Human trafficking is a compound societal issue that involves the exploitation of humans for monetary gain or benefit.

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Human trafficking analysis

Operations research and similar analytical techniques have the unique potential to address a worldwide problem.

By Renata Konrad, Andrew C. Trapp and Kayse Lee Maass

Worldwide, an increasing amount of public attention is being directed toward the problem of human trafficking. The media are more frequently covering trafficking, anti-trafficking activism has risen, and most countries have created new policies, laws and enforcement mechanisms to address the issue. Despite this recognition, there is a shortage of technical solutions that practitioners and analysts can use to analyze data, perform impact assessments and assess decisions related to anti–human trafficking efforts. Operations research (O.R.) and similar analytical techniques have a unique potential to promote anti-human trafficking efforts.

Human trafficking is a compound societal issue that involves the exploitation of humans for monetary gain or benefit. As a modern form of slavery, human trafficking violates human rights, presents a global public health concern, and is prevalent in both impoverished and wealthy nations. Victims range from domestic workers (such as housekeepers and nannies), to laborers (including factory, construction, mining, commercial fishing, food service and agricultural), sex workers, beggars and child soldiers.

Risk factors for trafficking increase when individuals are vulnerable due to poverty, the attraction of perceived higher standards of living elsewhere, lack of employment, organized crime, conflict, natural disasters or other such factors. The demand for cheap labor and for prostituted women, girls and boys drives trafficking. Human trafficking often begins with fraudulent recruitment methods, such as promises of employment, marriage or a better life. It starts out as recruitment or movement and ends with exploitation. Migration is an element of trafficking, but not all migrants become trafficking victims. Similarly, trafficking does not necessarily involve migration or movement. For example, statistics for juveniles indicate that between 2008 and 2010, 83 percent of confirmed sex trafficking incidents in the United States involved U.S. citizens. When a person through coercion, deception, force, abuse of power or power of vulnerability moves within her/his country or to another country for the purpose of exploitation, he/she becomes a human trafficking victim [1].

Due to its clandestine nature, it is difficult to detect and gather statistics on the crime of human trafficking. For analysts and practitioners, measuring its prevalence is both difficult and complicated. Sources estimate that between 27 million and 45.8 million individuals around the world are victims of human trafficking [2, 3]. Moreover, for traffickers, exploiting humans is an extremely profitable enterprise. Globally, forced labor and sexual exploitation generate an estimated $150 billion annually in illegal profits, making it one of the largest sources of profit for global organized crime, second only to illicit drugs.

There is a need for quantitative research to provide an understanding of trafficking operations, develop methods of deterring its prevalence, and ultimately, inform and transform policy. In 2014, the executive director for the United Nations Office on Drugs and Crime (UNODC) issued a plea for help in developing evidence-based approaches to address the crime of human trafficking. Given that services to trafficked persons are in their infancy, and evidence-based clinical and sociological research in the area is growing, there is an opportunity to examine how researchers and practitioners can use O.R. and analytics to effectively combat human trafficking.

While it is reasonable to assume that O.R. and analytics can play a unique, effective role in countering trafficking efforts, there are several practical challenges for O.R. and analytics practitioners in applying their techniques. At the same time, these challenges are opportunities to advance O.R. and analytical methodologies.

Complex Challenges

Trafficking is inherently clandestine. Recruitment is deception, traffickers are covert, and victims are concealed. This "industry's" illicit nature poses several (surmountable) challenges for O.R. and analytics practitioners.

There is a dearth of quantitative data regarding trafficking activity. Little reliable information exists on the distribution of victims, traffickers, buyers and exploiters. Data that do exist can be inaccurate, missing or worse, false; furthermore, simply enhancing data collection techniques and methodologies is often insufficient. Because data analysis of both trafficked persons and traffickers typically involves data from multiple sources and jurisdictions, issues like data ownership, privacy, unwillingness to share or a simple lack of knowledge concerning what data are available often hamper data collection. (Figure 1 provides a sample of largely governmental resources which contain some data aggregated by country for the interested reader.)

International Organization for Migration, Counter-trafficking: https://www.iom.int/counter-trafficking
Office of the United Nations High Commissioner for Human Rights: http://www.ohchr.org
The Organization for Security and Co-operation in Europe: http://www.osce.org
United Nations Global Initiative to Fight Human Trafficking: http://www.ungift.org

Figure 1: Sample of data resources regarding trafficking activity.

While **O.R. and analytics** can play a **unique, effective** role in **countering trafficking efforts,** several **practical challenges** remain.

Human Trafficking

Human trafficking is essentially a supply chain in which the "supply" (human victims) moves through a network to meet "demand" (e.g., for cheap, vulnerable and illegal labor). Traffickers consciously ensure that such networks are hidden and connections are covert to elude law enforcement; such circumstances pose a challenge for O.R. and analytics practitioners. Networks are dynamic, as traffickers are likely to change distribution and transportation routes to avoid detection. Rapid network adaptations leave law enforcement and analysts with incomplete information. Further complicating the effective development of strategies to identify and dismantle trafficking networks is the high level of diversity affecting network structures. The culture, local customs, access points, competing activities and efficacy of local law enforcement are all key factors influencing how networks both originate and evolve.

Opportunities for O.R. Application and Advancement

While the human trafficking "industry" presents challenges, these issues also introduce opportunities for new applications and advancements in O.R. and analytics. The authors are involved in some of the initiatives described below, while others present interesting and potential impactful avenues for investigation.

Analyzing resource allocation decisions. Resource allocation decisions lie at the heart of many O.R. problems, and anti-trafficking initiatives stand to benefit from techniques that the O.R. community has developed. For instance, a government may need to decide how to best schedule labor inspectors to detect child labor in the manufacturing industry. Such a government will likely have a limited operating budget, while inspectors need to travel to maximize the likelihood of detecting illegal labor practices, which are probably being concealed.

In another example, a nongovernmental organization (NGO) may want to decide where to locate a shelter for trafficking survivors. Such a decision entails a large investment, typically from the nonprofit sector, for a small population of survivors. While aspects of facility location problems could be used to select locations for rehabilitative shelters, such an approach would have to account for several characteristics that are unique to trafficking.

In addition to safe housing, for successful rehabilitation, shelters need to be linked to a network of social and medical services. Factors that influence the geographic location of shelters include access to necessary survivor services, security issues, and demand that is largely unknown. Organizations need to balance these factors against establishment and maintenance costs, as well as shelter capacity. As such, decisions concerning whether to open and where to locate a shelter are complex; O.R. techniques are well-suited for such a decision-making environment.

Identifying effective victim interventions. Although governments play an important role in creating socioeconomic policies to address the systemic causes of trafficking [4], ongoing trafficking recruitment calls for targeted intervention strategies to prevent individuals from falling victim to trafficking. The aim of awareness campaigns, arguably the most common form of trafficking prevention activities, is to raise awareness of the dangers of trafficking and offer strategies to avoid deception and exploitation. With effective implementation, such awareness campaigns can play a key role in combating human trafficking.

Evidence suggests that interventions that are empowerment oriented and involve communities hold even greater promise than top-down, one-time interventions, such as public awareness campaigns. These empowerment-oriented interventions include vocational training, skill-building and support for formal or other education classes. Yet, to be effective, targeted interventions must first identify a target population and then efficiently allocate resources to implement a prevention intervention. Analytics practitioners can potentially identify vulnerable individuals, communities or populations expected to have the highest likelihood of being trafficked. Furthermore, O.R. practitioners can develop resource allocation and media planning programs to effectively target interventions similar to efforts in public health.

Developing assessment measures. Despite significant financial and social investments, and the seriousness of the crime itself, many anti–human trafficking interventions operate without an adequate evidence base. Information is largely anecdotal, and a lack of meaningful impact assessments makes it difficult for analysts to evaluate the effectiveness of interventions. O.R. techniques identify and compare alternatives, and practitioners and researchers can play an active role in defining measures to assess interventions related to human trafficking.

Drawing from a significant presence in health policy modeling, medical decision-making, cost-benefit analysis and increasingly, welfare

economic principles, an opportunity exists for practitioners to develop and define appropriate measurements to guide anti-trafficking policymakers in assessing interventions. One can envision practitioners' development of an objective function that adequately captures societal costs for survivor rehabilitation programs.

Dismantling trafficking networks. The nature of human trafficking networks presents opportunities for O.R. and analytics practitioners to further develop the rich field of network-based analytic techniques. Network analysis can identify the means (e.g., individuals, groups, paths, etc.) to block or facilitate flow (e.g., money, communication, trafficking, etc.) in a trafficking network. Moreover, analysts and researchers can use network analysis to study network behaviors, measure relationships within the network or interdict/disrupt the network itself.

For example, analytics practitioners could exploit the structures embedded in social networks, such as Facebook and Twitter, to understand the social networks of at-risk persons or, alternatively, exploiters of trafficked persons. Social network analysis could help to determine which contacts have a critical influence over others, and this may enable early identification of either a victim or trafficking transaction.

Network interdiction, the seizing of traffickers and rescue of victims, is an obvious application for O.R. practitioners. Although the fundamental ideas of network interdiction pertain to human trafficking, unlike network interdiction research in the context of illegal narcotics or weapons, trafficked humans are a "renewable commodity." This difference changes how practitioners account for network flows in existing approaches. Perhaps what presents a greater challenge for them is ambiguous evidence in human trafficking networks. Compared to drug or weapons interdiction, where there is little dispute as to whether the commodity is illicit, in human trafficking interdiction the "commodities" may not be willing or able to identify themselves as such. Thus, the interdictor is faced with the additional decision of whether to pursue prosecution, and if so, the burden of collecting evidence.

Identifying trafficking activity. Analytics practitioners can apply several existing approaches to identifying victims and perpetrators or providing investigators with investigative leads or evidence. For example, some human-trafficking activity leaves traces in the public areas of the Internet, mostly in the form of advertisements and escort ads. Advertisers use social networking, dating, chat and community websites, with more proficient traffickers frequently altering their online presence to elude identification. Recent advances in techniques, such as matrix completion, have the potential to address issues regarding falsified or missing data. Machine-learning technologies can be used to learn and detect online trafficking activity.

Traffickers are also known to take advantage of increased demand for commercial sexual exploitation during major events, such as conventions or the Super Bowl. Analytics practitioners could conduct spatiotemporal analyses of online ads to detect and possibly interdict transportation of victims to the event. Results from such analyses could benefit law enforcement and policymakers for consensus building as to where and when they should focus intervention efforts.

Human trafficking is a serious crime and an appalling violation of human rights. Almost every country is affected by human trafficking as a source, transit point or destination of victims. Despite its prevalence, the seriousness of the crime, and the considerable investment in tackling it, there is a lack of technical solutions that can support decision-making related to anti-trafficking initiatives. O.R. and analytics have great potential to make an impact in this field. ORMS

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