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Monti Narayan Datta
University of Richmond, mdatta@richmond.edu

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Using Big Data and Quantitative Methods to Estimate and Fight Modern Day Slavery

Monti Narayan Datta

Given the hidden, criminal nature of contemporary slavery, empirically estimating the proportion of the population enslaved at the national and global level is a challenge. At the same time, little is understood about what happens to the lives of the survivors of slavery once they are free. I discuss some data collection methods from two nongovernmental organizations (NGOs) I have worked with that shed light on these issues. The first NGO, the Walk Free Foundation, estimates that there are about 30 million enslaved in the world today. The second NGO, Free the Slaves, employs a longitudinal analysis to chronicle the lives of survivors. The acquisition and dissemination of such information is crucial because policymakers and donors sometimes require hard data before committing time, political will, and resources to the cause.

Unpacking the Problem of Contemporary Slavery

As Kevin Bales of the Wilberforce Institute for the Study of Slavery and Emancipation explains, "Slavery is the possession and control of a person in such a way as to significantly deprive that person of his or her individual liberty, with the intent of exploiting that person through their use, management, profit, transfer or disposal. Usually this exercise will be achieved through means such as violence or threats of violence, deception and/or coercion."[1]

Thus, at its core, slavery is a dynamic between two individuals, the enslaved and the slaveholder, in which the slaveholder has a monopoly of control and violence upon

> . . . at its core, slavery is a dynamic between two individuals, the enslaved and the slaveholder, in which the slaveholder has a monopoly of control and violence upon the enslaved.

Monti Narayan Datta is an assistant professor of political science at the University of Richmond. His current book project, forthcoming with Cambridge University Press, focuses on the consequences of anti-Americanism. He is working on several projects on human trafficking and modern day slavery with Free the Slaves and Chab Dai and the Walk Free Foundation. Along with Kevin Bales and Fiona David, he is a co-author of the Global Slavery Index: http://www.globalslaveryindex.org.

the enslaved. The slaveholder can coerce the enslaved to perform a number of abominable acts. This can include: sexual servitude on the streets of New York City;[2] adult labor in the coltan mines of the Congo;[3] child slavery in the shrimp farms of Bangladesh; or forced domestic servitude in the suburbs of Los Angeles.[4] Compounding the matter is that enslaved persons can spend years—sometimes decades—under such conditions.[5] This can sometimes lead to slavery lasting across several generations. Short of homicide, slavery is one of the most inhumane crimes one person can commit against another.

In recent years, a number of governments and international governmental organizations have addressed modern day slavery at home and abroad. In the United States, Congress passed the Victims of Trafficking and Violence Protection Act (TVPA) in 2000. The TVPA established the President's Interagency Task Force to Monitor and Combat Trafficking—a cabinet-level group whose mission is to coordinate efforts to combat trafficking in persons—led by the U.S. State Department. Since then, the State Department has produced its annual Trafficking in Persons (TIP) Report, which has become "the U.S. Government's principal diplomatic tool to engage foreign governments on human trafficking."[6] Although not without controversy, the TIP Report has educated many on the sources and impact of modern day slavery.[7]

On the global stage, between 2000 and 2001 the United Nations General Assembly adopted three protocols to its Convention against Transnational Organized Crime: (1) the Protocol to Prevent, Suppress and Punish Trafficking in Persons, especially Women and Children; (2) the Protocol against the Smuggling of Migrants by Land, Sea, and Air; and (3) the Protocol against the Illicit Manufacturing and Trafficking in Firearms. With 117 signatory countries, these protocols, known as the Palermo Protocols, advanced the global discussion not only on what constitutes contemporary slavery, but also on what the international community can do to mitigate its spread.

Although some may argue that international agreements like the Palermo Protocols and documents like the TIP Report matter only marginally,[8] others counter they catalyze change.[9] Building upon a crest of public awareness on human trafficking, U.S. President Barack Obama proclaimed in 2012 at the Clinton Global Initiative, "We are turning the tables on the traffickers. Just as they are now using technology and the Internet to exploit their victims, we are going to harness technology to stop them."[10]

Although he did not mention it explicitly, President Obama was referring to the idea of using big data to mitigate contemporary slavery. As Pulitzer-prize winning journalist Steve Lohr explains, big data is "shorthand for advancing trends in technology that open the door to a new approach to understanding the world and making decisions."[11] This typically involves using software to find trends and patterns in large amounts of aggregated data from the Internet, sometimes from publicly available data, and other times from clandestinely obtained data.

Along the lines of utilizing publicly available data, the tech-giant Google announced in April 2013 a big data partnership with the Polaris

Project, an antislavery NGO in Washington, D.C. The partnership, called the Global Human Trafficking Hotline Network, aims to use data mining software to identify human trafficking trends from the hotline that can eventually inform "eradication, prevention, and victim protection strategies."[12]

Although using big data to fight trafficking is new, the idea has been demonstrated by scholars like Mark Latonero of the Annenberg Center on Communication Leadership & Policy at the University of Southern California. Latonero's team partnered with local law enforcement agencies in Los Angeles, explored trends in human trafficking on websites like Backpage.com, and applied this information to target specific traffickers. This was done by mining data from advertisements for the sexual services of domestic minors on the adult section of Backpage in the Greater Los Angeles area, and identifying the phone numbers from those ads that appeared in the greatest frequencies. With this information, Latonero's team was able to provide law enforcement with data linking certain phone numbers to criminal networks.

The U.S. government is also using big data to mine private information networks, not on the World Wide Web, but on what is called the Deep Web— that part of the Internet that is not searchable on databases like Google. The Defense Advanced Research Projects Agency (DARPA), a branch of the U.S. military, recently launched a program called Memex to hunt criminal networks on the Deep Web. The first domain DARPA intends to undercover with this new technology is human trafficking.[13]

These developments in big data dovetail with a broader discussion within academia about how social science researchers can apply quantitative methods to estimate trends in contemporary slavery. Although rigorous, many studies of modern day slavery only exist in the policy and academic communities, and very few published works actually employ quantitative methods. In a comprehensive review of the research-based literature on contemporary slavery, Elżbieta M. Goździak and Micah N. Bump of Georgetown University found that, of 218 research-based journal articles, only seven (about 3 percent) were based on quantitative methods. Without hard data, it can be challenging for scholars to make generalizable inferences to inform policy.

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In this paper, using big data as a backdrop, I discuss some novel quantitative methods employed by two NGOs I have worked with that shed light on contemporary slavery. The first NGO, the Walk Free Foundation, estimates that there are about 30 million enslaved in the world today. The second NGO, Free the Slaves, working with its local Indian partner, MSEMVS, assesses the lives of survivors and how they are reintegrating into society. The acquisition and dissemination of such information is crucial because

policymakers and donors sometimes require hard data before committing time, political will, and resources to the cause.

The Walk Free Foundation

Australian philanthropists Andrew and Nicola Forrest established the Walk Free Foundation (Walk Free)[14] three years ago to eradicate contemporary slavery. After meeting with Microsoft co-founder Bill Gates, Andrew Forrest was inspired to explore the underpinnings of contemporary slavery using quantitative methods. As Forrest recounts, "Global modern slavery is hard to measure, and Bill's a measure kind of guy," adding, "in management speak, if you can't measure it, it doesn't exist."[15] For Forrest, it was important to inform people in the business and policy worlds of the extent to which slavery exists, country-by-country, to prompt action. Although some quantitative assessments of contemporary slavery existed, very little was publicly available. Forrest sought to collect more precise data to disseminate freely and thus launched a Global Slavery Index (GSI), on which I have been working since 2012.[16]

The 2013 GSI ranks 162 of the world's nations in terms of their level of contemporary slavery. Methodologically, these rankings are based on several factors; the most novel is an estimation of the proportion of the population enslaved in each country. For this measure, the GSI team (led by Kevin Bales and Fiona David) has drawn upon secondary source data analysis that Bales pioneered for his book, *Disposable People*, and later disseminated in *Scientific American*.[17] These secondary sources consisted of a review of the public record, including materials from published reports from governments, the investigations of NGOs and international organizations, and journalistic reports. The GSI team has also drawn upon data from representative random sample surveys to extrapolate the prevalence of slavery for selected comparable countries. Figure 1 illustrates the 2013 GSI data for the proportion of the population estimated to be enslaved.

In Figure 1 the countries with darker shades indicate a corresponding higher proportion of enslavement. Some of the countries with the highest proportions are Haiti (about 2.1 percent of the population enslaved), Mauritania (about 4.0 percent of the population enslaved), Pakistan (about 1.2 percent of the population enslaved), and India (about 1.1 percent of the population enslaved).

> . . . 29.8 million are enslaved among the 162 countries under study.

Table 1 lists the 2013 GSI data in terms of the total estimated number of the enslaved, country-by-country. This is a novel contribution compared to other estimates of contemporary slavery. Such information can be useful to business people, policymakers, and students who want a more informed understanding of where slavery occurs and with what frequency.

Overall, the 2013 GSI estimates about 29.8 million are enslaved among the 162 countries under study. The country with the least number of esti-

Figure 1. Global Slavery Index (GSI)—Proportion of the Population Estimated Enslaved in 2013
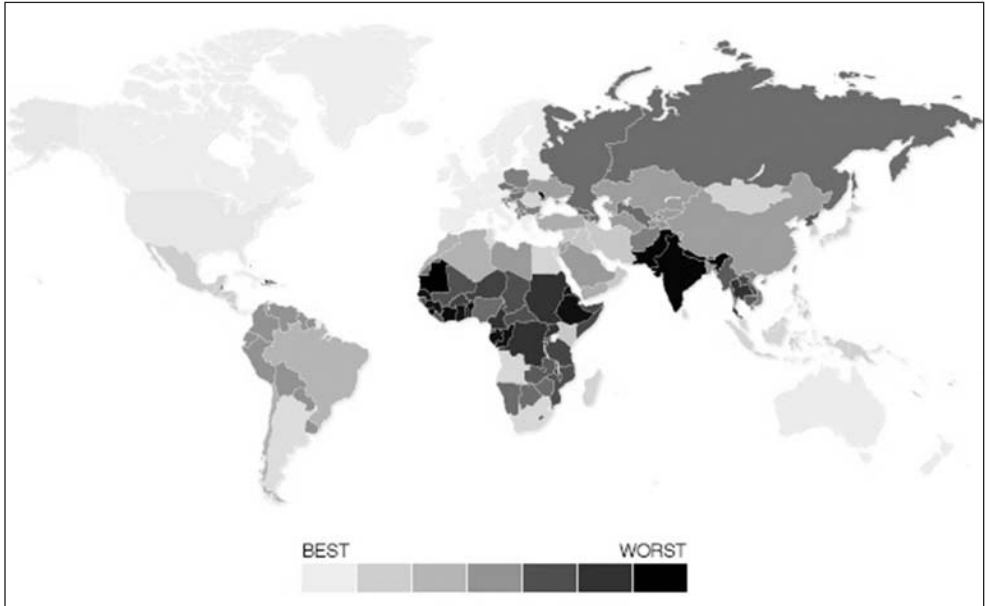
mated enslaved in 2013 was Iceland (twenty-two enslaved), and the country with the greatest number was India (13.9 million enslaved). The standard deviation (or spread) was extremely large: about 1.2 million enslaved.

One important question is if the GSI has made a difference in the real world. One way to shed light on this is to explore some of the statistics achieved since the GSI's launch in October 2013. To date, the GSI has received over half a million website visits. There have been over thirteen thousand downloads of the full report, available in English, Arabic, French, and Spanish. Moreover, there have been over fifteen hundred media reports about the GSI in over thirty-five countries, including *The Economist*,[18] *Die Standaard*,[19] *La Vanguardia*,[20] *CNN*,[21] *National Public Radio*,[22] and *Time*.[23]

Some of the media reports about the GSI illustrate how it can generate discussion on an underreported issue. In India, for instance, where the GSI estimates the greatest number of the enslaved to be, media response has been strong. *The Times of India* reported, "Sixty-six years after independence, India has the dubious distinction of being home to half the number of modern-day slaves in the world."[24] Perhaps due to such sentiments, the *Hindustan Times* discussed the causes of slavery in India and observed, "Some of the reasons for high numbers caught in slavery in India are the difficulty in accessing protections and government entitlements, such as the food rations card, corruption or non-performance of safety nets (such as the National Employment Guarantee, primary health care and pensions) and practices of land grabbing and asset domination by high-caste groups."[25]

There is also some evidence that the GSI has begun to influence government policy. In January of this year, building upon the momentum of the GSI, Andrew Forrest signed a memorandum of understanding (MOU)

Table 1. Global Slavery Index—Estimated Enslaved in 2013

Country	Estimated Enslaved	Country	Estimated Enslaved
Afghanistan	86,089	Lebanon	4,028
Albania	11,372	Lesotho	14,560
Algeria	70,860	Liberia	29,504
Angola	16,767	Libya	17,683
Argentina	35,368	Lithuania	2,909
Armenia	10,678	Luxembourg	69
Australia	3,167	Macedonia	6,226
Austria	1,100	Madagascar	19,184
Azerbaijan	33,439	Malawi	110,391
Bahrain	2,679	Malaysia	25,260
Bangladesh	343,192	Mali	102,240
Barbados	46	Mauritania	151,353
Belarus	11,497	Mauritius	535
Belgium	1,448	Mexico	103,010
Benin	80,371	Moldova	33,325
Bolivia	29,886	Mongolia	4,729
Bosnia and Herzegovina	13,789	Montenegro	2,234
Botswana	14,298	Morocco	50,593
Brazil	209,622	Mozambique	173,493
Brunei	417	Myanmar	384,037
Bulgaria	27,739	Namibia	15,729
Burkina Faso	114,745	Nepal	258,806
Burundi	71,146	Netherlands	2,180
Cambodia	106,507	New Zealand	495
Cameroon	153,258	Nicaragua	5,798
Canada	5,863	Niger	121,249
Cape Verde	3,688	Nigeria	701,032
Central African Republic	32,174	Norway	652
Chad	86,329	Oman	5,739
Chile	37,846	Pakistan	2,127,132
China	2,949,243	Panama	548
Colombia	129,923	Papua New Guinea	6,131
Costa Rica	679	Paraguay	19,602
Côte d'Ivoire	156,827	Peru	82,272
Croatia	15,346	Philippines	149,973
Cuba	2,116	Poland	138,619
Czech Republic	37,817	Portugal	1,368
Democratic Republic of the Congo	462,327	Qatar	4,168
Denmark	727	Republic of the Congo	30,889
Djibouti	2,929	Romania	24,141
Dominican Republic	23,183	Russia	516,217
Ecuador	44,072	Rwanda	80,284
Egypt	69,372	Saudi Arabia	57,504
El Salvador	10,490	Senegal	102,481

Equatorial Guinea	5,453	Serbia	25,981
Eritrea	44,452	Sierra Leone	44,644
Estonia	1,496	Singapore	1,105
Ethiopia	651,110	Slovakia	19,458
Finland	704	Slovenia	7,402
France	8,541	Somalia	73,156
Gabon	13,707	South Africa	44,545
Gambia	14,046	South Korea	10,451
Georgia	16,227	Spain	6,008
Germany	10,646	Sri Lanka	19,267
Ghana	181,038	Sudan	264,518
Greece	1,466	Suriname	1,522
Guatemala	13,194	Swaziland	1,302
Guinea	82,198	Sweden	1,237
Guinea-Bissau	12,186	Switzerland	1,040
Guyana	2,264	Syria	19,234
Haiti	209,165	Tajikistan	23,802
Honduras	7,503	Tanzania	329,503
Hong Kong, SAR China	1,543	Thailand	472,811
Hungary	35,763	Timor-Leste	1,020
Iceland	22	Togo	48,794
India	13,956,010	Trinidad and Tobago	486
Indonesia	210,970	Tunisia	9,271
Iran	65,312	Turkey	120,201
Iraq	28,252	Turkmenistan	14,711
Ireland	321	Uganda	254,541
Israel	8,096	Ukraine	112,895
Italy	7,919	United Arab Emirates	18,713
Jamaica	2,386	United Kingdom	4,426
Japan	80,032	United States	59,644
Jordan	12,843	Uruguay	9,978
Kazakhstan	46,668	Uzbekistan	166,667
Kenya	37,349	Venezuela	79,629
Kuwait	6,608	Vietnam	248,705
Kyrgyzstan	16,027	Yemen	41,303
Laos	50,440	Zambia	96,175
Latvia	2,040	Zimbabwe	93,749

Source: The Global Slavery Index

with the Pakistani State of Punjab. In the business world, that a government would sign a deal with a businessman to help eradicate slavery in its own borders is atypical. Yet Forrest was able to leverage his influence in Pakistan to encourage a conversation that aims to provide the state of Punjab with inexpensive coal in exchange for assurances that the government will work toward the liberation of its own people. [26] Although it is too early to see how Pakistan will hold up to its promise, this agreement may herald future MOUs between NGOs like Walk Free and governments that want to mitigate slavery, and one day even eradicate it.

The GSI may also be influencing heads of state. Former U.S. President Jimmy Carter references the GSI several times in his new bestselling book, *A Call to Action: Women, Religion, Violence, and Power*. And the GSI has been publicly endorsed by, among others, Hillary Clinton, Gordon Brown, Julia Gillard, and Tony Blair.[27]

Free the Slaves

The GSI strives to use big data to count the number of slaves in the world. Other NGOs have begun to employ longitudinal techniques to chronicle the lives of survivors of slavery once they are free. One such NGO is Free the Slaves (FTS), which Kevin Bales, Peggy Callahan, and Jolene Smith co-founded in 2000 as the sister-organization of Anti-Slavery International (the oldest international human rights organization in the world).[28]

Early in its evolution, FTS reasoned that the liberation of any slave would be beneficial not only for that individual, but also for the community, and thus produce a "freedom dividend," multiplied by each additional person freed. As FTS explains, "Local communities thrive when formerly enslaved people start their own businesses; communities begin to flourish as people come together to organize and watch out for one another; children go to school—and the benefits extend for generations." [29]

For the past decade, FTS has partnered with different grassroots organizations in Haiti, India, Nepal, Ghana, the Democratic Republic of Congo, and Brazil to empower local communities of the enslaved to seek liberation. In India, FTS has worked with a local grassroots organization called Mina Sansadham Evam Mahila Vikas Sansthan (MSEMVS).[30] Through the efforts of MSEMVS, over 150 villages have eradicated slavery and trafficking in recent years and many more are beginning to experience liberation in the North Indian States of Uttar Pradesh and Bihar, two of India's poorest states, as Figure 2 highlights.

In addition to empowering people in rural Uttar Pradesh to seek liberation, MSEMVS has been among the first NGOs to begin several longitudinal studies on the effects, in addition to quantitative studies of the predictive factors of enslavement. The studies are intended to provide insight into: (1) whether slavery and trafficking have been eradicated; and (2) whether the socio-economic conditions of people living in these communities have improved. I consulted with Free the Slaves at this time, and, along with Ginny Baumann, Jody Sarich, Austin Choi-Fitzpatrick, and Jessica Leslie, helped put together a follow-up report for the village of Kukrouthi in Uttar Pradesh.

The follow-up report was conducted among the residents of three hamlets in Kukrouthi village.[31] There were two sources of information: The first was a set of 120 household level surveys, and the second was a set of focus group discussions. A total of 929 people were accounted for by the surveys. The time periods under comparison were 2009 (when the liberation process began) and 2011 (when the process of self-liberation by local residents was completed).

Figure 2. Uttar Pradesh, North India

Some of the key findings between the 2009 and 2011 studies are as follows, providing credence to FTS's supposition of there being a "freedom dividend" after liberation.

Growth in Childhood Education
One important indicator of a freedom dividend in Kukrouthi village is the number of children in school. The underlying premise is that in free communities children receive better education, which fuels a society's human capital. In Kukrouthi, the team from MSEVMS found evidence of significant growth in childhood education rates. Whereas in 2009 only 69 percent of the school-aged children were reported to be in school, by 2011, 91 percent were enrolled, as Figure 3 illustrates.

Figure 3. Percent Children in School in Kukrouthi, 2009 and 2011
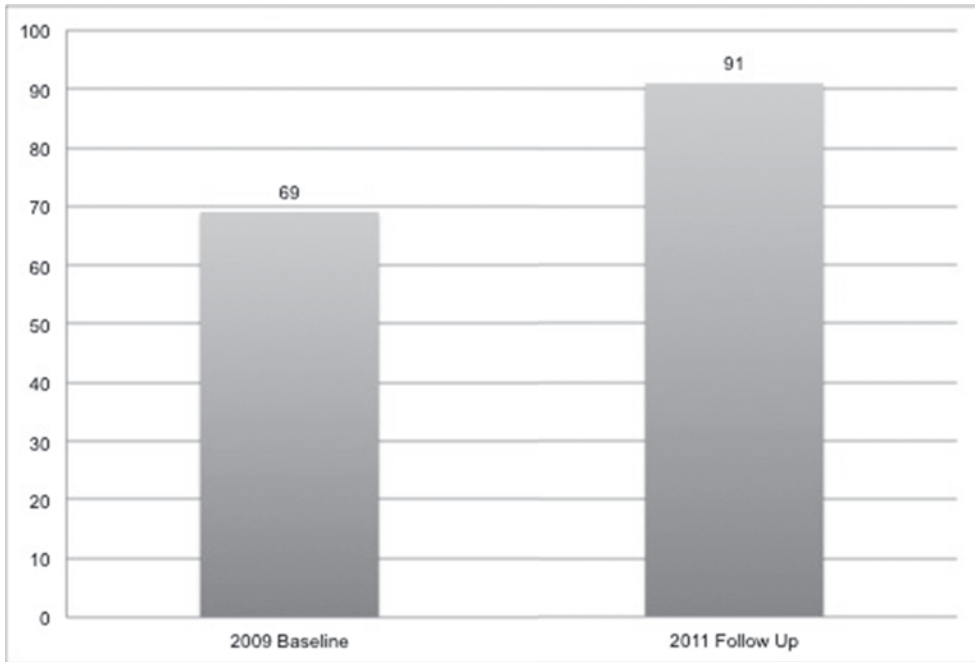
Better Nutrition
Another key indicator illuminating the freedom dividend is access to adequate nutrition. As with childhood education, the team from MSEVMS reported a dramatic increase in the number of families that were able to eat three meals a day, from 31 percent in 2009 to 71 percent in 2011. This was more than a 200 percent increase, as Table 2 details.

**Table 2. Number of Daily Meals By
Household in Kukrouthi, 2009 and 2011**

Number of Meals	Year	Percentage
Two Meals Per Day	2011	22%
	2009	31%
Three Meals Per Day	2011	71%
	2009	31%
No Response	2011	8%
	2009	3%

Improved Access to Health Care

Yet another strong indicator of a freedom dividend is access to health care, even if of rudimentary quality. In 2011, MSEVMS reported that almost the entire population of Kukrouthi village had access to healthcare. This was another dramatic increase compared to 2009, when MSEVMS found that just 52 percent of families received health care treatment. Table 3 provides a breakdown of this comparison.

Table 3. Comparison of Access to Health Care in Kukrouthi, 2009 and 2011

Access to Health Care	Year	Percent
Yes	2011	96%
	2009	57%
No	2011	3%
	2009	43%
Don't Know	2011	1%
	2009	.
No Response	2011	1%
	2009	1%

Improvement in Childhood Vaccinations

Lastly, in 2009, just one-third of children had the proper number of recommended vaccinations (i.e., three vaccinations). By 2011, this had increased to 90 percent, as Table 4 shows.

Table 4. Comparison of Child Vaccinations in Kukrouthi, 2009 and 2011

Immunizations	Year	Percentage
None	2011	.
	2009	49%
One	2011	3%
	2009	7%
Two	2011	7%
	2009	12%
Three	2011	90%
	2009	33%

A World Without Slavery

Applying quantitative methods to the study of contemporary slavery could contribute significantly to shedding more light on the phenomenon. In collaboration with my colleagues at the Walk Free Foundation, I have used quantitative methods to estimate the total number of enslaved in the world today. This, in turn, has generated discussion among the media and policy community on how to mitigate modern day slavery, with an eye toward its eradication. With Free the Slaves and MSEVMS, we

> Applying quantitative methods to the study of contemporary slavery could contribute significantly to shedding more light on the phenomenon.

have begun to chronicle systematically how communities can benefit from freedom. This information provides preliminary evidence to policy makers that liberating slaves provides a wide range of socioeconomic benefits.

The modern day anti-slavery movement is young. Moving forward, we need more scholars and policy makers who want to explore what quantitative methods and big data can do for the movement. We are at a point in the world where everyone agrees that contemporary slavery is a wrong that must be addressed. The time is ripe for further discussion on how to make this a reality. I hope we can get there, at least in part, through employing quantitative methods and exploring big data.

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