Legislative Action on Human Trafficking: Towards a Data-Driven Policy

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ABSTRACT

Previous meta-analysis of state-level human trafficking data reported by Polaris identified demographic, economic, and sociological drivers of human trafficking. This enabled prediction of the number of reported victims to be expected for each state. States with high-performing programs and practices for identifying victims have a higher reported rate than that predicted by demographic and socio-economic drivers alone. This new meta-analysis compares the legislative environment of higher performing states to those with fewer reported cases for the same expected underlying rate. In this way, insight is gained as to which legislative actions are more effective in identifying victims. For example, training of emergency room workers is an effective practice, yet as many as 37% states have no such requirement. This application provides data-driven recommendations for which legislative actions have the largest effect in driving the reporting of human trafficking victims. Statistical elements of this analysis were performed using SAS University Edition.

INTRODUCTION – HUMAN TRAFFICKING IN THE UNITED STATES

In recent years, there has been increasing public awareness of the problem of human trafficking in the United States. Civic groups and social justice organizations have begun to partner with law enforcement to address this persistent and growing problem. Human trafficking is often brown down into four types: sex trafficking, forced labor, debt bondage, and domestic servitude.

Sex trafficking is the most familiar form of human trafficking, in part because it is occasionally encountered in public places, while other forms tend to operate strictly in secret. Recently, however, law enforcement and public advocacy groups have become aware of a vast underground industry in sex trafficking. Victims are often found among runaways or others without critical support structures from family and friends. The new secret sex industry in the United States often has an international dimension, as victims are tricked by traffickers with promises of a job or student programs in the United States, only to find themselves sold into trafficking and held captive by stealing their passport and physical violence.

Forced labor has many of the same characteristics of sex trafficking with different a different kind of work: labor in secret sweatshops right here in the United States. Conditions normally found in the worst situations in Third World countries are replicated in the U.S., with the same conditions: captive labor that cannot leave the job or even the premises. As in other parts of the world, forced labor in America in most common in the garment industry; Robert Ross' book *Slaves to Fashion* is an exposé of this hidden criminal industry.

Debt bondage is the modern form of indentured servitude. While the 13th Amendment to the Constitution criminalized indentured servitude as well as slavery, both were driven underground - not abolished - and persist today. It is especially common among immigrants tricked into debt bondage in the United States, who have held until the cost of being smuggled into the country is paid. Whatever the source of the putative debt, those dealing in modern-day slavery see to it that the debt is never paid, generally through charging the victim excessive amounts for rooms, board, travel and other costs. The victim remains in slavery throughout his or her life.

Domestic servitude is perhaps the hardest form of human trafficking to detect, challenging quantification and therefore many analytic-based lines of redress. Victims are often held more by threats of violence – usually against family members – than physical imprisonment. In many cases, domestic servitude victims are used as sex slaves as well.
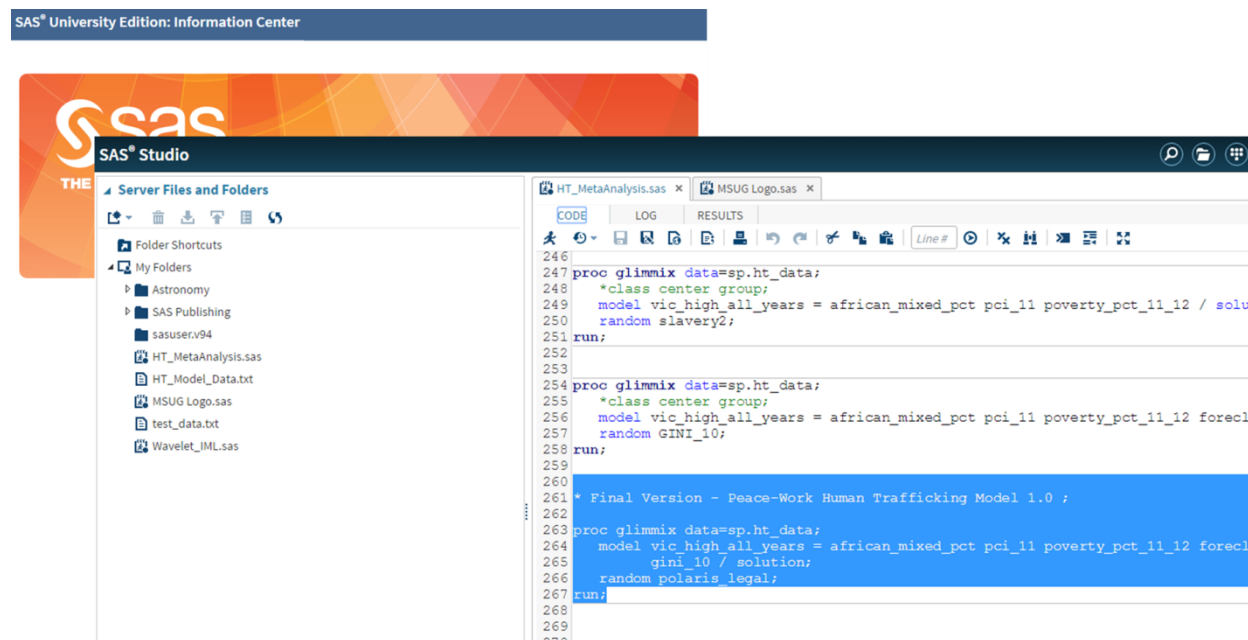
ANALYSIS OF HUMAN TRAFFICKING

In the last 15 years, there has been increasing public awareness of this important problem, as local victim advocacy and intervention groups sprang up across the country. Law enforcement task forces have been established in many areas. One of the most important drivers of change has been Polaris, a national not-for-profit organization dedicated to the eradication of modern-day slavery. In 2007, Polaris established the National Human Trafficking Resource Center (NHTRC), including a call center for victims. Others who suspect human trafficking can contact the NHTRC hotline. This study uses Polaris call center data for counts of individuals with "High Confidence" of being trafficking victims by state by year were divided by state populations from the US Census to calculate a per capita high confidence victim rate.

While the NHTRC call center has produced a single database, the information in it should not be viewed as a single object but rather as a mosaic individual state-level reporting systems. For this reason, meta-analysis is an appropriate analytic methodology to apply to this problem, with state as a random effect.

Analytic methods using SAS are being applied to these data by the NGO Peace-Work, an all-volunteer cooperative of statisticians, data scientists and other researchers applying analytics to issues in poverty, education and social justice. Peace-Work is part of the growing "Data For Good" movement, where teams of data scientists, statisticians and other researchers use their analytic skills to pressing issues and problems in our society and in our world. A fairly new organization, Peace-Work operates by connecting volunteers with organizations and datasets, often from governments and other official sources, to address issues volunteers care about deeply. With no full-time staff, larger statistical project are broken into small pieces to accommodate volunteers' busy schedules.

SAS University Edition as a powerful analytic tool with extensive statistical, machine learning, and big data capabilities that is free for non–commercial use. Using virtual server technology, it provides a familiar console-based SAS coding environment with an extensive set of SAS procedures for data management, analysis, and visualization. Peace-Work expresses its deep appreciation to SAS for making University Edition available for this research.

META-ANALYSIS OF HUMAN TRAFFICKING IN THE UNITED STATES

Mixed models in SAS combining both fixed and random effects - are especially well-suited to meta-analysis. In these models, factors that are *consistent* across the different studies, processes and

populations become the fixed effects. *Variations between studies* are explained by the random factors. For example, two studies on angioplasty by two different university hospital systems can be combined and investigated together using meta-analysis. The fixed effects in the mixed model analyze the angioplasty itself, while the random factors provide insight into the differences in the environment and context between the two hospital systems and how the data are captured and processed.

In SAS, procedures for producing mixed models include MIIXED, GLMMIX, and NLMIXED. These procedures perform linear regression using a linear combination of fixed effects added to a second linear combination of random effects. PROC GLIMMIX, used in this study, supports generalization of mixed models to permit normally distributed random effects and non-normal error terms. This allows fitting models to correlated data or where the variability is not constant. Fixed effects are placed in the MODEL statement, much like a simple regression model. Random effects are explicitly called out in a RANDOM statement:

```
proc glimmix data=study_data;

   class study treatment;

   model kpi =  x1  x2  x3  x4  x1*x2 / solution;

   random treatment(study);

run;
```

An earlier study (Corliss and Hill, 2017) applied meta-analysis to state-level summary data. The US Census, the Bureau of Labor Statistics, and the bureau of economic analysis provided most of the potential regressors. NHTRC call center data provided the outcome: the number of contacts with rated as "highly probable" to be human trafficking victim from the creation of the database in 2007 until the present, divided by the state population in millions. In this study, previous work has been enhanced with additional predictive fields. Especially important has been the addition of data on tourism, indicated as an important economic factor in both reports from human trafficking researchers (e.g., Anderson 2019) which both exploratory data analysis – however, a search of *statistical* literature has not found previous analysis of the role of tourism in human trafficking. In all, 67 economic, demographic, and sociological factors were considered for fixed effects. No input from previous work has been used in this study; the models have been redeveloped from first principles. PROC GLMSELECT with LASSO and LAR were used to screen candidate factors.

Exploratory data analysis and initial modeling found important differences between states with a history legal slavery and those states which did not. This led to development of separate models for two classes of states. That the features in the models for these different groups of states, separated by history from the 17th through 19th centuries, indicates sociological factors still present and at work today. The Historic Free State model is marked by demographic and economic factors, while the Historical Slave State model is marked by poverty factors.

Here is the SAS code and results for the Historical Free State model:

```
proc glimmix data=ht.ht_data;

   model vic_high_all_years = rtw_state forecl_pct_09 pci_11

                              african_mixed_pct poverty_pct_09_10 / solution;

   where free_state = 1;

   random st_fips;

   output out=ht_model_1 pred=estimate resid=difference;

run;
```

Features in this model include:

- Right to Work State, categorical, reflecting a pro-management environment and low regulation

- Foreclosure Rate – implication new homelessness as a risk factor for human trafficking victims

- Per Capita Income and also the Poverty Rate as positively correlated factors. Human trafficking has a greater tendency to thrive under conditions of income disparity: this economic crime requires both affluent perpetrators and poor victims.

- US Census combined percentage of African American and Mixed Race. Individually, there two components have similar performance characteristics. Consequently, they have been combined into a single factor with improved overall performance.

Solutions for Fixed Effects					
Effect	Estimate	Standard Error	DF	t Value	Pr > |t|
Intercept	-55.3370	32.8077	23	-1.69	0.1052
RTW_State	24.4498	7.7822	23	3.14	0.0046
forecl_pct_09	6.7419	2.8624	23	2.36	0.0274
pci_11	0.001288	0.000640	23	2.01	0.0560
african_mixed_pct	1.5519	0.8224	23	1.89	0.0718
Poverty_pct_09_10	1.1535	0.6911	23	1.67	0.1087

Fit Statistics	
-2 Res Log Likelihood	244.10
AIC (smaller is better)	248.10
AICC (smaller is better)	248.67
BIC (smaller is better)	244.10
CAIC (smaller is better)	246.10
HQIC (smaller is better)	244.10
Generalized Chi-Square	6068.84
Gener. Chi-Square / DF	252.87

Type III Tests of Fixed Effects				
Effect	Num DF	Den DF	F Value	Pr > F
RTW_State	1	23	9.87	0.0046
forecl_pct_09	1	23	5.55	0.0274
pci_11	1	23	4.05	0.0560
african_mixed_pct	1	23	3.56	0.0718
Poverty_pct_09_10	1	23	2.79	0.1087

A Historical Free State model including tourism expenditures by state contains stronger individual features but somewhat weaker overall performance:

Solutions for Fixed Effects					
Effect	Estimate	Standard Error	DF	t Value	Pr > |t|
Intercept	16.2366	8.7550	25	1.85	0.0755
RTW_State	22.9833	7.1401	25	3.22	0.0035
tourism_exp	0.000632	0.000236	25	2.67	0.0131
african_mixed_pct	1.7839	0.7546	25	2.36	0.0262

Fit Statistics	
-2 Res Log Likelihood	250.63
AIC (smaller is better)	254.63
AICC (smaller is better)	255.15
BIC (smaller is better)	250.63
CAIC (smaller is better)	252.63
HQIC (smaller is better)	250.63
Generalized Chi-Square	6215.28
Gener. Chi-Square / DF	239.05

Type III Tests of Fixed Effects				
Effect	Num DF	Den DF	F Value	Pr > F
RTW_State	1	25	10.36	0.0035
tourism_exp	1	25	7.14	0.0131
african_mixed_pct	1	25	5.59	0.0262

The features in the Historical Slave State model are markedly different, indicating intrinsic sociological difference between the two groups of states in terms of drivers of human trafficking:

```
proc glimmix data=ht.ht_data;

   model vic_high_all_years = pci_11 poverty_pct_09_10 forecl_pct_09

                             pct_slaves_1860_imp / solution;

   where free_state = 0;

   random st_fips;

   weight pop;

   output out=ht_model_2 pred=estimate resid=difference;

run;
```

Features in this model include:

- Per Capita Income, the Poverty Rate, and the Foreclosure Rate, as in the Historical Free State model

- The percentage of each historical slave state's population legally held in slavery at emancipation. The presence of this factor from the 1860 Census as predictive for the per capita number of human trafficking reports in these states today indicates a sociological difference handed down across generations leading to higher risk of becoming a victim of human trafficking. It is noteworthy that this factor holds a place in the Slave State model analogous to Right To Work laws in the Free State model.

Fit Statistics	
-2 Res Log Likelihood	197.87
AIC (smaller is better)	199.87
AICC (smaller is better)	200.16
BIC (smaller is better)	197.87
CAIC (smaller is better)	198.87
HQIC (smaller is better)	197.87
Generalized Chi-Square	1.195E11
Gener. Chi-Square / DF	7.4664E9

Solutions for Fixed Effects					
Effect	Estimate	Standard Error	DF	t Value	Pr > |t|
Intercept	-400.93	108.62	15	-3.69	0.0022
pci_11	0.006190	0.001804	15	3.43	0.0037
Poverty_pct_09_10	12.2785	3.5655	15	3.44	0.0036
forecl_pct_09	14.7577	3.7004	15	3.99	0.0012
PCT_SLAVES_1860_IMP	72.1326	54.3583	15	1.33	0.2044

Type III Tests of Fixed Effects				
Effect	Num DF	Den DF	F Value	Pr > F
pci_11	1	15	11.77	0.0037
Poverty_pct_09_10	1	15	11.86	0.0036
forecl_pct_09	1	15	15.91	0.0012
PCT_SLAVES_1860_IMP	1	15	1.76	0.2044

EVALUATING LEGISLATIVE ACTIONS AND GOVERNMENT PROGRAMS

These mixed models employ a single random effect: State. The overall picture of this economic crime is of an economic environment more or less conducive to the conduct of this illegal enterprise. The fixed effects in these mixed models - economic, demographic, and sociological - predict the per capita rate of victims reported with high confidence in the Polaris data. While the effect creates a picture of the relative rate of trafficking in each case, the random factor reflects the role of state-by-state variations leading to

difference in reporting apart from the underlying actual rate of crime. Human trafficking is under-reported due to a number of factors. Different states employ varying legislative actions and government programs designed to address this problem.

Polaris, in addition to the National Human Trafficking Hotline, also provides research in support of other groups fighting human trafficking. Polaris research has described a set of twelve legislative actions and government programs that can be taken to fight human trafficking:

- A sex trafficking provision in state law

- A lower burden of proof for sex trafficking of minors (e.g., presumption of non-consent)

- A labor trafficking provision

- Asset forfeiture

- Investigative tools produced by the state government to assist local law enforcement

- Training in recognizing the signs of trafficking victims

- A government human trafficking task force to support and coordinate efforts

- "Safe Harbor" laws to protect minors

- Victim assistance

- Ability of sue for civil damages

- Vacating convictions for sex trafficking victims

- Posting the Human Trafficking Hotline number

As an example, the states of Michigan and Ohio are similar in demographics and economics. Accordingly, they should same similar underlying victim rates. However, in actual practice, Ohio has a higher reported rate. This can be explained by a legal and legislative in Ohio that is more favorable to the identification and reporting of human trafficking victims:

Michigan

17.9 Victims Reported per 1M

5.5 out of 12 legislative actions

recommended by the NHTRC

Ohio

22.0 Victims Reported per 1M

9 out of 12 legislative actions

recommended by the NHTRC

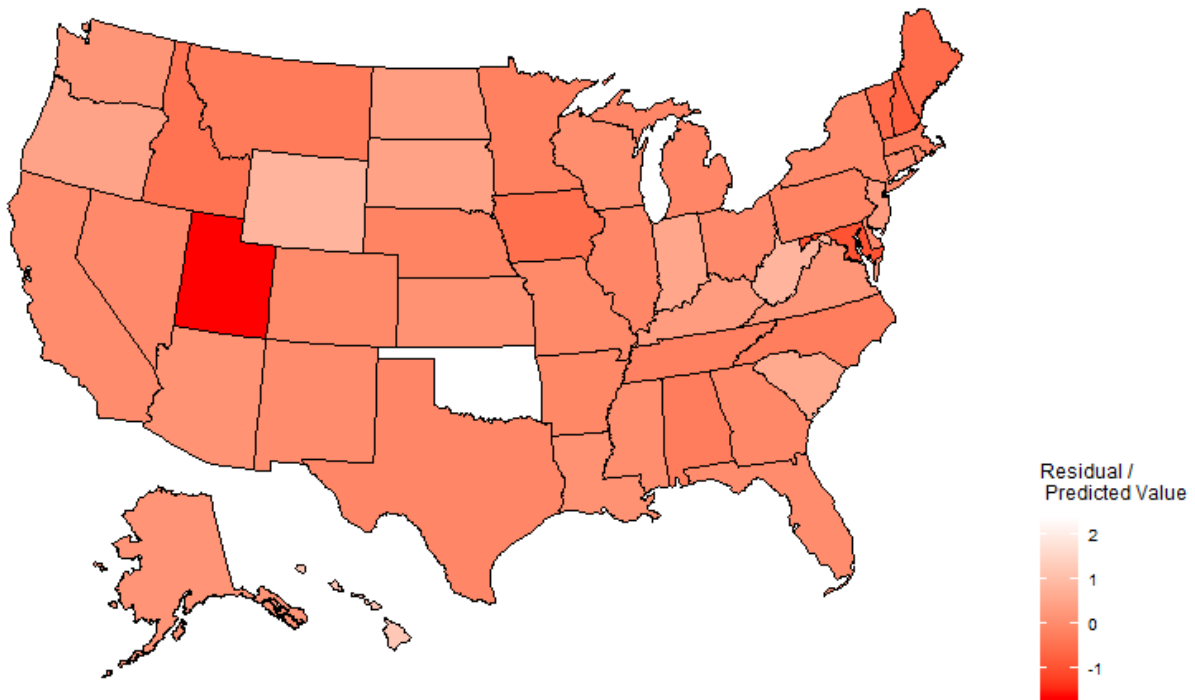Polaris data, victims identified with high confidence, 2015

While Polaris has recommended all of these actions, previous research has not applied statistical methods to identify the most effective. The mixed models used in this analysis provide a predicted level of trafficking victims. The residuals have two components – a noise factor and a separate component due to state-level differences in the likelihood of a victim contacting the NHTRC hotline – a factor influenced by differences in government laws and actions. Employing the most effective practices will tend to make a

state's reported rate higher than the predicted rate, leading to greater chance of larger positive residuals. In this way, the residuals can be used to identify best practices for states in combatting human trafficking. The relative residual rate was calculated for each state.

PROC REG was used to model effectiveness of the recommended laws, programs, and government actions. The relative residual rate served as the dependent variable and the different state legislative and government actions as the regressors.

```
data work.ht_model;
    set work.ht_model;
    difference_rate = difference / estimate;
run;
proc reg data=work.ht_model;
    model difference_rate = Asset_Forft Investi_Tools HT_Training
                            HT_Task_Force Post_Hotline Safe_Harbor
                            VicAssistance Civil_Damages VacateConvict
                          / selection=rsquare alpha=0.25;
run;
```

While Polaris recommends twelve different actions, three are universal or nearly so among the states: sex trafficking provision, labor trafficking provision, and a lower burden of proof for sex trafficking of minors. Consequently, only the remaining nine can or need be assessed by this method. Of the nine actions recommended by Polaris not implemented by all or nearly all states, six were found to be the most effective:

Historical Free States		Historical Slave States	
Action	**Effectiveness**	**Action**	**Effectiveness**
Safe Harbor	Highly Effective	Civil Damages	Highly Effective
Civil Damages	Effective	Vacating Convictions	Highly Effective
Training to Identify HT	Effective	Victim Assistance	Effective
Investigational Tools	Effective	Investigational Tools	Effective
		Safe Harbor	Effective

CONCLUSIONS

Relative rates of Human Trafficking for 50 US states and the District of Columbia have been measured using Polaris High victim counts divided by state population. Factors associated with high levels of human trafficking include both higher affluence and poverty, new homelessness, tourism, racial demographics with persons of color at higher risk, and sociological factors including a history of legal slavery.

Also noted as a risk factor is a government interest in minimizing state-level regulation of businesses. While expressly presenting no view on the regulatory environment of different states, this paper recommends those choosing to minimize regulation and policing of businesses note an increased risk of human trafficking, underscoring the importance of a state-level coordinated action to combat this crime.

Under-reporting of human trafficking is measured using the percent difference between actual and reported victim rates. Nine types of laws and government recommended by Polaris have been evaluated for their effectiveness by modeling this degree of over- or under-reporting in the several states. Actions rated as most effective include those lowering risks and barriers to reporting, such as Safe Harbor laws and vacating convictions. Economic relief, including civil damages and victim assistance also play an important role. Developing partnerships between state and local law enforcement for training and investigational support is also recommended.

ACKNOWLEDGEMENTS

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