Research Brief

Multiple Systems Estimation for estimating the number of victims of human trafficking across the world

Based on a paper written by Jan van Dijk and Peter G. M. van der Heijden for UNODC[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)

1 Overwiev

UNODC has been collecting international statistics on detected victims of trafficking in persons since 2003. At present, there is no sound estimate of the non-detected number of victims of trafficking in persons worldwide. Due to methodological differences and the challenges associated with estimating the sizes of hidden populations such as trafficking victims, this is a task that has so far not been satisfactorily accomplished. However, these efforts are set to gain momentum now that the eradication of trafficking in persons has been adopted as part of the Sustainable Development Goals (SDGs) under the 2030 Agenda for Sustainable Development.[2] The number of victims of human trafficking has been selected as an indicator to measure progress towards the implementation of SDG target 16.2.

In light of current efforts and challenges to collect this type of information, this research brief explores the potential of Multiple Systems Estimation as an alternative, efficient method of estimating the number of non-detected numbers of victims of trafficking in persons in a country. In short, the MSE methodology utilizes existing lists of victimis of trafficking by different authorities or NGOs and on the basis of a statistical methodology based on the concept of the caprture-ricaprture method the "dark figure" of victims that are not included on any list is estimated by analyzing the overlaps between the lists. A pioneering study of the UK's Home Office published in 2014 applied MSE to an existing database on detected victims of human trafficking maintained by the National Crime Agency of the United Kingdom. The resulting estimate of the dark number of victims of this crime (Silverman 2014; Bales, Henketh and Silverman 2015) was three to five times the number of detected victims (which ranged between 7,000-10,000). This research brief present the preliminary results of a similar exercise using the databases of the National Rapporteur on Human Trafficking of the Netherlands to arrive for the first time at an estimate of undetected victims of trafficking in persons in the Netherlands. This estimate reveals that ten per cent of all victims are detected in the Netherlands and the total total number of victims is 17,800 (range 14,000-23,900).

This research shows the potential of applying the Multiple Systems Estimation method to the

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[2] The target for SDG 16.2 is to end abuse, exploitation, trafficking and all forms of violence and torture against children. In addition, targets for SDG 5.2 is to eliminate all forms of violence against all women and girls in the public and private spheres, including trafficking and sexual and other types of exploitation, and for SDG 8.7 is take immediate and effective measures to eradicate forced labour, end modern slavery and human trafficking and secure the prohibition and elimination of the worst forms of child labour, including recruitment and use of child soldiers, and by 2025 end child labour in all its forms.

databases on detected victims of other countries. An analysis of the data on identified victims of countries in the UNODC database on trafficking in persons of 2012 suggests that MSE could potentially be applied to existing databases of around fifty countries around the world. An in-depth analysis of existing databases on detected victims in Europe suggests that in at least a dozen European countries, existing multi-source databases would allow Multiple Systems Estimation.

Finally, this research brief provides some recommendations on next steps in the design of an efficient international statistical system on detected and undetected victims of human trafficking as envisaged by the SDG indicator framework. Generating a methodologically sound estimate of the global number of trafficking victims, in order to better formulate policy and help bring an end to all forms of trafficking in persons, is a commendable objective that is now within our reach.

2 Counting detected victims of human trafficking

Mandates and challenges

Criminal statistics seek to guide the policies of governments to prevent and control crime, one of the core functions of modern states. Although statistics on crime are among the oldest existing official statistics, going back to the beginning of the 19th century in Europe, they have always been somewhat contentious. The first reason is that acts punishable by law are typically committed in secrecy. This implies that most incidents remain hidden from the authorities and that, consequently, officially recorded incidents reflect no more than a small, and unknown, part of the true volume of crime. These problems are compounded in the case of international statistics on crime by diverging national legal definitions, reporting patterns and recording practices (Van Dijk 2008).

The collection of statistics on human trafficking presents additional complications. First, there are definitional challenges. Although the definition in the UN Protocol to Prevent, Suppress and Punish Trafficking in Persons, especially Women and Children (UN Trafficking in Persons Protocol) of 2000 has been wholly or at least partly incorporated in the national criminal codes of many countries across the world as well as in several regional treaties

including the Council of Europe Convention on Action against Trafficking in Human Beings[3], many of its key elements remain open to interpretation[4]. Whereas in many forms of common crime, the defining elements are relatively straightforward, the essentials of human trafficking, like deception, coercion and exploitation can be much more difficult to operationalize. Second, traffickers and exploiters not only try to hide their operations from the authorities as do other criminals, but they typically target vulnerable populations, such as illegal migrants or sex workers, many of whom have no incentive to come forward. In the case of minority groups, some victims may even have internalized their experiences of extreme discrimination and exploitation as normal. Taken together, these factors make it a safe assumption that levels of reported cases of human trafficking, and thus of detected victims, bear even less relation to the true volume of actual victimization in the population than other types of crime.

In spite of the near insurmountable problems with international statistics on human trafficking, they are much in demand for policy purposes (De Cock 2012; De Vries and Dettmeijer 2015). Numerous studies have noted the need for undertaking research on prevalence of human trafficking to understand how often this crime occurs within any given population and how many victims are affected. Without baselines on these fundamental points, it becomes very difficult – if not impossible – to measure progress in the prevention and combatting of this crime, and the support given to victims. For this reason, the collection of internationally comparable statistics on human trafficking has repeatedly been requied under international law. The UN Convention against Transnational Organized Crime (United Nations 2000), the parent convention of the Protocol to Prevent, Suppress and Punish Trafficking in Persons, especially Women and Children (United Nations 2000), ratified by 186 states, specifically requires state parties to collect and share information on trends in organized crime, including human trafficking[5]. Likewise GRETA, the monitoring body of the Council of Europe Convention (Council of Europe 2005), ratified by 41 states, requires the maintenance of comprehensive statistical systems covering all aspects of human trafficking[6].

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[3] Evaluations by the monitoring body of the Warshaw Convention, GRETA, have revealed that the legislators of many countries have not fully adopted the Palermo definitions, for example by not including the means as defining elements.

[4] Definitional clarity is further complicated by the concominant use of concepts of trafficking in persons/human beings, forced labour and modern slavery.

[5] In July 2010, the United Nations General Assembly adopted the Global Plan of Action to Combat Trafficking in Persons. Among its provisions was a request for an expanded knowledge base on trafficking in persons. As a result, UNODC was given the mandate and duty to collect data and report biennially on trafficking in persons patterns and flows at the national, regional and international levels

[6] The Group of Experts on Action against Trafficking in Human Beings (GRETA) considers "that for the purpose of preparing, monitoring and evaluating anti-trafficking policies and measures, the authorities should develop

The European Union (Directive 2011/36/EU on Preventing and Combating Trafficking in Human Beings and protecting its victims, adopted in 2011) requested that 'the Union should continue to develop its work on methodologies and data collection methods to produce comparable statistics on trafficking in human beings' [7]. In 2015, the Member States of the United Nations have included eliminating human trafficking and forced labour among the Sustainable Development Goals of the 2030 Agenda for Sustainable Developement [8]. The United Nations Statistical Commission subsequently adopted in March 2016 as one of the indicators for target 16.2 : "Number of victims of human trafficking per 100,000; by sex, age and form of exploitation" (E/CN.3/2016/2/Rev.1). Statistical authorities of member states are expected to regularly collect this indicator as a means to monitor progress in achieving relevant SDG targets.

Court statistics and police statistics

From a strictly legal perspective, statistics on detected victims of human trafficking relate to persons identified as victims in verdicts of criminal courts regarding the offense of human trafficking [9]. Only in these cases it is formally ascertained that an act defined as human trafficking has been committed victimizing one or more persons. In reality, the application of this narrow definition of a victim does not produce comprehensive, reliable statistics on all detected victims. The difficulty is that criminal sentences focus on person(s) convicted, and do not necessarily contain information on the victims involved. Even in the case of crimes against persons, the numbers of victims are not automatically recorded in the court sentence,

and maintain a comprehensive and coherent statistical system on trafficking in human beings by compiling reliable statistical data on identified or otherwise registered victims, measures to protect and promote the rights of victims as well as on the investigation, prosecution and adjudication of human trafficking cases. Statistics regarding victims should be collected from all relevant state and non-state actors and allowing disaggregation concerning gender, age, type of exploitation, country of origin and/or destination".

[7]More specifically, Article 19 of the EU Directive stresses the importance of gathering statistics, stating that "Member States shall take the necessary measures to establish national rapporteurs or equivalent mechanisms. The tasks of such mechanisms shall include the carrying out of assessments of trends in trafficking in human beings, the measuring of results of anti-trafficking actions, including the gathering of statistics in close cooperation with relevant civil society organizations active in this field, and reporting".

[8] SDG target 5.2: "Eliminate all forms of violence against all women and girls in the public and private spheres, including trafficking and sexual and other types of exploitation". Target 8.7: "Take immediate and effective measures to eradicate forced labour, end modern slavery and human trafficking and secure the prohibition and elimination of the worst forms of child labour, including recruitment and use of child soldiers, and by 2025 end child labour in all its forms". Target 16.2: "End abuse, exploitation, trafficking and all forms of violence against and torture of children".

[9] An example of statistics on detected victims exclusively referring to persons recognized as aggrieved parties in convictions for human trafficking are those published in the annual reports of the National Rapporteur on THB of Sweden (Van Dijk et al 2014).

let alone in the statistical forms used for collecting court statistics. For human trafficking, the number of victims involved in court cases can vary from 1 to 100 or more. In countries with civil law systems, victims may be mentioned only if they have constituted themselves as civil party (or in some countries including Germany, as "assisting prosecutor"). In common law countries, victims are recorded if they present an impact statement to the court and/or if the suspect is ordered to pay compensation to the victim. To the extent that court statistics on victims are available, they relate to victims who have been assigned, or have claimed, a special status in the criminal trial as victims. Since many victims of human trafficking belong to vulnerable groups, they often refrain from claiming a special status in the trial against the traffickers. In addition, victims often refrain from cooperation with the prosecuting authorities out of fear of retaliation against themselves or their family. Court statistics on victims of human trafficking, then, represent a relatively small, and biased selection of all detected victims.

As a measure of crime, criminologists prefer statistics on police-recorded crimes over court statistics because the former cover a wider scope of crimes including those which remain unsolved and for which no offenders are ever found or brought to court. For the same reason, police data are likely to be a better source of information on victims of crime. Unfortunately, police statistics on recorded crime, or on persons suspected of having committed offences, cover a wider scope of crimes including unsolved crimes, but do not necessarily include information on the victim. The administrative statistics of police forces on recorded crimes are often still as much offender-centered as court statistics. In sum, statistics on the numbers of crimes or offenders based on court or police records are in general incomplete to describe the crime and its actors. The challenge is even more acute in the case of statistics on the victims of such a complex crime like human trafficking. The collection of victim-based statistics on human trafficking evidently requires innovative approaches which go beyond the regular collection of crime statistics through the criminal justice recording system.

The UNODC Global Reports on Trafficking in Persons

Considering the current state of crime and criminal justice statistics, the collection of international statistics on detected victims of trafficking in persons remains a challenge. Fortunately, the collection of international statistics on trafficking in persons victims is facilitated by two unique regional and international instruments. First, trafficking in persons is internationally defined in the UN Trafficking in Persons Protocol and this definition has been subsequently incorporated in regional legal instruments in Europe and elsewhere. Second, at

regional level, the Organisation for Security and Cooperation in Europe (OSCE) has since 2004 advocated the use of Identification and Referral Mechanisms for trafficking in persons victims (OSCE/ODIHR 2004)[10]. These mechanisms have found their way into international legal instruments such as the Council of Europe Convention and the EU Directive of 2011, the latter specifically obliging member states to introduce "appropriate mechanisms" for the identification of trafficking in persons victims and their referral to support agencies. This obligation requires all European countries to be able to produce statistics on all persons who have been identified as victims of trafficking in persons as defined in the UN Trafficking in Persons Protocol. A mechanism to identify and refer victims of trafficking in persons also forms part of the United Nations Model Law on Trafficking in Persons (UNODC 2009). In several countries outside Europe, including Mexico, Thailand and Swaziland, for example, national mechanisms of identifying victims have been put in place.

The requirment to identify victims of a certain, uniformly defined type of crime is unprecedented in the world of criminal justice. It opens an avenue for the collection of administrative victim-centred statistics that are comparable across countries which otherwise would not exist[11].

From 2006 onward, UNODC has collected statistics from the UN member states on victims of trafficking in persons "as identified by State Authorities". The definition used in the UNODC questionnaire includes victims identified in court sentences, police records as well as those identified through the bespoke Identification and Referal Mechanisms, just mentioned. Table 1 gives an overview of the numbers of detected victims reported to UNODC in 2011 for the Global Report on Trafficking in Persons.

Table 1 Regional distribution of the number of detected victims of trafficking in persons (2011), by sex and age

	Total Victims	of which : Total Adults	of which : Adult Men	of which : Adult Women	of which : Total Children	of which : Cl Girls
West and Central Europe	5210	4080	979	3055	1043	
Eastern Europe	1027	914	115	674	84	
South Asia, East Asia and the Pacific	2655	567	38	265	385	
South America	895	532	152	367	361	
North America, Central America and Carebbean	1073	769	303	362	300	
Americas	1968	1301	455	729	661	
Africa and Middle East	3131	889	314	544	2079	
Total	13991	7751	1901	5267	4252	

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[10] The concept of a National Referral Mechanism (NRM) has been elaborated in a Handbook of OSCE/ODIHR (2004): "*At the core of every NRM is the process of locating and identifying likely victims of trafficking, who are generally known as "presumed trafficked person". This process includes all the different organizations involved in an NRM, which should co-operate to ensure that victims are offered assistance through referral to specialized services*".

[11] A similar information on crime outside the regular police and court statistics can be found in data on suspicious financial transactions collected by Financial Investigative Units.

Source: UNODC Trafficking in Person Report 2014

Table 1 shows that two-thirds of the identified trafficking in persons victims are reported by West and Central Europe. The world totals are dominated by the European results. One reason for this skewed distribution is that in almost all European countries, identification and referral mechanisms have been introduced, as can be gathered from the GRETA evaluation reports published for over 40 countries (GRETA 2015)
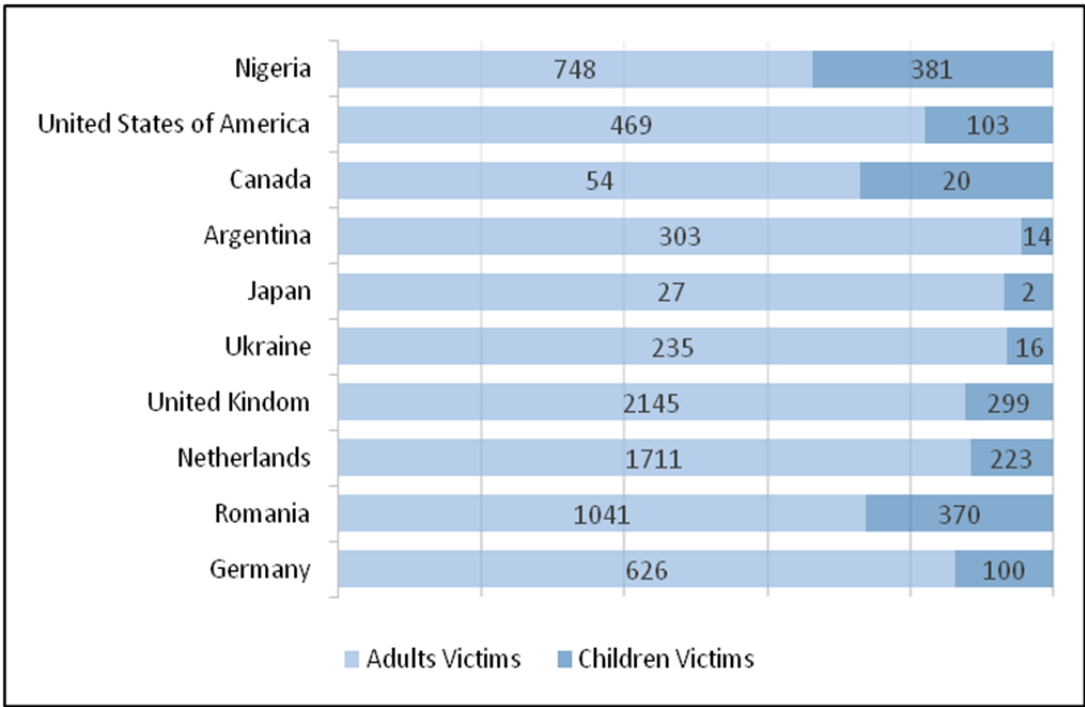
The breakdown of global data shows that around 50 per cent of identified victims are women and that 30 per cent are children, mainly girls. While a majority of trafficking victims are subjected to sexual exploitation, other forms of exploitation are increasingly detected. The numbers of detected victims of trafficking for forced labour - a broad category which includes, for example, exploitation in manufacturing, cleaning, construction, catering, restaurants, domestic work and textile production – have increased steadily in recent years. Some 40 per cent of the victims detected between 2010 and 2012 were trafficked for forced labour. Trafficking for exploitation that is neither sexual nor forced labour such as trafficking of children for armed combat, or for the commission of petty crime or forced begging, is also detected to an increasing extent.

There are considerable regional differences with regard to the various forms of exploitation. Trafficking for sexual exploitation is the main form detected in Europe and Central Asia, whereas the main form detected in East Asia and the Pacific is forced labour. In the Americas, the two types are detected in near equal proportions (UNODC 2014). The gender difference is less pronounced in regions where more cases of labour exploitation are detected. The existence of special victim identification mechanisms in Europe and Central Asia has boosted the statistical reporting of detected victims in these regions and has probably inflated the global share of detected victims for sexual exploitation since this is the predominant form of exploitation in these regions.[12]

The UNODC dataset includes data on 128 countries, of which 43 are from Europe and Central Asia. Table 2 presents some results on detected victims from ten selected countries, highlighting the range of variation across the world.

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[12] In several European countries anti-trafficking policies including identification mechanisms have from the outset mainly or exclusively focussed on trafficking for sexual exploitation (e.g., Spain and Sweden).

Table 2 Share of total numbers of detected victims of trafficking in persons in ten selected countries in 2012, by age

Country	Adults Victims	Children Victims
Nigeria	748	381
United States of America	469	103
Canada	54	20
Argentina	303	14
Japan	27	2
Ukraine	235	16
United Kindom	2145	299
Netherlands	1711	223
Romania	1041	370
Germany	626	100

Source: UNODC Trafficking in Persons Report 2014

It can be observed that by far the highest numbers, for both adult and children victims are reported by European countries (notably the United Kingdom, the Netherlands and Romania). By comparison, the absolute numbers registered in Canada, Japan and the USA for both adults and minors are low. Since there are no *apriori* reasons to assume that human trafficking is considerably less prevalent in the latter countries than in Europe, the low numbers suggest deficiencies in identifying and or recording victims (Barrett, 2012).

Metadata provided in a Eurostat report (2013) and Van Dijk et al (2012) illustrate this variation. Illustrative examples of the different practices used in reporting victim statistics are: Sweden which reports only on victims involved in human trafficking cases tried in a Swedish court and the Netherlands which at the contrary reports on all persons who show any sign of having been trafficked encountered by state institutions or NGOs. The Dutch recording mechanism, operated by an NGO on behalf of the National Rapporteur on Trafficking in Human Beings, covers a larger number of victims than those formally identified by the police/immigration. The UK also collects data on all persons identified as potential victims of

trafficking by NGOs or any state agency[13]. France has not established a formal identification mechanism for victims of human trafficking and their statistics are collected from police records. Considering the vast differences in the meaning of the concept of an identified victim, statistics on identified victims at the present are not comparable even at European level. Differential identification mechanisms and practices impact not just on the numbers of victims identified but also on the types of victims. For example, Germany, France, Hungary and Latvia report very few male victims of trafficking in persons but it can not be concluded that few males are victimized in these countries. These data may simply reflect that law enforcement is strongly focused on sexual exploitation where female victims are the great majority. In other words, both the numbers and the type of victims identified are heavily influenced by the scope and focus of the national identification mechanisms in place. This is true for the statistics collected by both UNODC and Eurostat.

3 Studies to estimate victims of trafficking in persons and forced labour which are not identified by authroties or NGOs (dark number)

Using information available to the public

Since statistics on identified victims cannot, as explained, be used as prevalence measures of trafficking in persons, there is a need for the collection of statistics on the total number of trafficking in persons victims, beyond those identified by the authorities. A first pioneering attempt to supplement officially registered numbers of victims with data from other sources was made by UNODC, which collected information on incidents of trafficking in persons victimization reported in the public domain during the period 1996-2003, including those by public media. This project yielded a tentative, first ever, ranking of countries according to the numbers of reported victims, differentiating between source, transit and destination countries (Kangaspunta 2003; UNODC 2006). In the ensuing debate, the point was made that the ranking of reported cases of trafficking in persons victimization might reflect the strength of governmental efforts to identify victims and media attention rather than true prevalence. In subsequent global reports, UNODC has limited itself to reporting on the numbers of officially identified victims, based largely on information provided by the governments.

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[13] Although the UK reported to Eurostat only on the subgroup of persons conclusively identified as victims by either the specialized unit within the police or by the Border Agency.

In 2005, the ILO published a global estimate of victims of forced labour, including for sexual exploitation. ILO included also victims of forced labour as a result of a trafficking process in this estimate. This estimate was likewise based on reported cases of forced labour in the public domain. The study produced a global estimate based on the extrapolation of the counts of publicly reported victims of forced labour identified by two independently working teams of analysts, applying the formula used in capture-recapture studies (ILO, 2005). The results showed a minimum global count of 12.3 million victims of forced labour and 2.4 million victims of trafficking at any point in time during the period 1995-2004. In 2012, the ILO subsequently improved its methodology by combining an estimate of recorded cases based on the capture-recapture methodology with the results of a small set of surveys among populations of returned migrants. The 2012 results produced an estimate of 20.9 million victims of forced labour at any point in time covering the period 2002 to 2011, while no detailed estimate was presented for victims of trafficking in persons. For the European Union countries, the estimated total of victims of forced labour amounted to 888,000 at any given time, or 1.8 per 1,000 inhabitants (ILO 2012). Out of the total number of 880,000 "forced labourers" in the European Union, 270,000 (30%) were estimated to be victims of sexual exploitation, and 610,000 (70%) victims of labour exploitation[14].

Household surveys on victimization

The search for alternatives to the official statistics on crime has prompted criminologists in the United States and Europe since the late 1960s to design household surveys to collect data on the experience of victimization by type of crime (Bidermann and Reiss 1967; Van Dijk 2015). Since 1987, a standardized survey has been repeatedly conducted at international level (Van Dijk, Mayhew and Killias 1990; Van Kesteren, Mayhew & Van Dijk 2013). At a later stage probabilistic representative surveys were designed to better capture previously underreported, or unreported, instances of sexual violence and domestic violence, among other relatively hidden crime types[15]. Household surveys are now widely used in that context. Surveys among population groups at risk to be victimized by trafficking in persons, sampled through respondent-driven sampling techniques, have been pilot tested in the USA (Zhang, et al 2014; Zhang 2015). The results of these surveys suggest that as much as 30 per cent of

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[14]For critical reviews of the ILO studies see National Rapporteur (2013) and Van der Heijden, de Vries, Boehning and Cruyff (2015).
[15] See Kilpatrick (2004); Krug et al. (2002); see also World report on violence and health, (chapter 9); Group of Experts on Gender Statistics (2006).

migrant workers in California are exposed to exploitative practices that qualify as forced labour under federal USA law.

The NGO Walk Free has produced global estimates of the numbers of victims of modern slavery based on a combination of analyses of documents and surveys among representative samples of national populations in nine countries (Bales 2013; De Cock 2007)[16]. The 2014 Global Slavery Index estimates that there are 35.8 million people living in some form of modern slavery globally. This estimate surpasses the older ILO estimate on forced labour by almost 60 per cent.

Although the new generation of survey-based statistics on victims of forced labour/modern slavery may hold a promise for the future also in the field of trafficking in persons, some important limitations exist. Costs constraints have limited Walk Free to use sample sizes per country of no more than 1,000 households. Even when network sampling (e.g. through interviewing respondents about their family members) was used only a handful of victims were identified per country. The large margins of error of prevalence estimates does not allow to draw reliable conclusions on differences between countries, or on change over time within the same country, as required for monitoring progress of Sustainable Development Goals. Surveys with such sample sizes are unlikely to provide reliable information on the characteristics of the victims, or on the nature of the acts of exploitation because the numbers of identified victims are too small for any meaningful analysis. Since the surveys have so far been confined to developing or middle income countries, their potential to provide estimates of forced labour victims in high-income countries remains for the moment unproven. Considering that forced labour is likely to be less common in these countries, it is doubtful that sample sizes of 1,000 per country can accurately estimate the prevalence of forced labour among national populations in high income countries. Constructing such estimate requires special sampling methods, including respondent-driven sampling among high-risk populations such as irregular migrants. Finally, and most importantly, surveys may need to be designed with special methodology to collect information on sensitive issues such as sexual exploitation. The first batch of Walk Free surveys has uncovered verty few cases of victimization by sexual exploitation, suggesting that the measurement of victimisation by sexual exploitation may, like partner violence, require special interview modes, e.g. self-

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[16]The Index is the flagship report produced by the Walk Free Foundation, a global human rights organization dedicated to ending modern slavery. For the purpose of the Index, modern slavery involves one person possessing or controlling another person in such as a way as to significantly deprive that person of their individual liberty, with the intention of exploiting that person through their use, management, profit, transfer or disposal.

completion questionnaires. In conclusion, the survey-based approach, however promising in many respects, faces several methodological problems of its own and should not be seen as a panacea to address all problems related to measuring the total number of undetected victims of trafficking in persons.

4 Capture-Recapture Analysis and Multiple Systems Estimation

The statistical technique to estimate the volume of hidden populations, known as Capture-Recapture Analysis was originally developed by biologists to estimate animal populations. Although the precise historical origins of the technique are disputed (Silverman 2014), Danish marine biologist Johannes Petersen (1860-1928) is often credited with the early use of the capture-recapture method to estimate the sizes of fish populations.

The quintessential idea to estimate the number of fish in a pond is as follows. One catches a number of fish (say 100), tags them, and then throws them back into the same pond. Some time later, one takes a new catch (say another 100) from the same pond, and counts how many of the second catch are tagged, as being part of the returned original first catch. If the overlap between the two catches is zero, or very small, this suggests that the population of fish in the pond is much larger than 100. If the overlap is considerable, say 50, this suggests that the population is smaller. The larger the overlap, the smaller the fish population is. The event that the second catch consists mainly, or exclusively, of marked fish from the first catch, suggests that the population is not much larger than a hundred fish in total.

Table 3 depicts a hypothetical case of a fisherman who catches 100 fish in two catches each, and who observes 20 tagged fish the second time.

Table 3 Hypothetical example showing observed and estimated numbers of fish in a pond in the case of two catches of 100 with an overlap of 20

	Catch 2		
Catch 1	yes	no	Total
yes	**20**	**80**	**100**
no	**80**	320	400
Total	**100**	400	500

The key question is how many of the fish in the pond have not been caught in either of the catches (the no-no cell in the table). Given that 20 per cent of the fish caught in the first catch have been recaptured, we assume that the same proportion of all other, non-marked fish have been caught in the second catch as well. Since in the second catch, 20 out of 100 marked fish have been caught, or one-fifth, we therefore assume that the 80 non-marked fish also are one-fifth of the total, or 400. The number of fish that have remained hidden in the second catch is 320. This implies that the total number of marked and unmarked fish in the pool can be estimated at 500. Put simply, knowing that of the tagged fish 20 percent have been caught, it is assumed that there is a similar catch rate for all fish in the pond. Since the catch is a hundred fish, the estimated total is 500 fish.

If the first catch is called A, the second catch B, and the overlap C, the mathematical formula to estimate the size of the total populations is A x B/C. If the overlap is, as in the example given above, 20 fish, the natural estimate of the total population of fish is 100x100/ 20, or 500. The formula implies that the estimated total number of fish are smaller to the extent that the overlap between the captured fish is larger. One important assumption in the application of this methodology is that the two catches are independent.

Following the capture-recapture approach of biologists has translated into a well-known method for estimating the size of a hidden human population using two independent recording systems (or registers) which partially list its members. Linking the individuals in the two registers allows to estimate the number of individuals that are not recorded in the registers. For example, with two registers A and B, linkage gives a count of individuals in A but not in B, a count of individuals in B but not in A, and a count of individuals both in A and B. The counts form a contingency table denoted by A × B, with the variable labeled A being short for "inclusion in register A" differentiating between the categories "yes" and "no," and likewise for register B. The statistical problem is to estimate this value in the cell "no, no". An improved population size estimate is obtained by adding this estimated count of doubly missed individuals to the counts of individuals found in at least one of the registers.

The capture-recapture method has been successfully applied to estimate the size of hidden human populations by determining the overlaps between unique individuals appearing in separate recording systems (or lists) (Werna, 2013). Using such capture-recapture analysis, estimates have, for example, been made of the numbers of soliciting prostitutes in Oslo, casualties of human rights violations in Peru, homeless people, victims of domestic violence , drugs users and irregular migrants in the Netherlands as well as of intravenous drug users in

Scotland[17] . The International Labour Organisation has used the technique, as mentioned before, for its global estimates of numbers of persons in forced labour at any given time (Belser, De Cock & Meran /ILO, 2005; ILO, 2012).

Capture-recapture analysis depends on four assumptions about the lists and the population from which they are drawn:

- The system is closed, meaning that the population does not change during measurement (in the example of the fish counting it is assumed that the fish confined to the pond with no connections with other water reservoirs, and that no fish is born or die between the two measurements.

- The overlap between the two catches or lists can be correctly identified, i.e., it is possible to identify perfect matching of uniquely defined individuals in the two registers.

- There is equal probability of capture for all individuals in at least one of the two lists[18].

- The lists are independent, i.e. the probability of inclusion in one list does not affect probability of inclusion in the other. In the case of the fish pond, the fact that the fish caught in the first catch has been tagged should not affect the chance of being caught a second time, either positively or negatively.

It is generally agreed that these assumptions rarely fully hold in human populations, thus there is limited applicability of the method in social research. Different approaches may be adopted to make the impact of possible violations of the assumptions less severe (Van der Heijden et al., 2015). The condition of closed systems can be met by restricting the listing of individuals in time and space, for example by focusing on drug addicts seeking help or services from different institutions in one city in the course of the same year. Correct matching of persons can be improved with more detailed identifiers, such as birth dates[19]. The condition of homogeneous inclusion probabilities on at least one of the lists can be approximated by stratification of the analysis according to relevant covariates (Van der Heijden et al, 2012;

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[17] See, for example, King, Bird, Overstall, Hay and Hutchinson (2013) and Manrique-Vallier, Price, and Gohdes (2013).

[18] It is often, incorrectly, supposed that both inclusion probabilities have to be homogeneous; see Van der Heijden, et al (2015).

[19] In the case of vulnerable populations such as victims of human trafficking the linkage of lists of police and NGO's through unique identifiers is sometimes resisted as a breach of privacy. After a linkage between various lists has been determined by a trusted third party the MSE can be carried out on depersonalised data.

2015). If, for example, certain categories of drug addicts are more likely to be recorded than others, estimates can sometimes be made for each of these two groups of drugs addicts separately.

Arguably the most problematic condition to fulfill when using recording systems of human individuals is the fourth condition of independence. For example, persons identified by the authorities as presumed victims of human trafficking, are in many countries likely to be referred to social assistance programmes, and they consequently have a higher probability of being included in the recording systems of the involved NGOs as well. In fact, the very purpose of National Referral Mechanisms is to ensure that all relevant organisations systematically refer identified victims to each other. In this case the inclusion in the list of a service provider is far from independent from registration by the police. Since such dependence increases the overlap between the two lists, the number of the unobserved population is consequently underestimated, given the formula A x B/C.

A promising approach to relax the condition of independence is to include a third register, or multiple registers, and to analyze the three ways, or multiple way contingency tables. In official statistics, this extension of the two-list capture-recapture method is known under the name of Multiple Systems Estimation. Assuming, for example, that there are three lists on which individuals can appear, individuals may be on just one list, or on two or on all three of them. By setting up a contingency table, as depicted in Table 4, it is possible to count the number of people that appear in only one list, two lists or all three. In the case of three lists, there are ($2^3 - 1 =$) 7 possible combinations. Table 4 provides an overview of the 7 possible combinations in the hypothetical example that 1000 individuals are listed once or more on the three lists. In the bottom row are given, by way of example, the numbers of investigated persons falling under each of the possible categories. The pertinent question is how many persons have been missed by all three lists (the estimated size of category 8).

Table 4 Hypothetical example of the listing of 1000 persons on three different lists

categories	1	2	3	4	5	6	7	**8** (Estimate of the individuals who are not listed)
LIST 1	X	0	0	X	0	X	X	
LIST 2	0	X	0	X	X	0	X	
LIST 3	0	0	X	0	X	X	X	
observations	70	400	500	10	0	15	5	?

Multiple systems estimation allows an estimation of the number of individuals not appearing on any of the lists, given the distribution of individuals in the contingency table. This is done by assuming that each of the 7 counts in Table 4 is derived from a Poisson distribution, a distribution for the occurrence of rare events. A restrictive Poisson loglinear model is estimated for these 7 counts and the parameter estimates are projected on the cell in the 8th column (Baillargeon et al 2007).

In the fish example, given above, it was assumed that the chance of being in the second catch is not affected by whether or not the fish was in the first. When there are more than two lists used in the analysis, the condition of independence can be relaxed. In multiple systems estimations derived from three lists, loglinear models can be used to allow for pairwise dependence of lists. The only underlining assumption that this approach requires is that there is no so-called three-factor interaction (Van der Heijden et al 2012, 2015).[20]

Another complication of the capture-recapture method is that the likelihood to be listed varies across subgroups of the population. If these subgroups probabilities are structurally different, estimates based on average probabilities might result in erroneous estimates (Van der Heijden et al 2012, 2015). Stratification can be incorporated into MSE estimation leading to separate estimates for each stratum[21].

Theoretically, it is possible to stratify on any covariate that is available in one of the lists, so it is not necessary that a stratifying variable is available in each of the lists (Zwane and van der Heijden 2007; van der Heijden et al 2012). In the case of human trafficking statistics, it seems *a priori* relevant to distinguish between victims of human trafficking for forced labour and those for sexual exploitation. It is reasonable to think that victims of trafficking for non-sexual exploitation have different, namely lower capture probabilities than victims of sexual exploitation (UNODC/UN.GIFT 2009). Another stratifying variable could be age. In some countries the number of detected child victims is, as discussed, relatively low, probably due to lack of attention by youth care institutions and other identifying institutions (GRETA 2015).

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[20] An example of three-factor interaction is that the relation between a pair of lists is different for those who are included in the third list compared with those who are not included in the third list. With log-linear modeling, it is possible to assess how much being on one particular list affects a person's chances of being on another. Possible interactions between lists can be detected, and controlled for in the estimates.

[21] For example, the research team estimating human rights violations in certain conflict zones has stratified its estimates on several dimensions, including geography and perpetrator group. The group found separate estimates for several national departments, as well as separate estimates of violence committed by the state forces and violence committed by the insurgency group in the same country. By stratifying in this way, they were able to control for the fact that lethal violence in some rural areas was much less likely to be reported than lethal violence in urban areas, and lethal violence by insurgency cadre much less likely than lethal violence by state forces.

In many existing databases identified victims are differentiated according to type of exploitation and age. Within Europe such disaggregation is in fact mandatory. In multiple systems estimations of trafficking in persons victims, stratification according to type of exploitation and the variable minors/adults is therefore feasible.

The case of the United Kingdom[22]

In the UK, the obligation to identify presumed victims of human trafficking is discharged by the National Referral Mechanism (NRM), introduced in 2009. The NRM is a framework for identifying victims and ensuring they receive appropriate protection and support. It is managed by the United Kingdom Human Trafficking Centre (UKHTC), which is part of the Organised Crime Command in the National Crime Agency (NCA). The NRM is the mechanism through which the UKHTC collects data about victims from different sources.

The UKHTC's partners include police forces, the Home Office and other government departments, the UK Border Force, the Gangmasters Licensing Authority, international agencies, non-governmental organisations (NGOs) and many charitable and voluntary expert groups. The NRM collates data from most of these sources to produce statistics on presumed victims. These are published quarterly and are broken down into the sources of the various cases.

The National Crime Agency carries out a Strategic Assessment of the Nature and Scale of Human Trafficking (NCA Strategic Assessment 2013). In 2013, the Strategic Assessment identified 2,744 unique presumed trafficking in persons victims[23].

The information about presumed victims in the NCA Strategic Assessment came from a large number of separate source organisations. This information can be summarised into six lists based on the source organisation type:

LA: Local Authority

NG: Non-governmental organisation

PF: Police force

NCA: National Crime Agency

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[22] This paragraph is largely based on Silverman (2014) and Bales, Henketh and Silverman (2015).

[23] The Strategic Assessment is a measure of potential rather than confirmed victims. These comprise individuals formally identified as victims by the NRM process plus individuals identified as potential victims by intelligence. The potential victims identified through intelligence have not been through a formal assessment to determine their actual victim status. The number of potential victims included in the NCA assessment differs from the numbers of potential victims reported by socalled first responders to the NRM (1.746 in 2013).

GO: Government Organisation (mostly Home Office agencies e.g. UK Border Force, Gangmasters Licensing Authority)

GP: The general public, through various routes

Of the 2,744 victims included in the Strategic Assessment, some appeared on two and a few on three or four of the six lists. The Home Office, applied MSE to estimate the figure of potential victims who do not appear on any of the lists, and hence to give an estimate of the total number of potential victims (Silverman, 2014). Analysis was carried with five lists, after combining PF and NCA into a single list. Table 5, taken from Silverman (2014), shows the distribution of the identified victims over the five lists. With five lists the independence assumption in the two-list case is replaced by the (not very restrictive) assumption that the multiple factor interaction is absent.

Table 5: Incidence table for the National Crime Agency Strategic Assessment data*

LA	X					X	X	X								X	X	X
NG		X				X			X	X	X				X	X	X	X
PF			X				X		X			X	X		X	X		X
GO				X				X		X		X		X	X		X	X
GP					X						X		X	X				
number	54	463	995	695	316	15	19	3	62	19	1	76	11	8	4	1	1	1

Source: Silverman 2014

*Each column shows the number of cases which fall in the combination of lists indicated by the cells marked. Columns corresponding to patterns which do not occur in the observed data are omitted.

According to Silverman, the methodology fits a model which allows for individual list effects, and also for interaction between lists (theoretically, up to interaction between four lists simultaneously). The results are summarized as follows:"The estimated confidence interval for the actual population size (including the 2744 cases already known to the NCA) is from 10,000 to 13,000, so this suggests that the Strategic Assessment is aware of roughly 20 per cent to 30 per cent of all the potential victims in the UK in 2013. In round numbers, therefore, the dark figure is around 7,000 to 10,000. There is positive correlation between LA and each of NG and PF, so that being known to the local authority increases the chance of being known to NGOs or the police. This may reflect the existence of referral pathways for potential victims between these agencies, in particular in relation to children who do not need to

consent to referral to the National Referral Mechanism (unlike adults), or joint operations between the local authorities and other agencies.

There is negative correlation between GP and each of NG, PF and GO, so that cases brought to attention by the general public are less likely to be known to agencies (other than local authorities). This may reflect the fact that these referrals often lack the detailed information contained in referrals from public authorities. As an additional check the analysis was repeated with the GP list omitted. There is some negative correlation between NG and GO, so there is some propensity for cases known to NGOs not to be known to Government agencies. This may reflect the reluctance of some NGOs to share information with public authorities."

In concluding Silverman (2014) notes: "These must be regarded as tentative conclusions, because the model is based on assumptions that (while sensible) cannot be easily verified and inevitably uses data that has some limitations. Care was taken to try to collate all the individuals between lists, but some individuals may still be incorrectly counted separately. Considerations of this kind may have the effect that the overall figure is slightly over-estimated".

The upshot of the MSE carried out on the lists of the National Crime Agency is that the true numbers of victims during 2013 is estimated as a figure between 7,000 and 10,000, or between three and five times the numbers of detected victims. In other words, the ratio between detected victims and undetected victims is estimated as one to four. Calculations based on comparisons between recorded crime and the estimated rates of victimization from the National Crime Surveys of England and Wales, formerly the British Crime Survey, indicate a ratio of four for total crime as well.[24] Considering the relatively hidden nature of human trafficking, compared to, for example, household burglaries which are - if only for insurance reasons - commonly reported to the police by victims, a ratio of four seems comparatively low.

The case of the Netherlands

In the Netherlands, the state-sponsored NGO, CoMensha, formerly La Strada Netherlands, has been commissioned by the Dutch National Rapporteur on Human Traficking and Sexual Violence against Children to act as clearing house of cases of presumed victimization by

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[24] The first BCS estimated that there were 11 million crimes in England and Wales in 1981. However, there were less than three million crimes recorded by the police in 1981 (Jansson 2006). For a critical review of such comparisons between recorded crime and survey-based estimates see van Dijk (2009).

human trafficking. Relevant governmental institutions such as the seventeen different local police forces (since 2014 districts of the National Police), the Border Police (Koninklijke Marechausee/Kmar), Regional Coordination Offices (decentralised units of CoMensha coordinating victim services) and Labour Inspectorates (Inspecties Sociale Zaken en Werkgelegenheid/ISZW) are instructed to report on all cases of possible victimization by trafficking in persons coming to their knowledge. Specialised NGOs offering services to trafficking in persons victims are invited to report their cases as well, and most seem generally to comply with this request. In addition, law firms, youth care and social work organisations and organisations supporting asylum seekers such as reception centres can also report clients who show signals of having been victims of trafficking in persons to CoMensha. Finally, victims can self-identify themselves by contacting CoMensha.

In the CoMensha database covering 2014, a total of 1561 uniquely defined cases were registered once or more. The database distinguishes between lists for each of the institutions mentioned, including 17 different police districts, altogether 22 lists. An additional list, composing of clients who show trafficking signals from a variety of agencies, is called "Others".

In roughly one in fourteen cases, victims have been reported by more than one organisation, usually 2, and in some cases 3. Many of the theoretically possible combinations of 2 lists occur. The distinction between various police districts is theoretically justified since victims are often moved around by their traffickers and can therefore correctly been reported in different parts of the country as newly detected (presumed) victims. In the log-linear models used to estimate the dark number, the 17 police lists have been combined into one[25]. The reports by Law Firms are few and have been combined with the list "Others". This resulted in a total of six lists: National Police, Border Police (Kmar)[26], Labour Inspectorate (ISZW), Regional Coordinators, NGOs and Others.

As in the UK, interactions can be expected between several of the lists due to a set of formal and informal agreements about referrals. For example, CoMensha refers all victims in need of services to specialized NGOs. This referal does not, however, necessarily mean that such victims are doubly counted because NGOs may refrain from reporting victims who they know to be already known by CoMensha. Theoretically the list of the Border Agency is likely to be

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[25]This means that matches between the reports of the 17 police districts have been ignored in the models.
[26]Since 2012 the CoMensha database includes a significant number of cases reported by the Border Police, which has stepped up its checks on signs of possible victimization by human trafficking for sexual exploitation. The cases reported by the Border Police include mainly cases of East European women who have been trafficked into the Netherlands for prostitution. Such border-crossing trafficking is punishable under Dutch law, regardless of the use of means or the purpose of exploitation.

the most independent since presumed victims often are recorded and allowed into the country without necessarily being reported to CoMensha for support or other services, if suspicions cannot be immediately substantiated. Some of these presumed victims signalled by the Border Agency may at a later stage be identified and listed by police or by other organisations.[27]

Preliminary results

The analyses have been conducted on the six lists just mentioned (see Table 6). Table 6 presents preliminary results for five models, whereby A = Police; B= Regional Coordinators CoMensha; C= Border Police; D= service providing NGOs; E= Labour Inspectorate; F= Others (e.g. youth care and law firms).

A model search was carried out using forward selection, i.e. it started with a simple model and included interaction terms until the fit of the model to the data became adequate. Terms to be included were selected with the deviance, a commonly used fit measure.

In Table 6, the first five models are reported. It is well known that in the analysis of contingency tables that are spare, i.e. that have many small counts, the Pearson chi-square performs better than the deviance for assessing whether the discrepancy between the model and the data is statistically significant. However, due to the zero counts the value of the Pearson chi-square of the models cannot be compared with the chi-squared distribution. For assessing the fit, 20,000 samples were simulated under the model to estimate the distribution of the Pearson chi-square, and assessed how the chi-square for the model related to the distribution. This is revealed by the p-value. For example, for the third model, the Pearson value of approximate 1300 samples was larger than the Pearson value 66, showing an adequate fit. Estimated population sizes are reported, with a 95 per cent confidence interval estimated with a parametric bootstrap.

A first analysis looked at a model assuming independence of all lists (Model M1). This model showed an inadequate fit (the p-value is smaller than .05). In subsequent models, interactions have been fitted between the NGOs and Others and between the Labour Inspectorate and Others. Models M2 and M3 showed better fits. Models fitting more interactions proved to be overfitting, i.e. they were more complicated than necessary to describe the data well, and therefore these models were ignored (*Ockam's razor*). The preferred model was the model

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[27] Possible victims reported by the Border Agency include persons who have been assisted to cross the border into the Netherlands for the purpose of working in prostitution in a non-exploitative situation. Such border-crossing is covered by a special section in the article on human trafficking in the Dutch Criminal Code (Art. 273f sub3).

fitting the interactions between the NGOs and Others and between the Labour Inspectorate and Others (model 3).

Table 6 Results of loglinear modelling of six lists of trafficking in persons victims in the Netherlands

	Estim	Confidence Interv.	Pearson	df	p
M1. A,B,C,D,E,F	10,542	(8,802 - 12,956)	577	56	.007
M2. A,B,C,DF,E	15,711	(12,552 – 20,576)	226	55	.017
M3. A,B,C,DF,EF	17,812	(14,026 – 23,874)	66	54	.130
M4. B,C,AD,DF,EF	22,270	(16,871 – 32,275)	49	53	.175
M5. C,AB,AD,DF,EF	32,646	(22,299 – 56,048)	46	52	.173

As can be seen, the preferred model 3, gives an estimate of 17,800 victims. Of these 17,800 victims 1,560 have been recorded. The estimate suggests that roughly ten percent of all victims are detected, or, in other words, that there are ten times more victims present on the Dutch territory in the course of a year than those reported to CoMensha. The 95 per cent confidence interval ranges from approximately 14,000 to 23,900. It seems worth noting that the numbers per capita and the ratio between detected and undetected victims are considerable larger than the ones estimated in the United Kingdom. One possible explanation is the inclusion in the Dutch database of persons reported by the Border Agency who have been assisted to cross the border in order to work in prostitution in non-exploitative conditions.

The CoMensha databases include covariates such as age (minor or adult), type of exploitation experienced by the victim (sexual services, forced labour, forced criminality and unknown) and nationality (Dutch/foreigner). Using these variables, in future analyses the estimates could be stratified by age, type of exploitation and nationality. They could also be repeated with and without the reports from the Border Agency.

5 The potential for MSE on human trafficking across the world

Carrying out Multiple Systems Estimations of national figures require, lists of detected victims from two, preferably three or more sources. The number of entries on each list need to be large enough to give an indication of the possible overlap with other lists. If the total numbers of identified victims are relatively high, for example more than 75, this is less likely

to be problematic. Table 7 presents the 50 countries which have over the period 2010-2012 reported to UNODC at least once a total of 75 or more detected victims in the course of a year.

Table 7 Number of detected victims per country (countries reporting on 75 or more victims in at least one year in 2010-2012)

Country	Total Victims 2010	Total Victims 2011	Total Victims 2012
West and Central Europe			
Albania	97		
Bulgaria	432	541	580
Czeck Rep	76	55	52
Germany	651	672	626
Greece	92	97	94
Hungary	59	134	57
Ireland	78	57	48
Italy	96	91	117
Netherlands	993	1222	1711
Norway	319	274	349
Romania	1154	1048	1041
Serbia	76	74	
Turkey	58	82	55
United Kindom	331	1998	2145
Eastern Europe and Central Asia			
Belarus	362	295	209
Kazakstan	134	141	**153**
Moldova	181	154	**290**
Ukraine	407	389	235
South Asia, East Asia and the Pacific			
Bangladesh	310		126
India		152	
Nepal	193	141	
Laos	145		
Malaysia	471	220	309

Country	Total Victims 2010	Total Victims 2011	Total Victims 2012
Myanmar	381	256	
Singapore	135		
The Philippines	207	537	406
Taiwan	319	131	
Thailand	122	279	
Vietnam	671	821	
South America			
Argentina	263	150	303
Chile	17	131	28
Ecuador	50	96	86
Paraguay	63	148	84
Peru	253	286	99
North America, Central America and Caribbean			
Costa Rica	83		
El Salvador	72	68	80
Nicaragua	40	85	
Canada	47	115	54
Mexico	225	122	127
United States of America	541	564	469
Africa and Middle East			
Burkina Fasu	588	1282	
Ghana	284		
Nigeria	1044	976	748
Togo	357	278	
Gabon	140		
South Africa	248	87	68
Israel	78	26	86
Jordan	81	49	24
Qatar	26	214	
UAE	152	51	75

Although the numbers of victims identified in these countries are sufficient for MSE, it is

unknown if in these countries statistics have been collected from three or more sources with the possibility of matching, potentially allowing Multiple Systems Estimation.

Eurostat has collated data on identified victims of trafficking in persons from all EU member states. In its working paper on Trafficking in Human Beings, Eurostat (2013) provides the following explanatory notes: "*Data might be available in registration systems of different services. In police registers when victims have reported the crime, border guards might react on trafficking signals at (EU) borders and labor inspectors might pick up signal of victims of human trafficking during their (regular) controls on working conditions in businesses. Immigration services will register trafficked persons from third countries who are granted a residence permit based on Directive 2004/81. Victim assistance services might register a victim when the victim has requested assistance and different authorities will refer a potential victim to the police. Some Member States have a registration system linked to their National Referral Mechanism*". The guidance offered in the Eurostat questionnaire to the participating statistical authorities suggested to collate statistics from a wide range of different organisations, and to assure avoiding double counting of victims appearing on lists from different organizations. This offers favorable prospects for MSE. Through an in-depth analysis of the metadata on the Eurostat statistics of identified victims of human trafficking, a group of researchers (Van Dijk et al 2014) has examined the nature of existing databases of detected victims in EU countries. Their overview shows, first of all, that within the European Union, in spite of legislation and guidelines[28], structures for the collection of data on trafficking in persons are still highly divergent.[29] The results show that in over half of member states (16) comprehensive, multi-source datasets on trafficking in persons victims are maintained (Poland, Croatia, Denmark, Ireland, Latvia, Portugal, The Netherlands, Romania and the United Kingdom), or are likely to be maintained in the near future (Austria, Bulgaria, the Czech Republic, Hungary, Poland, Slovakia and Spain.). These countries are, or will soon be, able to report on the numbers of victims of human trafficking who have been formally identified by a state authority and/or who have received services from any state institution and/or state-funded NGO. Since these sixteen countries collect data on detected victims from

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[28] Pursuant to its objective of advancing victim protection, the 2011 EU Directive obliges member states to "take the necessary measures to establish appropriate mechanisms aimed at the early identification of, assistance to and support for victims, in cooperation with relevant support organizations" (Article 11, par 4). In the EU Strategy towards the Eradication of Trafficking in Human Beings 2012-2016, the European Commission refers to the commitment of member states to establish "formal, functional national referral mechanisms" by the end of 2012. The Commission has in 2015 issued a reference document "Guidelines on identification of victims of trafficking in human beings".

[29] Appendix A presents an overview of the national contexts of statistics on identified/presumed victims of all 28 member states, largely based on the Trafstat study (Van Dijk et al 2014).

different sources and are able to avoid double counting, they possess multiple lists of detected victims which can be matched. These countries seem therefore well placed for the application of MSE. In an additional four countries (Germany, Finland, Italy, Malta, and Slovenia) parallel systems are maintained which could potentially be linked. The development of a comprehensive system seems feasible if agreements could be reached on data exchanges between the police/Ministry of the Interior and mandated NGOs. Data exchanges would require the application of techniques to avoid double counting, while safeguarding data protection. If a system of unique identifyers of listed victims could be agreed upon, the databases in these countries, even when maintained by independent organizations, could jointly be used for a Multiple Systems Estimation of the dark number of victims.

The prospects for the production of comprehensive statistics, as well as for MSE, seem also relatively favorable in Belgium and Estonia where NGO-based databases exist. These would then need to be supplemented by and linked to police-based datasets. In Estonia data collection used to be managed by NGO's but a new system with a more prominent role for the police is under development and guidelines for comprehensive data collection, requiring unique identifyers of victims, are being prepared. In just a few EU countries, the development of comprehensive data collection systems, permitting MSE, seems for the forseeable future to pose insurmountable legal and/or organizational challenges.

6 Conclusions and recommendations

The recent adoption of the "numbers of detected and undetected victims of human trafficking per 100,000 populaton, disaggregated by sex, age and form of exploitation" as an indicator for Sustainable Development Goal target 16.2 poses a formidable challenge to national Statistical Authorities. A review of the statistical system on detected victims of UNODC and Eurostat shows great variation in the standards and mechanisms to identify victims. Some countries apply the strict legal definition of identified victims as persons whose victimization has been ascertained in a judicial decision. In many European countries, victims are counted as being identified through multi-agency identification and referal mechanisms (NRM's). The precise nature of these mechanisms, and the standards used for identifying a person as victim, shows considerable variation.

The review of the different practices included in this research brief provides valuable insights on how to improve the comparability of the data collected by UNODC. UNODC is considering revising the GLOTIP questionnaire regarding the question on "victims identified

by State authorities." For example, one option could be to ask reporting countries to provide numbers of all persons who have received any services from state agencies or state-sponsored NGOs and/or legal procedural rights as victims of human trafficking.[30] It is clear that the questionnaire should explicitly request the inclusion of metadata on the national definitions and the mechanisms of identification used.

As for other crime statistics based on officially recorded offences, the ratio between detected cases and undetected cases is unknown, and is likely to vary considerably between countries and across time (Van Dijk 2009; Aebi 2010). So, even if common operational definitions are used, the resulting harmonised statistics on detected victims cannot be used as indicator of the true numbers of victims of human trafficking, most of whom remain undetected.

An emerging new research strategy is the carrying out of household surveys concernig different experiences of exploitation. Following the model of the International Crime Victimization surveys and the UN Manual for victimization surveys (UNODC/UNECE 2010) standardised instruments could be developed for survey research into actual experiences with victimization by human trafficking. With a view to monitoring progress in the relevant Sustainable Development Goals, such surveys should be conducted in a broad sample of low, middle and high-income countries. Innovative sampling techniques including network scale-up method and respondent driven sampling should be tested and implemented with a global sharing of practices and lessons learnt.

An important limitation of the survey-based approach is clearly its apparent underestimation of sexual exploitation, either among primary respondents or among family members. There are also obvious financial implications in regularly conducting large scale population surveys on victimization by human trafficking. Carrying out bespoke surveys on victimization by human trafficking among samples of general populations, or among at risk populations such as migrant workers, will require considerable and recurrent investments. This is especially true if such surveys are meant to produce level estimates and change estimates at the national scale with sufficient statistical accuracy to be useful for monitoring implementation of counter trafficking policies.

Considering the limitations and cost implications of national surveys on victimization by human trafficking, an alternative and promising approach is the use of Multiple Systems Estimation as shown in this brief. This approach was succesfully piloted in the United

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[30] See the recommendation in the final report on the TrafStat project which examined the statistics collected by Eurostat (Van Dijk et al 2014): *Our preference would be to ask countries to report on all persons who have been recognized by any state institution and/or state-funded NGO as deserving to receive special rights, protection or services. The use of this definition would result in higher numbers of identified victims in a broad sense.*

Kingdom, using the numbers of detected victims collected by the National Crime Agency. Preliminary analyses were also made of lists of detected victims collected on behalf of the Dutch National Rapporteur on Trafficking in Human Beings by CoMensha. Both tests have produced estimated numbers of undetected victims of human trafficking that are several times larger than the numbers of detected victims.

To promote this efficient method to estimate the dark numbers of victims of human trafficking, UNODC is available to support interested countries to further test MSE and it is considering inserting in the GLOTIP questionnaire a question on the availability of lists of identified victims maintained by different national organisations.

A total of 50 Member States has reported to UNODC a total of 75 or more detected victims in a single year at least once. These countries possess sufficiently large numbers of data on detected victims to carry out MSE. It seems likely that in many countries separate lists are kept by both law enforcement agencies and service providers which could, with some additional efforts, be matched.

An analysis of databases of EU member states revealed that sixteen countries possess data on detected victims from different organizations which could eventually be matched. The datasets of these countries seem therefore to be suitable in principle for MSE (see Appendix A for a description of databases on detected trafficking in persons victims available in the European Union).

New implementations of MSE can give more insight into the data requirements for succesful estimation of the dark numbers of victims. They can facilitate a further exploration of the potential of MSE to estimate the dark numbers of undetected victims in a comparative perspective.[31] Stratification of the estimates according to type of exploitation and age seems both feasible and recommendable.

Upon completion of these pilots, and a critical assessment of their results, a technical manual could be designed for estimating the true numbers of victims of human trafficking by applying MSE to statistics on detected victims. Estimates complying with such guidelines could then be certified as a viable statistical indicator to measure progress in the implementation of the relevant Sustainable Development Goal targets. The results may also contribute to ongoing efforts to produce better global and regional estimates of human

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[31]Theoretically, countries with low probabilities of inclusion on the available lists due to deficient identification will show smaller overlaps and therefore larger estimates of the true numbers. In this way, MSE-based estimates might correct for identification deficiencies. However, when subcategories of victims remain largely unidentified on all available lists, the estimates of dark numbers will be deflated. An example of this would be victims of forced labour in countries where such victims are almost never identified.

trafficking with a mixed method combining results of survey research and analyses of statistics on detected victims as collected by UNODC (Van Dijk, 2015a).

Appendix A

The legal-institutional contexts of statistics on identified/presumed victims in the European Union

The information in this overview is mainly derived from the TrafStat study based on the data collection from the EU countries (Van Dijk et al, 2014). Where useful, we have also consulted the metadata provided by the governments to Eurostat for the 2013 report and the country evaluation reports of the Group of Experts on Action against Human Trafficking (GRETA) of the Council of Europe.

Austria

The data on identified victims are collected by the Federal Police which is in charge of the identification mechanism. However, dedicated NGO's such as LEFOE-IBF are also authorized to identify victims and offer state-funded services. There is no formal mechanism of sharing data between the two identifying authorities and /or of avoiding double counting. The reported data are those of the police only and are therefore limited to victims in contact with the police. An expert group in the Ministry of Justice is looking into ways to improve the data collection. In its latest report, released in 2015, GRETA has urged the Austrian authorities to design an integrated statistical system. This recommendation has been endorsed by the Austrian authorities.

Belgium

The data on victims refer to victims who have been received in one of the three reception centers and have received a temporary right to stay of 45 days (identity document) by the immigration service at the request of the prosecutor in consultation with centers. The numbers may include a small group of victims of smuggling of migrants. These statistics derive both from the reception centers and from the immigration service. Not covered are victims who have not been referred to the three reception centers. These could be EU nationals who do not need or want such services. Some of them may nevertheless cooperate with the police as witnesses and/or participate in criminal proceedings as civil plaintiffs.

Bulgaria

In Bulgaria a NRM was first introduced in 2010. Formal identification is in the hands of police and prosecutors. A range of first responders can start the process informally and give access to support and services. Data on trafficking in persons are collated by the secretariat of

the National Commission for Combating Trafficking in Human Beings (NCCTHB), using a model developed by the ICMPD. Data on victims presently come exclusively form the prosecutor general at the Supreme Court and are limited to victims taking part in investigations/criminal proceedings as witnesses. In 2015 a new comprehensive system of data collection is expected to be in operation collating data on presumed victims from various sources including NGOs, using software developed by the Observatory on Trafficking in Persons in Portugal (The Pan-EU MoSy 2015).

Croatia

The Government Office for Human Rights maintains a database on formally identified victims on behalf of the National Coordinator for trafficking in persons. Strict data protection measures limiting access to authorized persons have been put in place. Identification is in the hands of police officers working for the Organized Crime Department, in collaboration with NGOs. The first country evaluation report of GRETA, observing the extraordinarily low numbers of identified victims, recommends increased efforts of identifying victims, especially victims of labour exploitation and foreign victims. In 2015 a new protocol on the exchange of data on victims of human trafficking was due to be issued.

Cyprus

The data on victims come exclusively from the Office of Combating Trafficking in Human Beings of the Cyprus Police which is in charge of the formal identification procedure concerning trafficking in persons victims. Victims who refuse contacts with the police are not formally identified. The numbers of identified or presumed victims who received assistance are collected by Social Welfare Services. Some victims receiving services from NGOs might be double counted.

Czech Republic

A National Rapporteur, established in 2003 under the Ministry of Interior/Police collates all data on trafficking in persons, including on victims. The overall count of the number of victims as recorded by the National Rapporteur includes data from all organizations that are represented in the Inter-ministerial Coordination Group on the Fight Against Trafficking in Human Beings as indicated in the National Strategy to Combat Trafficking in Human Beings in the Czech Republic for the period 2012-2015.

Data on victims come from the special programme of support (funded by the Ministry of Interior) , other specialised NGOs, the police and the Refugee Facility Administration. In the future, they may also come from the labour inspectors. Double counting may occur. An E-project for avoiding double counting is under development.

The data provided to TrafStat refer to victims who have been received in the Special Programme for Support and Protection which seems focused on foreign victims in need of a residence permit. Victims assisted by three other NGOs specialized in supporting trafficking in persons victims, who have stayed outside the Special Programme, are not included. Since 2012 support to all trafficking in persons victims is coordinated by one NGO . This is likely to result in better statistics on victim assistance.

Denmark

Denmark has a comprehensive system for the registration of officially identified victims of trafficking in persons. The Danish Immigration Service and the Danish Centre against Human Trafficking are the only actors responsible for verifying the status of victims of trafficking in persons. Most referrals are made by the polic, including the border police. The Danish Immigration Services identify victims of trafficking in persons who reside in Denmark without residence permits. They do so on the basis of information they receive from social workers of the Danish Centre against Human Trafficking and from the police. The Centre itself deals with victims with a legal status who can receive assistance without contact with the police. The Centre registers data on all formally identified victims of trafficking in persons and can provide information on gender, age, type of exploitation, and citizenship. There is no double counting and victims of smuggling are excluded.

Estonia

Before April 2012, data on identified victims was collected through three government-funded NGOs (the NGOs have a contract with the Ministry of Social Affairs to deliver services to victims of trafficking in persons). The NGOs used a checklist to identify victims and record information on identified victims. In response to the recognition of trafficking in persons as a special crime, Estonia is currently redesigning the data collection process. As of April 2012, all victims should be identified by the police. Cases can reach the police from different ways, for instance, through NGOs. However, the police is responsible for the identificatioion. Migration services, police, and border guards will use one system. After identification, the cases are presented to the social insurance board. They offer victim support services in

Estonia and will decide whether they can assist the victim themselves or whether they have to refer a victim to an NGO. Estonia is elaborating procedural guidelines for identifying and registering victims.

Finland

In Finland the police collects statistics on victims identified by them. These are the statistics provided to TrafStat and most probably to Eurostat as well. However, the Joutseno Reception Center has been mandated to also identify (presumed) victims who upon identification are eligible for assistance from NGOs. The latter statistics are more encompassing and provide more detail. It is at this point not possible to come up with a reliable total count of identified victims. The National Rapporteur is not directly involved in the collection of data. From 2014 onwards the data collection has been coordinating by the National Coordinator.

France

The metadata provided to Eurostat 2013 explain that the statistics on victims are taken from three police-based databases: a database on victims identified during investigations into pimping and prostitution networks (Office central de repression pour le traite des etres humains/OCRTEH), a database on smuggling of migrants and a database of the border police. The GRETA evaluation report observes that the statistics on victims mainly refer to victims of pimping. According to the report, the French authorities "said that a statistical tool (the national police procedures drafting application, or "LRPPN") which will allow automatic data reporting, is to be introduced in late 2013/2014" (GRETA 2015 evaluation reports). The collection of data on victims is further complicated by the absence of a formal identification system. In practice identification is, according to the GRETA report, exclusively done by the police and limited to victims cooperating with their investigations.

Germany

The data are from the annual situation report of the Federal Criminal Police (BKA) and refer only to victims officially identified by the police. KOK is an umbrella NGO coordinating 40 or more NGO's at state level. Several local NGOs offering assistance to victims (Beratungsstelle) keep records of their clients about which they report in their Annual Reports. KOK is currently planning a project for centralised collation and analysis of data from counselling centres. At this juncture, these data are not shared with the BKA. The BKA count should therefore be seen as an undercount. The government has announced plans to establish a National Rapporteur or equivalent menchanism. If this happens, a centralized database integrating data from police and NGOs without double counting and with all necessary guarantees for data protection might be set up.

Greece

The Greek TrafStat data on victims are exclusively provided by the Hellenic Police Headquarters/ Public Security Division which is responsible for victim identification, in collaboration with NGOs.

Hungary

Data on identified victims used to come from police offices and prosecutor's offices only. In 2012 Hungary introduced a new data collection mechanism involving the police, other state institutions and a broad range of NGOs. After the introduction of this comprehensive system the number of identified victims has significantly increased. Since the data come from various organizations, double counting is likely to occur. In 2015 the Hungarian authorities announced plans to set up a new comprehensive database.

Ireland

The Human Trafficking Investigation and Coordination Unit of the Immigration Bureau of the National Police (HTICU) is responsible for the identification of presumed victims applying a reasonable grounds test. The Anti-Human Trafficking Unit of the Ministry for Justice and Equality (AHTU) collates data on presumed victims identified by HTICU and from other relevant state institutions and NGOs. The results are published in annual reports. Double counting of referred victims is limited by the AHTU through further checking of overlapping data across a number of variables with the reporting organizations to clarify the referral path for individuals in compliance with data protection standards.

Italy

Italy has not established a national identification or referral mechanism. Identification is carried out at the local level by either the prosecutors or local social service institutions and/or NGOs. The Ministry of Interior maintains a register of identified victims with relatively low numbers (below 100). National statistics are collected on victims supported by local social protection projects, either in the recovery stage or of a more secondary nature. The latter statistics, originating from NGOs and adding up to a total of over 2,000 seem to be the ones that were provided to Eurostat for the 2013 report.

Latvia

Formal identification of victims can be done by the police or by a multi-disciplinary committee involving the police. National Anti-Trafficking Coordinator receives data on identified victims from both the police and the mandated NGO and checks for double counting. Latvia could also provide (less detailed) data on "presumed victims" that is, on persons who are identified as victims of human trafficking by any relevant authority (e.g., by border guards, labor inspectors, consular officials), municipalities (social workers, orphan courts) and NGOs, but who refuse to be formally recognized as victims of human trafficking.

Lithuania

Little information was received from Lithuania in the course of Trafstat. From the metadata in the Eurostat 2103 report. it was concluded that the government can only make available data on victims involved in criminal investigations. However, in its reply to the GRETA questionnaire the government stated that the Security Policy Department of the Ministry of Interior collects data on victims from the police, immigration and border police and that the police has signed a memorandum of understanding with specialized NGOs about, inter alia, exchange of information on victims.

Luxembourg

In Luxembourg, formal identification of victims is in the hands of the police (Organised Crime Unit) and in practice linked to the initiation of criminal proceedings. In the TrafStat study, the data on victims came from the police. According to the GRETA evaluation report, a newly established Committee to monitor trafficking in human beings is expected to collect comprehensive statistics from a broader range of actors.

Malta

In Malta, formal identification of victims is done by the Maltese police. The police also collect and collate data on victims. Since 2011, a Human Trafficking Monitoring Committee is mandated to collect data from various actors.

The Netherlands

Identification of victims without residence permits is done by the National Police with a mandate from the Immigration Service. On behalf of the National Rapporteur, a state funded NGO (CoMensha) acts as observatory for all state institutions including the police and the border police as well as relevant NGOs coming into contact with presumed victims. CoMensha avoids double counting. Its database can be regarded as a comprehensive database covering both identified and presumed victims. The database fully complies with the TrafStat definition of a trafficking in persons victim since all registered victims have received certain services from state institutions or NGOs under the supervision of CoMensha. However, it has been argued that part of the victims reported by the border police should be excluded from future Eurostat statistics as possible victims since they not necessarily receive follow up services upon entry into the country. CoMensha could approximate the TrafStat definition by deducting this category from the total. Since 2014, the cases reported by the Border Police have been screened more stringently and their numbers have gone down accordingly.

In response to criticism from the National Rapporteur , the Dutch government in 2016 announced a pilot study with an independent appeal procedure for victims whose cases have been dismissed by the prosecutor. The appeals will be handled by a special chamber of the State Compensation Fund.

Poland

In Poland, identification can be done both by the police and in the case of victims with a regular residential status by two mandated NGOs. The trafficking in persons unit at the Ministry of the Interior (MOI) collects data on victims from different sources (police, prosecutors and NGOs). Since 2010 the National Consulting and Intervention Center for Victims of Human Trafficking (KCIK) is mandated to identify certain victims and provide support to both formally and informally identified victims. The Center provides data on their clients to the trafficking in persons unit at MOI. The numbers are higher than those provided for the Eurostat 2013 report. The KICK data cannot be combined with the data on victims formally identified by the police but are more comprehensive than the police data.

Portugal

Formal identification is in the hands of the police but NGOs are invited to act as early responders and report all presumed victims to the Observatory of Trafficking in Human Beings (OTSH). This Observatory has a mandate to collect comprehensive statistics on identified and presumed trafficking in persons victims. It signed memoranda of understanding with numerous governmental and non-governmental organisations. However, some NGOs seem reluctant to provide the OTSH with data on victims of trafficking in persons because of concerns regarding the confidentiality of these data. At present, the data collection system seems to receive the great majority of its input from the police. The Observatory avoids double counting, if necessary by contacting the reporting institution. The OTSH has introduced software allowing direct inputting of data by various institutions as well as sophisticated, geographical analyses.

Romania

The National Identification and Referral Mechanism recognizes formal identification by the police and informal identification by NGOs or social service centers. The National Agency against Trafficking in Persons at the Ministry of the Interior runs a database (SIMEV) with data on formally and informally identified victims with input from a broad range of state institutions including labour inspectors, and from NGOs. Double counting is avoided while respecting data protection standards.

Slovakia

The National Referral Mechanism in Slovakia includes criteria for identification of potential victims of trafficking in persons, a structure of cooperating stakeholders from the third sector and a state administration and referral system. Identification of victims of trafficking in persons can be performed by any public or non-governmental body in the Slovak Republic, as well as by a foreign agency abroad. Official identification of victims may be performed by the National Coordinator for Combating Trafficking in Human Beings or by police. Before 2013, the Information Center for Combatting Trafficking in Human Beings and the Prevention of Crime at the Ministry of Interior collected data on victims who had received support from the special Program of assistance and support for victims of trafficking in persons, regardless of whether or not they took part in criminal proceedings. Parallel to this, the police kept a record of victims involved in criminal investigations. From May 2013 onwards, the Information Center administered a new, comprehensive information system covering both types of data on

victims without double counting. Efforts will be made to also include counts of victims who were identified as potential victims by NGOs or international organization outside the special program in order to provide a complex overview of all victims of trafficking in persons in Slovakia.

Slovenia

Identification is not formalized. An Interdepartmental Working group exists that is chaired by the National Coordinator/National Rapporteur and comprises representatives of line ministries, the police, State Prosecutor General's Office, non-governmental organisations and intergovernmental international organisations. The police, NGOs and the prosecution each separately collect comprehensive data on victims. The data, which is checked for double counting between the police, the prosecution and the NGOs, is published in the Annual Reports of the Interdepartmental Working group. Not included are possible victims who deny being victims, but the police also keep records of the presumed victims. The database conforms to the Data Protection Act (source: GRETA's first evaluation report).

Spain

In Spain, identification of victims is the sole responsibility of the various police forces. Data on identified victims from all police forces are collated by the Organized Crime Department (CICO). The respondent observed that the police may loosely count all prostitutes found in brothels during raids as victims of human trafficking. The same persons might also be counted twice when working in different brothels. Data on victims involved in criminal proceedings might be derived from the files of the prosecutor's office. Since the TrafStat project, Spain has introduced a National Referral Mechanism and in 2015, a comprehensive statistical system on victims of trafficking in persons has been launched.

Sweden

The respondent for the TrafStat project represented the National Crime Prevention Council (BRA). The number of identified victims that was reported in the questionnaire refers to the number of victims registered in trafficking offences that have become known to the police. The statistics on victims provided to Eurostat for the 2013 report were based on trafficking cases registered by the police and/ or Prosecution Authority. Breakdown to gender are not systematically available in the police registration. The National Rapporteur publishes annual reports. Data on victims in these reports are not comprehensive either. Statistics provided for

the GRETA evaluation report, collected by the National Rapporteur, referred to victims recognized as aggrieved parties in human trafficking cases ending in a conviction.

United Kingdom

The UK operates a formal identification mechanism (NRM) since 2009. The process is three-staged. Suspicions that persons are trafficking in persons victims can be signaled by institutions placed on a list of First Responders. Competent authorities in the identification process are the police-based United Kingdom's Human Trafficking Center (UKTHC) and the UK Border Agency for non- EU-nationals. Initial identification is done on the basis of a reasonable grounds test. The final identification is done by the same authorities. United Kingdom's Human Trafficking Center (UKTHC) is also the national repository of data and intelligence on trafficking in persons. In addition, the UKHTC produces data regarding the number of referrals to the NRM and decisions taken by the two competent authorities to identify victims of trafficking, with a breakdown by nationality, gender and age, as well as by the type of exploitation. Most of this data is made available on the UKHTC's website.

For the Eurostat 2013 report, the UK seems to have sent in statistics on conclusively identified victims, broken down to categories of First Responders. The UK is able to provide statistics on all persons who have been reported by first responders as potential victims and on those who have passed a reasonable grounds test carried out by the Competent Authorities. The latter presumed victims are allocated to victim support organizations by an umbrella organization, currently the Salvation Army. The numbers of potential and of presumed victims are considerably higher than the numbers of conclusively identified victims.

In 2015, the UK launched pilot projects with the initial identification by local officials as first responders (Slavery Safeguarding Leads) and with conclusive identification by multi-disciplinary panels. This new approach might lead to a reduction of the numbers of potential victims.

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