

<b>Institution:</b> University of Southampton		
<b>Unit of Assessment:</b> 10 Mathematical Sciences		
<b>Title of case study:</b> 10-05 Population size estimation of global human trafficking to meet United Nations Sustainable Development Goals and facilitate policy action		
<b>Period when the underpinning research was undertaken:</b> 2012 – 2018		
<b>Details of staff conducting the underpinning research from the submitting unit:</b>		
<b>Name(s):</b>	<b>Role(s) (e.g. job title):</b>	<b>Period(s) employed by submitting HEI:</b>
Dankmar Böhning Peter van der Heijden	Professor of Medical Statistics Professor of Social Statistics	October 2011 – present October 2012 – present
<b>Period when the claimed impact occurred:</b> August 2013 – July 2020		
<b>Is this case study continued from a case study submitted in 2014?</b> N		
<p><b>1. Summary of the impact</b></p> <p>Human trafficking is a major international crime. One of the main challenges faced by countries is in understanding its extent and prevalence within society. Through their research on capture-recapture methods, Professor van der Heijden and Professor Böhning developed new methods to improve the accuracy of national-level estimates of the extent of human trafficking. For example, in the context of the Netherlands, their estimates show that only around 1,400 out of 6,250 victims of human trafficking are detected each year. Specifically, the research has direct impact with international reach and significance by: (1) improving the accuracy of estimates produced by the United Nations Office on Drugs and Crime (UNODC) in meeting Sustainable Development Goal 16.2; (2) deriving estimates for UNODC high level reports for The Netherlands, Ireland, Romania and Serbia; and (3) providing evidence for significant policy change in the Netherlands on its approach to sexual, labour and criminal exploitation.</p>		
<p><b>2. Underpinning research</b></p> <p>Research into population size estimation methods for hard-to-reach populations such as human trafficking victims addresses a vital problem in society. Böhning and Van der Heijden have a long track record in research of capture-recapture methods, which seek to identify the size of elusive target populations, which are of prime interest in social and community research as they connect to hidden or illegal activities that by their nature are difficult to quantify. Capture-recapture methods have been used in biology and ecology for more than 100 years and it is only recently that these methods have become popular in the social and medical sciences to estimate the size of populations such as illegal immigrants, illicit drug users, or the extent of alcohol misuse, abuse or dependency. <i>Capture-Recapture Methods for the Social and Medical Sciences</i> [3.1], edited by Böhning and van der Heijden, brings together important developments in the capture-recapture literature.</p> <p>There are two key approaches taken by capture-recapture methods, dependent on data availability. In the first approach, only one source is used and counts are made of the number of times each member of the target population is identified within the observational period. To accomplish this task a statistical model is fitted to the observed part of the distribution, namely the counts for those members of the population who have been identified one or more times. The fitted model can then be used to construct an estimate of the hidden part, those units of the target population which have not been observed. For example, in a study of domestic violence in The Netherlands a count is made of the number of times the police have identified a perpetrator of domestic violence [3.1, p. 207]. Evidently, those perpetrators with no police record remain hidden and it is the purpose of capture-recapture here to provide an estimate of number of undetected crimes. Clearly, this approach is dependent on the model used for the observed part of the distribution. An early application of this methodology in human trafficking was proposed by the International Labour Organisation, but van der Heijden, Böhning and others [3.2] showed that the methodology was applied in an incorrect way.</p>		

In the second approach, *multiple systems estimation* (MSE), the main focus of this impact case study, more than one source of data is used to identify the *observed* size of the elusive target population. The overlap between the different data sources then allows the construction of an estimate of the true size of the hidden population. For example, in the case of human trafficking, data from the police and border forces can be used to identify the *observed* number of human trafficking victims. In [3.3] MSE is further worked out in detail and estimates of the magnitude of human trafficking are provided for the Netherlands.

In the context of human trafficking, data are often sparse. This is a problem, as the key data in MSE are counts which are analysed with loglinear models. The methodology was made more robust by including covariates and additional years, to ensure that the results become more stable as more data are available [3.3]. As more covariates and years are available, model search and testing also becomes an issue. Model testing was adjusted by making use of more modern approaches, such as generating distributions for the deviance instead of relying on asymptotic distributions [3.3] and [3.4]. Also, a methodology was developed for carrying out sensitivity analyses in the context of MSE [3.5]. Böhning and van der Heijden jointly guided the theoretical developments while other colleagues helped to implement the developed methodology to produce the estimates.

### 3. References to the research

- 3.1 Böhning, D., van der Heijden, P.G.M. & Bunge, J. (Eds.) (2018). *Capture-recapture methods for the social and medical sciences*. Boca Raton: CRC Press. Available on request.
- 3.2 van der Heijden, P.G.M., de Vries, I., Böhning, D. & Cruyff, M. (2015). 'Estimating the size of hard-to-reach populations using capture-recapture methodology, with a discussion of the International Labour Organization's global estimate of forced labour'. *Forum of Crime and Society*. Special issue: Researching hidden populations: Approaches to and methodologies for generating data on trafficking in persons, 8: 109-136. <https://doi.org/10.18356/ccc8db2a-en>
- 3.3 Cruyff, M., J. van Dijk, J. & van der Heijden, P.G.M (2017). 'The challenge of counting victims of human trafficking'. *Chance*, 30(3): 41-49. <https://doi.org/10.1080/09332480.2017.1383113>
- 3.4 Coumans, A. M., Cruyff, M.J.L.F., van der Heijden, P. G. M., Wolf, J. & Schmeets, H. (2017). 'Estimating homelessness in the Netherlands using a capture-recapture approach'. *Social Indicators Research*. 130(1): 189-212. <https://doi.org/10.1007/s11205-015-1171-7>
- 3.5 Gerritse, S., van der Heijden, P.G.M. and Bakker, B.F.M. (2015). 'Sensitivity of population size estimation for violating parametric assumptions in loglinear models. *Journal of Official Statistics*, 31(3): 357-379. <https://doi.org/10.1515/JOS-2015-0022>

### 4. Details of the impact

#### Global impact through UN Office on Drugs and Crime (UNODC) and Walk Free Foundation (WFF) to achieve Sustainable Development Goal Target 16.2

The eradication of human trafficking has been adopted as part of the UN Sustainable Development Goals (SDG) under the 2030 Agenda for Sustainable Development. Specifically, SDG target 16.2 asserts to 'end abuse, exploitation, trafficking, and all forms of violence and torture against children' [5.1]. In 2013, van der Heijden was invited to contribute as a consultant for the Expert Group Meeting on Trafficking in Persons Research by the UNODC in Vienna. The UNODC has collected international statistics on detected victims of human trafficking since 2003. Historically, there has been no sound estimate of the number of undetected victims of trafficking in persons worldwide, mainly owing to methodological differences and the challenges associated with estimating the sizes of hidden populations, including human trafficking victims, in countries where the hidden population is small, such as The Netherlands.

The number of victims of human trafficking has been selected as an indicator to measure progress towards the implementation of this target and as Mr. Herman Bolhaar the Dutch Rapporteur says obtaining accurate estimates "contributes greatly to the fight against human

trafficking, for it enables the development of evidence-based policies” [5.2]. As a direct result of van der Heijden’s recommendations on the robustness of the MSE methodology when using multiple years and covariates, the UNODC concluded that MSE should be officially adopted as a means to estimate the extent of human trafficking because it produces “a more realistic estimate of the size of any country’s human trafficking problem,” and a “clearer projection of the scale of the issue within that country” [5.3]. In 2016, UNODC and WFF signed an official agreement to work together to use MSE “to develop estimates of human trafficking in four European countries [The Netherlands, Ireland, Serbia and Romania]...to provide much needed data on human trafficking at the national level and...build relevant knowledge about how to measure this serious crime” [5.4], [5.5]. In 2018, the UNODC and WFF jointly published a report on the extent of human trafficking in Ireland [5.6] using MSE to calculate the estimated number of victims. As a direct result of the research, van der Heijden worked on MSE for Ireland, Serbia and Romania (three reports were published by UNODC as research briefs in 2018 [5.6]). In 2019, the UNODC commissioned van der Heijden to write a Handbook [5.7] on how to apply MSE to estimate the extent of human slavery that can be used globally. “We are confident that Professor van der Heijden’s approach represents a sound methodology by which to estimate the extent of human trafficking within a country and we have tasked him to lead a team to write the statistical part of a Manual which explains how this methodology can be used by countries to estimate the size of human trafficking within its borders.” [5.8].

### Policy impact in The Netherlands

In 2016 and 2017, van der Heijden worked on estimates for the Netherlands for the period 2010-2015 [5.6], published in 2017 as research brief by UNODC and Dutch National Rapporteur on Human Slavery and Child Abuse [5.9]. The publishing of further reports by UNODC [5.3, 5.6] and the Dutch National Rapporteur [5.10] constitute evidence that human trafficking has been placed higher on the political agenda.

The new estimates based on MSE were published in a report by the Dutch National Rapporteur [5.6, 5.9]. These show that only 1400 out of 6250 (around 1 in 5) victims of human trafficking are observed each year in the Netherlands [5.11]. As a response, on 13 November 2018, one year later, five ministers from the government jointly sent a letter to Dutch parliament titled “Together against human trafficking: An integrated programme-approach to sexual, labour and criminal exploitation”, which specifically refers to the estimated numbers of victims [5.12] to accompany the 44-page programme [5.13].

The Dutch government reports annually on the progress on the implementation of the programme: “In addition to the resources previously made available to the Public Prosecution Service and the police... the Coalition agreement (that is the 4-year programme the political parties that participate in the government agreed upon) provides for a considerable intensification of the approach to human trafficking. The Coalition agreement makes extra resources available for the reception of victims of trafficking in human beings (EUR2,000,000 (11-2018)), and within the EUR50,000,000 (11-2018) for the Inspectorate for Social Affairs and Employment, the approach to labour exploitation will be implemented. One part of the EUR291,000,000 (11-2018) for the police will also be used for, among other things, extra police liaisons for trafficking in human beings”. [5.12]

Publication of the estimates and subsequent debates and discussion that followed helped the Dutch government to take special actions addressing victims most at risk of trafficking. For example, “a special focus on the prevention aimed at young people in the Netherlands” and an “Action Line with a special focus on the detection of victims of labour exploitation”. Both are examples of evidence-based policies made possible by the MSE results [5.2]. In September 2019, the government enacted legislation providing, inter alia, for an authorisation requirement for all forms of sexual services, and by criminalising facilitating the pursuit of profit from illegal prostitution, the so-called pimp ban [5.14]. At the same time, the moral legislation is being modernised based on results from van der Heijden’s and Böhning’s analysis, as described in the updated report on victims of human trafficking (an update of [5.9], without updates of estimates). As stated by the Dutch National Rapporteur [5.2], “Knowing the number of unobserved victims is tremendously useful for us, as the size of the total population of victims reveals the extent of the

problem that we face in the Netherlands. But more importantly ... it enables us to develop more evidence-based policies, because it also provides insight into the different detection-rates of the different forms of human trafficking.” This is also evident from the recently published Victim Monitor Trafficking in Human Beings 2013-2017 by the National Rapporteur on Trafficking in Human Beings and Sexual Violence against Children [5.9].

## 5. Sources to corroborate the impact

- 5.1 Sustainable Development Indicator 16.2.2: “Number of victims of human trafficking per 100,000 population, by sex, age group and form of exploitation” (E/CN.3/2016/2/Rev.1).
- 5.2 Testimonial letter from Dutch Rapporteur
- 5.3 Multiple Systems Estimation for estimating the number of victims of human trafficking across the world. *Research brief published by the UNODC*. See <https://www.unodc.org/documents/data-and-analysis/tip/TiPMSE.pdf>.
- 5.4 Fiona David (2016). UNODC and Walk Free Foundation join forces to estimate the extent of trafficking in persons. [https://www.huffpost.com/entry/unodc-and-walk-free-foundation-join-forces-to-estimate\\_b\\_5840919fe4b04587de5de857?guccounter=1](https://www.huffpost.com/entry/unodc-and-walk-free-foundation-join-forces-to-estimate_b_5840919fe4b04587de5de857?guccounter=1)
- 5.5 UNODC and WFF agree to measure the extent of human trafficking (2.12.2016) <https://www.unodc.org/unodc/en/frontpage/2016/December/unodc-and-wff-agree-to-measure-the-extent-of-trafficking-in-persons.html>
- 5.6 Trafficking in Persons UNODC <https://www.unodc.org/unodc/data-and-analysis/glotip.html>
- 5.7 Peter G.M. van der Heijden, Maarten Cruyff, Jan van Dijk and Raggie Johansson (first draft). Using multiple systems estimation to report on SDG 16.2. A United Nations Manual.
- 5.8 Testimonial letter from UNODC
- 5.9 National Rapporteur on Trafficking in Human Beings and Sexual Violence against Children (2017). *Victims of Human Trafficking: Periodical Report 2012-2016. Summary*. The Hague: National Rapporteur. Is also available on their website. [https://www.dutchrapporteur.nl/binaries/FINAL\\_BNRM-Victims%20of%20Human%20Trafficking-%20Periodical%20Report%202012-2016\\_INTERACTIVE\\_tcm24-353879.pdf](https://www.dutchrapporteur.nl/binaries/FINAL_BNRM-Victims%20of%20Human%20Trafficking-%20Periodical%20Report%202012-2016_INTERACTIVE_tcm24-353879.pdf)
- 5.10 National Rapporteur on Trafficking in Human Beings and Sexual Violence against Children (2017). *Monitoring Target 16.2 of the United Nations Sustainable Development Goals: A multiple systems estimation of the numbers of presumed human trafficking victims in the Netherlands in 2010-2015 by year, age, gender, form of exploitation and nationality*. The Hague: National Rapporteur. Is also available on their website. <https://www.dutchrapporteur.nl/Publications/Monitoring-Target-16.2-of-the-United-Nations-Sustainable-Development-Goals/monitoring-target-16.2-of-the-united-nations-sustainable-development-goals.aspx>
- 5.11 Testimonial letter from Walk Free Foundation
- 5.12 Five ministers of the Dutch government authored the letter to Dutch parliament (letter number 2413397).
- 5.13 Dutch Ministries of Justice and Security; of Social Affairs and Employment; of Health, Welfare and Sport; of Foreign Affairs (2018). Samen tegen mensenhandel. Een integrale programma-aanpak van seksuele uitbuiting, arbeidsuitbuiting en criminele uitbuiting. (Together against human trafficking. An integrated programme-approach to sexual, labour and criminal exploitation).
- 5.14 Official Gazette of the Kingdom of the Netherlands: 445 September 2019 <https://zoek.officielebekendmakingen.nl/stb-2019-445.html>