpretation. More fundamental improvements to data integrity could, however, open up opportunities to exploit data science techniques in future.

To improve analysis in the medium- and long-term, improving data integrity is crucial if there is to be more reliable, robust and informative quantitative geospatial analyses of trafficking. Better data would enable more fine-grained analysis and intervention and reduce reliance on notoriously shoddy global statistics (see, e.g. McGrath & Watson, 2018; O'Connell Davidson, 2015). Consultation between geospatial analysts and frontline agencies could help in the evolution of data collection systems to ensure maximally useful but still feasible data were generated as standard. A better understanding of trafficking's spatial systems would in turn support more nuanced, evidence-informed approaches to anti-trafficking. In our view, the recent redesign of the NRM system (and specifically the standardised referral form) was a missed opportunity better to capture geographical information at scale, in a standardised format and with more meaningful categories (e.g. by recording recruitment location not just place of birth). If one country were to make advances in collecting and analysing geospatial data on trafficking, wider international progress might ensue. So far there has been, to our knowledge, relatively little formal transnational collaboration towards improved geographical data, perhaps in part because data collection falls outside the remit of Europe's main monitoring mechanism for counter-trafficking.²⁶

Careful, rigorous and nuanced geospatial (and indeed, spatio-temporal) analyses could help advance understanding of the nature and distribution of trafficking, inform counter-measures and support, where relevant, evaluations of interventions. Notably, evaluation evidence is notoriously scant in this field, despite the fact that anti-trafficking interventions done badly can be ineffective and even actively harmful to marginalised groups ((Cockbain, 2020)). While our focus in this article was on quantitative analysis in the aggregate, we see both qualitative and quantitative research as having vital and complementary roles to play in disentangling the geographies of trafficking – and anti-trafficking – in all their complexities and interconnectivities.

Author contributions

- Ella Cockbain: Conceptualisation, methodology, investigation, formal analysis, writing – original draft, supervision, project administration, funding acquisition.
- Kate Bowers: Conceptualisation, methodology, writing – original draft.
- Oli Hutt: Methodology, formal analysis, data curation, writing – original draft, visualisation.

Data statement

This research used sensitive and confidential data held by the NCA. Our data-sharing agreement stipulated that they could only be used for the specified project and by the named researchers. We are therefore unable to share our data for onward use.

Acknowledgments and declaration of interests

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this journal. We would like to thank Dr Sam Scott for his insightful comments on an earlier version of this paper, the anonymous reviewers for their thorough and very constructive feedback and Managing Editor Professor Dennis Wei and Journal Manager Dipu for their support through the submissions process. We used Eurostat/GISCO geographical data for the creation of all maps shown in this article and © EuroGeographics for the administrative boundaries. We used the Jill Dando Institute Research Laboratory at UCL to store sensitive research data. We have no competing interests to declare.

Appendix Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.apgeog.2022.102643>.

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²⁶ The Council of Europe's Group of Experts on Action Against Trafficking in Human Beings (GRETA). Although GRETA does not work on data directly, it recognises that improved data are a crucial tool to inform, adjust and assess anti-trafficking policies, as well as to carry out risk assessment' (Council of Europe, 2020, p. 44).

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