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## Prevalence Estimation Using Respondent-Driven Sampling and Network Scale-Up Methods: An Exploratory Analysis of Labour Exploitation among UK Domestic Workers

### Abstract

Investigation of deviant managerial activity represents distinctive methodological problems for researchers wishing to access so called 'hidden' or hard-to-reach populations. Such empirical management research needs to be conducted in circumstances where a representative population sample is hard to obtain. Recent advances in statistical techniques such as the use of respondent-driven sampling (RDS) and network scale up (NSUM) modelling methods enables use of the underlying structure of respondents' social networks to reduce the sampling biases that may occur in practice with the use of convenience samples and therefore enables more robust population estimates. This paper presents and discusses the application of and opportunities for the use of RDS and NSUM in the management field drawing upon illustrations from a novel exploratory empirical study which used these techniques to estimate the nature and scale of labour exploitation among domestic workers in the United Kingdom. Both practical and theoretical opportunities, and limitations of these approaches, are discussed and their potential use in future management research outlined.

### Introduction

Representative samples of criminal and other deviant management practices are difficult to obtain yet the prevalence of such behaviours is of increasing interest to management scholars. Alternatives to traditional representational statistical sampling techniques are required if accurate estimates of the nature and scale of such behaviours in such 'hidden populations' are to be calculated. A population is deemed to be hidden where 'no sampling frame exists and public acknowledgement of membership of the population is potentially threatening' (Douglas D. Heckathorn, 1997, p. 174). It may be difficult to access a representative sample of a hidden population due to factors related to social stigma, the relative isolation of its members and the presence of deviant behaviour. Alternative techniques, such as respondent-driven sampling (RDS) which utilises the network of social connections that exist between members of a hidden population to identify a respondent sample (Douglas D. Heckathorn, 1997) have been proposed. While similar in principle to snowball sampling (Goodman, 1961), RDS also relies on the social ties of an initial set of respondents. However, unlike Goodman's method, it has been recognised that, in practice, the initial sample of respondents known to the researcher upon which subsequent sampling waves are based may not be random (Gile and Handcock, 2015). These authors identify

the drawbacks of such initial convenience samples as including an inability to directly compute sampling weights and a need to model the complex sampling process to infer likelihood. In response to these problems, an alternative, model-assisted, sampling approach providing which enables the generation of a new class of RDS estimators and the use of a corresponding bootstrap method to estimate standard error.

The use of RDS sampling for prevalence estimation in the field of severe labour exploitation has received recent attention (Zhang and Kyle, 2021), with the advantages of hybrid methodological combinations proposed by some (Kysia and Zines, 2021). Specifically, the adoption of network scale-up methods, which use measures of the size of personal networks of individuals in the general population to estimate the size of a hidden, or hard-to-reach population, have been advocated (Blazek and Feehan, 2021). Yet, with the exception of a recent report of the labour exploitation of children in the criminology literature (Zhang et al., 2019a), there are a paucity of studies in the management domain that have examined the practicalities of combining these techniques. In this paper, we explore the use of RDS and NSUM, drawing upon an original empirical study designed to examine the nature and extent of labour exploitation among domestic workers in the United Kingdom. Exploited domestic workers may be considered a hidden, or hard-to-reach, population due not only to their relative social isolation, but also the potentially criminal nature of the conditions within which their work is carried out making them reluctant to report the nature of their working conditions due to the fear of reprisals.

Migrant domestic workers may be at particular risk of exploitation due to several intersecting structural issues related to their gender, the relative isolation of the work, a lack of social network support and regulatory restrictions that mean that they may fall out of legal migratory status. Due to the social stigma that a loss of such status can lead to, this group of workers may be considered a hidden, hard-to-reach, population with commensurate difficulties of the employment of the normal statistical sampling methods required for robust prevalence estimation. Yet despite the persistence of concerns in the grey literature (Kalayaan, 2008; LAWRS, 2023; Mantouvalou, 2016), research to date has failed to accurately capture representative samples to enable estimation of the nature and extent of labour abuse that exists among domestic workers in the United Kingdom (UK). Due to these sampling difficulties, we know relatively little about prevalence of labour exploitation in this at-risk population. For, while there is a grey literature which highlights the risk of debt bondage, where workers find themselves saddled with large debts that are beyond what they can earn to pay off (Kalayaan, 2008), along with a range of other vulnerabilities and potentially exploitative conditions (LAWRS, 2023), to the authors' knowledge there have been no attempts to quantify these various types of exploitation among domestic workers in the UK beyond the level of simple descriptive statistics. It is to begin to remedy these omissions that this paper attends.

We make two specific contributions to the literature. First, we use RDS to sample and survey migrant domestic workers experiencing various types of labour exploitation in the UK and use this data to provide an estimate of the proportion of migrant domestic workers experiencing labour exploitation. Second, drawing upon the International Labour Organisation's indicators of forced labour (ILO, 2011a), we shed light on the nature of the severity of the exploitation experienced through the construction of a novel exploitation risk index. In addition to providing an estimate of the 'at risk' domestic worker population, our methodological examination sheds light upon the distinctive role of social network ties in RDS and NSUM statistical analyses, exemplifies some of the practical limitations of a combined approach and discusses how the features of other related techniques may be applied in the field of management research to overcome them. In so doing, we address the research questions: what proportion of UK domestic workers are at risk of labour exploitation? How does the role played by social network ties differ between RDS and NSUM? What are the implications of these two techniques on the resulting estimates' sensitivity? And what opportunities are there for the use of other advanced techniques to address some of the practical limitations of combined RDS and NSUM?

The remainder of this paper is structured as follows. First, we review the development of RDS techniques and explain why this sampling method is suitable for our study. Next, we describe what is known about the current population of migrant domestic workers in the UK and the conditions in which they work. Then we describe our methods, including how we designed our survey, made contact with our sample seeds and analysed our data. We then present and discuss our findings, detailing the proportionate estimate that we calculated and the risk index we constructed, and the implications of our findings for policy, practice and further research. Finally, we conclude our paper with some thoughts upon the use of these methods for future prevalence studies of exploitation in other sectoral and geographic contexts.

### The Development of Respondent Driven Sampling (RDS)

Comprehensive descriptions and literature reviews of the development and use of Respondent Driven Sampling (RDS) to estimate the population size of a hidden population are available elsewhere (Gile et al., 2018; Heckathorn, 2011). Suffice it to say, the possibilities of the use of a one-wave snowball sampling to allow researchers to obtain a sample of personal networks was posited by Frank and Snijders (1994).

Following the identification of a set of original sample members known as seeds, Heckathorn (D.D. Heckathorn, 1997; Heckathorn, 2002) advocates the use of a double incentive to recompense participants not only for their involvement, but also for their recruitment of further participants in subsequent 'waves' of participation by drawing upon the social ties through which members of the hidden population are connected to each other.

The typical number of original sample seeds is between two and ten: chosen as heterogeneously as possible (Gile et al., 2018). Though they may be subject to both systematic and non-systematic errors, the use of snowballing methods for the study of hidden populations, with the support of monetary or symbolic rewards, has been advocated as a way of creating robust recruitment embodying diversity in characteristics such as ethnicity, gender and geographical location (D.D. Heckathorn, 1997; Heckathorn, 2002). In these papers, Heckathorn advances the development of RDS to include self-reported network size as a population estimator and bootstrapping techniques to support the development of an estimators' confidence intervals, an approach that has since been refined by others (Gile et al., 2015). Such developments derive a new class of indicators for the population mean and define a corresponding bootstrap method to estimate the errors in RDS. The resulting 'network working model' permits the individual's connected ness in the network to be tested, while reducing bias with respect to the composition of the seeds. Snowball sampling is based upon the initial recruitment of the original sample selection by means of convenience, RDS also takes a non-random approach to seed selection, but relies upon the social network structure that exists between participants to produce a non-probabilistic sample (Goodman, 2011). Incentive structure is important, though this weakness is not a feature of our target hidden population, some researchers have identified that younger men with higher socio-economic status are less likely to participate (McCreesh et al., 2013). Perhaps of more concern, RDS has been described as a risky strategy since researchers cannot be sure whether enough respondents have been recruited though subsequent waves to eliminate bias within the original sample members (Vincent and Thompson, 2017).

RDS has been widely used to sample a variety of hidden populations, including HIV prevalence, rape and client-initiated gender-based violence among sex workers (McCreesh et al., 2012; Schwitters et al., 2012). While the RDS method has proved limited when seeking to provide population heterogeneity by geographical location (McCreesh et al., 2011) where these population features are of lesser importance, such methods have been used successfully. RDS methods have been used to survey other, migrant, populations (Tyldum, 2021) while such network-based referrals have been described as the only viable method to reach many types of labour trafficking victims (Zhang, 2012) and have been used to research exploitation among low-wage workers in three American cities (Bernhardt et al., 2009); a study of labour trafficking in migrant communities in the city of San Diego (Vincent and Thompson, 2017); examination of the worst forms of child labour in the Indian state of Bihar (Zhang et al., 2019b); and the commercial sexual exploitation of children in Nepal (Jordan et al., 2020).

Why is a study of the exploitation of domestic workers relevant to the field of management?

Other authors have already pointed out the continuing deficit of slavery-related studies in the management field (Cooke, 2003; Caruana et al., 2021). Domestic servitude represents perhaps one of the oldest and most persistent forms of enslavement and yet, despite continual concern from civil society organisations about their ramifications, governments such as that of the United Kingdom continue to view domestic work as a discrete workforce category with distinctive labour and migration laws and regulations which, it is recognised, lead to structural inequalities. The risks of labour exploitation in such circumstances have been widely reported yet post Brexit the scale and nature of this exploitation remains under-researched. Without such insights, calls for changes to government policy lack rigorous supporting evidence. The sector warrants further study due to indications that visa schemes that tie workers to an employer are now also being used for labour market control of employees in other occupational categories - as exemplified by the UK government's Health and Care Visa introduced in the Spring of 2022 for social care workers. Taken together, these categories of worker account for the majority of migrant worker visas issued by the UK government in 2023.

Detailed statistics related to the country of origin of domestic workers migrating to work in the UK are difficult to isolate before 2019. Since that time, annual migration has fluctuated – falling sharply in 2021 due in part to the Covid-19 pandemic, before later rising again above pre-pandemic levels. In the year to December 2022, the UK Home Office reported that it had issued 18,533 Overseas Domestic Worker visas (Home Office, 2023). These domestic workers came from various countries in South America and Asia, including many from the Philippines. Strauss and Cocco (2023) reported a big shift in the source countries of migrants arriving in the UK on the Overseas Domestic Worker and other types of worker visas.<sup>3</sup> Migrant domestic workers from the Philippines and India accounted for the single largest number of applications granted (10,186 and 3,858 visas respectively), followed by smaller, but still significant, numbers of workers arriving from Bangladesh (465), Nigeria (446), Sri Lanka (444), Egypt (422), and Ethiopia (285), and in the same period, smaller numbers of applications for UK domestic work were also accepted from workers from other source countries including, but not limited to the Sudan, Nepal, Ghana, Kenya, the Lebanon, Eritrea, Iran, Turkey, Yemen, Malaysia, Thailand and Morocco. This post-Brexit increase in the diversity of source countries from which migrant workers are drawn makes a more detailed analysis of the risk of labour exploitation in the sector both more timely and urgent.

There is a long history of reports of exploitation in the domestic work sector. In 2008, the civil society migrant domestic workers organisation Kalayaan, formed to campaign for the formal recognition of migrant domestic workers rights in the UK, reported on the impact of proposed changes to the UK immigration system on migrant domestic

workers (Kalayaan, 2008). This report highlights Government recognition of documented and unacceptable levels of abuse and exploitation among domestic workers in the UK as early as 1996. At this stage, new policies, including the development of a specialised visa allowing domestic workers to change employer during their stay were introduced. However, in 2012, these visa conditions were modified, tying domestic workers to a single employer and restricting the length of time that they are permitted to remain in the country to a period of six months (Gower, 2016). This report highlights the underlying reasons for migrant domestic workers' vulnerability, including workers' relative desperation for work; their lack of social ties; unfamiliarity with English language and culture; long working hours; lack of knowledge of their legal rights; a lack of oversight of the private home as a workplace; their work forming part of the informal economy; their reliance on their employer for permission to work in the UK and their lack of recourse to public funds and notes, as a result, migrant domestic workers' vulnerability to abuse ranging from minor breaches of employment and health and safety law, to physical and sexual violence, slavery, forced labour and trafficking.

That these conditions may persist is evidenced by report from another civil society organisation, the Latin American Women's Rights Service which describe the results from twelve in-depth interviews with Latin American domestic workers in the UK that depict high levels of isolation, exploitation and abuse including a failure to provide written contracts or payslips, breaches of verbal agreement, a requirement to perform different tasks from those indicated during recruitment; increasing working hours with little or no time off; excessive work days; a lack of paid holiday; many domestic workers not registered with a GP; sexual harassment in the workplace, verbal or physical abuse; employer surveillance; a lack of opportunity to change working conditions; isolation and fear of seeking help and high reported levels of trafficking for labour exploitation (LAWRS, 2023). Against this backdrop, we turn next to the development of RDS as a suitable sampling technique with which to provide a statistical estimator of the nature and scale of reported abuse by migrant domestic workers. In the following section we describe our methods, including how we designed our survey, contacted our sample seeds and analysed our data.

## Research Methods

Our approach can best be described as Web-based RDS (Wejnert and Heckathorn, 2008). We designed a web survey using the JISC online survey interface, suitable for our respondents to complete via a mobile phone. Composite measures to quantify the extent to which respondents were at risk of labour exploitation, including severe forms of exploitation such as forced labour, were constructed from existing exploitation typologies, notably the ILOs Indicators (ILO, 2011a). The survey consisted of these 11, composite, indicators and also included questions related to domestic workers level of job satisfaction, employment conditions and demographic data such as nationality, age

and gender. The main survey was conducted in the 5 months between February and July 2023.

### Generation of initial sample seeds

Our initial sample seeds were drawn from three distinct community groups: Kanlungan, a Filipino domestic workers organisation; Voice of Domestic Workers, a cross-community grassroots domestic workers organisation and the Latin American Workers' Rights Service, a civil society organisation representing the interests of Latin American migrants in the UK. Our initial sample respondents were drawn from these three organisations to reduce the effects of homophily in our sample: the common feature of a networked population where social ties are more likely to occur between people who have similar attributes than between those that do not (Gile et al., 2015). The effects of homophily were further mitigated during analysis through the use of the network model advanced by Gile et al. (2015).

Along with other academics with expertise in exploitation within domestic work, representatives from these three civil society organisations also contributed to survey question design and facilitated the piloting of an initial version of the survey (which was translated and made available in four languages: English, Spanish, Tagalog and Portuguese) to selected domestic workers within each community.

### Survey incentives

A double incentive scheme rewarded respondents both for completing the questionnaire and for each referral who went on to engage with the survey. The challenge of incentive design is to set the incentive at a level that adequately rewards respondents' time and participation, but that also avoids the risk of fraudulent participation due to too high a monetary gain (Jordan et al., 2020). A sum of £10 was provided for survey completion with a further £5 for each successful nomination. While respondents were asked to nominate up to 10 domestic workers within their existing social network, it was the first three of these from whom participation was requested in subsequent waves. This approach is akin to the use of vouchers in face-to-face studies as advocated by Thompson (2002). The ethical and practical issues related to the design and effective use of incentives for RDS among vulnerable populations has been much discussed in the literature. See for example, (Abdul-Quader et al., 2006; Brunovskis and Surtees, 2010; DeJong et al., 2009; Platt et al., 2015; Semaan, 2010; Semaan et al., 2009; Singer and Bossarte, 2006; Wang et al., 2005), including the specificities of incentive use within web-based surveys (Cobanoglu and Cobanoglu, 2003). Following the principles of lottery use established by Brown et al. (2006) and Laguilles et al. (2011), we also designed our survey to encourage the maximum extent of participation by entering all respondents completing the questionnaire into a free prize draw for £150. Research

suggests that a high lottery provides the most cost-effective incentive for obtaining complete responses (Gajic et al., 2012). While using incentives to encourage participation would seem to be desirable, it is worth noting the potential downside of respondents fabricating responses to increase their remuneration (Robinson, 2014). To minimise this risk, mobile phone numbers for each respondent and those whom they referred were collated and each of these numbers were called by one of the authors of the paper to ascertain the veracity of the respondent as a migrant domestic worker.

#### Data analysis

**[Scott- are you perhaps able to draft this section?]**

#### Findings

##### Descriptive statistics

In total, we received completed online surveys from 97 respondents. Of these respondents, 90 respondents identified themselves as migrant domestic workers. Forty-five percent regarded themselves as self-employed, 39% identified themselves as employees and 16% categorised their employment status as that of a worker. Of the 97 respondents, 64 respondents (66% of the total), and the largest single nationality group, reported that they had a Filipina background. Other nationalities represented included Dominican, Brazilian, Spanish, Colombian, Bolivian, Venezuelan, Cuban and Panamanian. Female domestic workers made up 97% of the sample, with 3% of the sample comprised of male domestic workers. The age structure of the domestic workers was skewed towards those over 45 years old, with such workers representing over half of the sample (See table 1).

Age	23-25	26-35	36-45	45 and over
Number of Respondents	2	24	23	48

Table 1: Age profile of respondents (n=97)

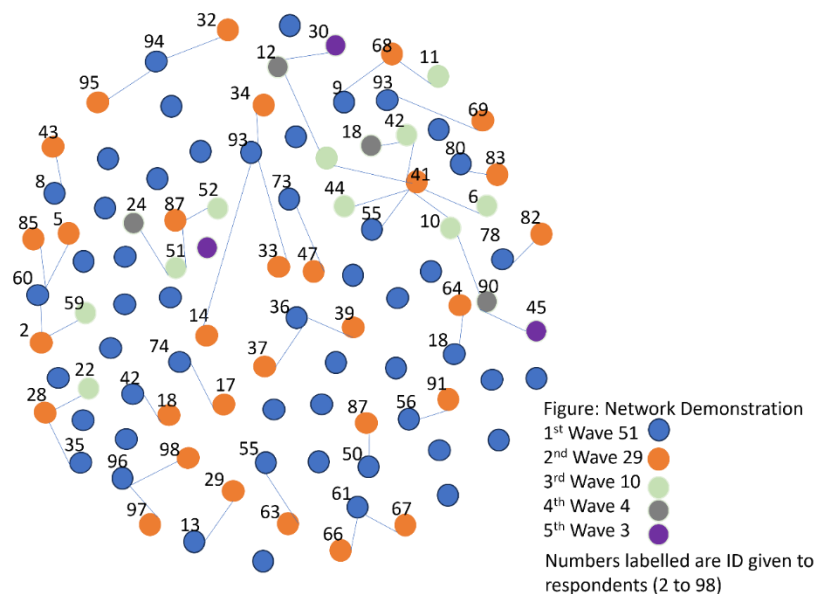
#### Network structure

**[Selim, could you please add and describe here the graphic that depicts the network structure?]**

Figure below demonstrates the network of domestic workers sampled in this research (only respondents with more than one wave has been labelled with their short ID). Due to the situation that the survey is based on a WebRDS completed online, the sequential numbering system is converted to a online Excel system and managed by the research team. The social connections between respondents are identified through the phone number each respondent received their referral. There are 51 respondents who participated in the first wave, 29 respondents were then referred in the second wave, 10



respondents have been referred in the third wave, and finally only 4 and 3 respondents respectively were referred in the fourth and fifth wave.



The average network size between sampled domestic workers is 9.4. This may be compared to the results of other RDS studies. For example, a study of marginalised young females reported a similar average of eight people in their networks (Byrant 2014). Both of these results are higher than the average network size of five calculated for female sex workers but are significantly lower than that of the average network size of people who inject drugs (55) and that of the homeless population in two Czech cities (also 55) (Uuskula et al. 2010; Bernard et al. 2018). This means that, relatively speaking, domestic workers are not highly inter-connected with each other. For this reason, domestic workers are at higher risk of isolation and lack of social communication, and they might not know or be able to find peers to exchange their experiences with, especially experiences related to exploitation.

The practical barriers of time and knowledge has provided useful lessons for the methods' application in the modern slavery context. The long-working hours of domestic workers made respondents harder to be reached despite the research team could contact them on the phone. Such a difficulty shows the value of this rare data, as respondents often express that they do not have time to understand the referral process. The misunderstanding gives the respondents a lack of motivation to refer their social connections, and if so, they fail to identify the connections between each other. NGO partners also highlight that extremely exploited respondents might not have the time or access for an online survey. The lack of motivation could provide an explanation to why the sample has grown horizontally, as similar situation was encountered by another research using WebRDS (McGowan et al. 2023; Stromdahl et al. 2015).

In this case, the key to for modern slavery researchers to employ the RDS needs to depend on mechanisms to motivate referrals. Apart from increasing the referral incentives, repeated reminder calls and communications with respondents who are well-connected are solutions that has helped the data collection process of this research.

Point estimation and confidence intervals

**[Scott, could you please add the point estimation and confidence limit estimates that you have calculated here?]**

Discussion

Implications for policy

In the past, the UK Government has proved reluctant to respond to calls to remove the restrictive, tied, visa conditions currently in force for those migrant workers working in the UK on the Overseas Domestic Workers visa (Gower, 2016). Maintaining these restrictive conditions prevents the ratification in the UK of C189, the International Convention for domestic workers (ILO, 2011b). If the estimates resulting from our study are correct, these visa conditions place migrant domestic workers at significant risk of serious forms of labour exploitation including, in its most severe form, abuse that exhibits the characteristics of forced labour -legally considered a form of modern slavery. To reduce the vulnerability of migrant domestic workers to this – and other forms of labour exploitation, we urge policy-makers to reconsider these discriminatory visa conditions and offer the same freedoms to domestic workers that are enjoyed by other groups of workers under UK law.

In addition, given the vulnerabilities experienced by workers due to the private nature of the workplace, we would urge the UK government to consider the regulation of domestic worker employers.

Finally, given the stigma and very real danger of deportation of those migrant domestic workers who may have fallen out of legal migration status, our evidence suggests that there is an urgent need for the UK Government to enforce a firewall between immigration control and labour exploitation if the true scale of abuse is to be made visible and the perpetrators brought to justice.

Implications for practice

The UK Visa and Immigration service already offers rights-based training to migrant domestic workers via UK embassies in certain source countries. To reduce migrant domestic workers vulnerabilities, we advocate the expansion of this training both to include explicit training related to employment and labour rights within the UK and to the rapidly expanding range of new source countries from where migrant domestic workers are now drawn.

## Enhancements that could be made in further studies

- Take the opportunity to ask questions of identified members of the hidden population. For instance, how many people know that you are a member of the hidden population. Empirical data of this nature permits calculation of Generalised Network Scale-up Methods (GNSUM) estimators (Feehan and Salganick, 2016).
- Use of game of contacts to estimate respondents' social network sizes

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