



Evaluating Strategies for Achieving Global Collective Action on Transnational Health Threats and Social Inequalities

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EVALUATING STRATEGIES FOR ACHIEVING GLOBAL COLLECTIVE ACTION ON
TRANSNATIONAL HEALTH THREATS AND SOCIAL INEQUALITIES

A DISSERTATION PRESENTED
BY
STEVEN JUSTIN HOFFMAN
TO
THE COMMITTEE ON HIGHER DEGREES IN HEALTH POLICY

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF

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HEALTH POLICY

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Evaluating Strategies for Achieving Global Collective Action on
Transnational Health Threats and Social Inequalities

Abstract

This dissertation presents three studies that evaluate different strategies for addressing transnational health threats and social inequalities that depend upon or would benefit from global collective action. Each draws upon different academic disciplines, methods and epistemological traditions.

Chapter 1 assesses the role of international law in addressing global health challenges, specifically examining when, how and why global health treaties may be helpful. Evidence from 90 quantitative impact evaluations of past treaties was synthesized to uncover what impact can be expected from global health treaties, and based on these results, an analytic framework was developed to help determine when proposals for new global health treaties have reasonable prospects for yielding net positive effects. Findings from the evidence synthesis suggest that treaties consistently succeed in shaping economic matters and consistently fail in achieving social progress. There are three differences between these domains which point to design characteristics that new global health treaties can incorporate to achieve positive impact: 1) *incentives* for those with power to act upon them; 2) *institutions* designed to bring edicts into effect; and 3) *interests* advocating for their negotiation, adoption, ratification and domestic implementation. The chapter concludes by presenting an analytic framework and four criteria for determining which proposals for new global health treaties should be pursued. First, there must be a *significant transnational dimension* to the problem being addressed. Second, the goals should *justify the coercive nature of treaties*. Third, proposed global health treaties should have a *reasonable chance of achieving benefits*. Fourth, treaties should be the *best commitment*

mechanism among the many competing alternatives. Applying this analytic framework to nine recent calls for new global health treaties reveals that none fully meet the four criteria. This finding suggests that efforts aiming to better utilize or revise existing international instruments may be more productive than advocating for new treaties. The one exception is the additional transnational health threat of antimicrobial resistance, which probably meets all four criteria.

Chapter 2 builds on this work by evaluating a broad range of opportunities for working towards global collective action on antimicrobial resistance. Access to antimicrobials and the sustainability of their effectiveness are undermined by deep-seated failures in both global governance and global markets. These failures can be conceptualized as political economy challenges unique to each antimicrobial policy goal, including global commons dilemmas, negative externalities, unrealized positive externalities, coordination issues and free-rider problems. Many actors, instruments and initiatives that form part of the global antimicrobial regime are addressing these challenges, yet they are insufficiently coordinated, compliant, led or financed. Taking an evidence-based approach to global strategy reveals at least ten options for promoting collective action on antimicrobial access, conservation and innovation, including those that involve building institutions, crafting incentives and mobilizing interests. While no single option is individually sufficient to tackle all political economy challenges facing the global antimicrobial regime, the most promising options seem to be monitored milestones (institution), an inter-agency task force (institution), a global pooled fund (incentive) and a special representative (interest mobilizer), perhaps with an international antimicrobial treaty driving forward their implementation. Whichever are chosen, this chapter argues that their real-world impact will depend on strong accountability relationships and robust accountability mechanisms that facilitate transparency, oversight, complaint, and enforcement. Such relationships and mechanisms, if designed properly, can promote compliance and help bring about the changes that the negotiators of any new international agreement on antimicrobial resistance will likely be aspiring to achieve. Progress should be possible if

only we find the right mix of options matched with the right forum and accountability mechanisms, and if we make this grand bargain politically possible by ensuring it simultaneously addresses all three imperatives for antimicrobials – namely access, conservation and innovation.

Chapter 3 takes this dissertation beyond traditional Westphalian notions of collective action by exploring whether new disruptive technologies like cheap supercomputers, open-access statistical software, and canned packages for machine learning can theoretically provide the same global regulatory effects on health matters as state-negotiated international agreements. This kind of “techno-regulation” may be especially helpful for issues and areas of activity that are hard to control or where governments cannot reach. One example is news media coverage of health issues, which is currently far from optimal – especially during crises like pandemics – and which may be difficult to regulate through traditional strategies given constitutional freedoms of expression and the press. But techno-regulating news media coverage might be possible if there was a feasible way of automatically measuring desirable attributes of news records in real-time and disseminating the results widely, thereby incentivizing news media organizations to compete for better scores and reputational advantage. As a first move, this third chapter presents a relatively simple maximum entropy machine-learning model that automatically quantifies the relevance, scientific quality and sensationalism of news media records, and validates the model on a corpus of 163,433 news records mentioning the recent SARS and H1N1 pandemics. This involved optimizing retrieval of relevant news records, using specially tailored tools for scoring these qualities on a randomly sampled training set of 500 news records, processing the training set into a document-term matrix, utilizing a maximum entropy model for inductive machine learning to identify relationships that distinguish differently scored news records, computationally applying these relationships to classify other news records, and validating the model using a test set that compares computer and human judgments. Estimates of overall scientific quality and sensationalism based on the 500 human-scored news records were 3.17 (“potentially important but not critical shortcomings”) and

1.81 (“not too much sensationalizing”) out of 5, respectively, and updated by the computer model to 3.32 and 1.73 out of 5 after including information from 10,000 records. This confirms that news media coverage of pandemic outbreaks is far from perfect, especially its scientific quality if not also its sensationalism. The accuracy of computer scoring of individual news records for relevance, quality and sensationalism was 86%, 65% and 73%, respectively. The chapter concludes by arguing that these findings demonstrate how automated methods can evaluate news records faster, cheaper and possibly better than humans – suggesting that techno-regulating health news coverage is feasible – and that the specific procedure implemented in this study can at the very least identify subsets of news records that are far more likely to have particular scientific and discursive qualities.

Prospects for achieving global collective action on transnational health threats and social inequalities would be improved if greater efforts were taken to systematically take stock of the full-range of strategies available and to scientifically evaluate their potential effectiveness. This dissertation presents three studies that do so, which together showcase the diversity of approaches that can be mustered in pursuit of this goal.

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Chapter 1

The Role of International Law in Addressing Global Health Challenges*

Abstract

Recently there have been many calls for new global health treaties without consideration for when, how and why they may be helpful. In the first part of this chapter, we assess what impact can be expected from global health treaties based on 90 quantitative impact evaluations of treaties on trade, finance, human rights, conflict and the environment. While evidence is mixed, it appears treaties consistently succeed in shaping economic matters and consistently fail in achieving social progress. There are three differences between these domains which point to design characteristics that new global health treaties can incorporate to achieve positive impact: 1) *incentives* for those with power to act upon them; 2) *institutions* designed to bring edicts into effect; and 3) *interests* advocating for their negotiation, adoption, ratification and domestic implementation. Experimental and quasi-experimental evaluations of treaties would provide more information about what can be expected from this type of global intervention. In the second part of this chapter, we present an analytic framework and four criteria for assessing when global health treaties have reasonable prospects of yielding net positive effects. First, there must be a *significant transnational dimension* to the problem being addressed. Second, the goals should *justify the coercive nature of treaties*. Third, proposed global health treaties should have a *reasonable chance of achieving benefits*. Fourth, treaties should be the *best commitment mechanism* among the many competing alternatives. Applying this analytic framework to nine recent calls for new global health treaties reveals that none fully meet the four criteria. Efforts aiming to better utilize or revise existing international instruments may be more productive than advocating for new treaties. The one exception is the additional transnational health threat of antimicrobial resistance, which probably meets all four criteria.

* Co-authored with John-Arne Røttingen and Julio Frenk.

Introduction

There have been many calls over the past few years for new international treaties addressing health issues, including alcohol,¹ chronic diseases,² falsified/substandard medicines,³ health system corruption,⁴ obesity⁵ impact evaluations,⁶ nutrition,⁷ research and development (R&D),⁸ and global health broadly.⁹ These calls follow the perceived success of past global health treaties – most notably the *Framework Convention on Tobacco Control* (2002) and the revised *International Health Regulations* (2005) – and perceived potential for future impact.¹⁰ The World Health Organization's (WHO's) unusually expansive yet largely dormant powers for making new international treaties under Articles 19 and 21 of its Constitution are also cited as a reason for using them.¹¹⁻¹³ While few multilateral institutions are empowered to enact new treaties, in WHO's case, with just a majority vote of its governing assembly new regulations can automatically enter into force for all member states on communicable disease control, medical nomenclature, diagnostic standards, health product safety, labelling, and advertising unless states specifically opt-out (Article 21). Treaties in other health areas can be adopted by a two-thirds vote of WHO's membership, with non-accepting states legally required to take the unusual step of justifying their non-acceptance (Article 19).¹⁴

The impact that can be expected from any new global health treaty, however, is as yet largely unknown. Negotiation, adoption, ratification and even domestic implementation of treaties do not guarantee achievement of the results that are sought. Contemporary history has shown how some states comply with international treaties while others neglect their responsibilities. Even those states that mostly comply with their international legal obligations do not necessary comply with all of them. Citizens in the most prosperous and powerful countries may be surprised by the extent to which their own governments break international law and skirt responsibilities – well-beyond what may be commonly assumed. Often states are even quite open about acknowledging their non-compliance, whether in statements to the media or in formal reports to international institutions.¹⁵ Perhaps most

concerning is that even if we assume all international treaties cause at least some effects, there is no reason to believe these effects will all be intended and desirable. For international treaty-making can be used strategically by states to buy time before needing to act, placate domestic constituencies without changing domestic policies, provide a distraction from dissatisfaction, hide more pressing challenges, and justify unsavory expenditures. Ratifying international treaties can even provide political cover for engaging in more harmful behaviors – like state-sponsored torture – than what was done or may have been acceptable before.¹⁵⁻¹⁶ In this way, advocates of new global health treaties cannot be sure whether they are successfully promoting their goals or unintentionally helping states undermine the very objectives they so earnestly seek fulfilled.

The most obvious starting point to assess what impact can be expected from global health treaties would be evaluations of existing global health treaties (see Panel 1.1). Unfortunately, few studies to date have empirically measured the real-world impact of global health treaties across countries. Three studies modelled the *Framework Convention on Tobacco Control's* influence on national policies, finding the treaty and its negotiation process were associated with certain countries adopting stronger tobacco control measures faster.²⁰⁻²² While not actually a treaty, one study qualitatively evaluated the perceived effectiveness of the *WHO Global Code of Practice on the International Recruitment of Health Personnel*, finding it had no effect on 93% of key informants surveyed.²³

Panel 1.1: Global Health Treaties

Year Adopted	Treaty Name
1892	International Sanitary Convention
1893	International Sanitary Convention
1894	International Sanitary Convention
1897	International Sanitary Convention
1903	International Sanitary Convention (replacing 1892, 1893, 1894 and 1897 conventions)
1912	International Sanitary Convention (replacing 1903 convention)
1924	Brussels Agreement for Free Treatment of Venereal Disease in Merchant Seamen
1926	International Sanitary Convention (revising 1912 convention)
1933	International Sanitary Convention for Aerial Navigation

Panel 1.1: Global Health Treaties (Continued)

1934	International Convention for Mutual Protection Against Dengue Fever
1938	International Sanitary Convention (revising 1926 convention)
1944	International Sanitary Convention (revising 1926 convention)
1944	International Sanitary Convention for Aerial Navigation (revising 1933 convention)
1946	Protocols to Prolong the 1944 International Sanitary Conventions
1946	Constitution of the World Health Organization
1951	International Sanitary Regulations (replacing previous conventions)
1969	International Health Regulations (replacing 1951 regulations)
1972	Biological Weapons Convention
1989	Basel Convention on Transboundary Movements of Hazardous Wastes and their Disposal
1993	Chemical Weapons Convention
1994	WTO Agreement on the Application of Sanitary and Phytosanitary Measures
1997	Convention on the Prohibition of Anti-Personnel Mines and their Destruction
1998	Rotterdam Convention on Hazardous Chemicals and Pesticides in International Trade
2000	Cartagena Protocol on Biosafety to the Convention on Biological Diversity
2001	Stockholm Convention on Persistent Organic Pollutants
2003	World Health Organization Framework Convention on Tobacco Control
2005	International Health Regulations (revising 1969 regulations)
2013	Minamata Convention on Mercury

Global health treaties are those that were adopted primarily to promote human health.

Fortunately, evidence of international treaties' effects in other policy areas is rapidly expanding and can be used to inform judgments about what impact can be expected from existing and proposed global health treaties. In fact, the precise effects of international treaties, their causal pathways, and the conditions under which these pathways function currently represents one of the most heavily debated issues and contested puzzles in the fields of international law and international relations.¹⁷⁻¹⁸ This includes at least 90 quantitative studies evaluating the impact of international trade treaties,²⁴⁻³² international financial treaties,³³⁻⁶⁷ international human rights treaties,⁶⁸⁻⁹⁸ international humanitarian treaties,⁹⁹⁻¹⁰⁵ and international environmental treaties.¹⁰⁶⁻¹¹⁵

In the first part of this chapter, we summarize these 90 quantitative impact evaluations of international treaties to assess what impact can be expected from existing and proposed global health treaties. First, findings are summarized by policy area. This is important because global health treaties are diverse, with some proposals most reminiscent of international human rights treaties that promote norms (e.g., proposed health R&D treaty), international humanitarian treaties that constrain state

behavior (e.g., proposed global health corruption protocol), international environmental treaties that impose regulatory obligations (e.g., proposed framework convention on alcohol control), and international trade treaties that regulate cross-border interactions (e.g., proposed falsified/substandard medicines treaty). Second, results from existing quantitative impact evaluations are summarized by type of objectives sought. This is important because global health treaties have different goals, from changing national government policies to altering people, places or products.¹⁹ Appendix 1 presents a concise summary of each quantitative impact evaluation individually for additional detail. The second part of this chapter develops an analytic framework for identifying when new global health treaties may be worth their costs.

Part 1: Assessing the Expected Impact of Global Health Treaties

Assessing Impact by Policy Area

As with any complex regulatory intervention, the impact of international treaties varies greatly depending on the problems being addressed and the contexts in which they operate.¹⁸ Evaluations of international trade treaties, for example, have overwhelmingly found they encourage liberal trade policies and increase trade flows among participating states as intended. International financial treaties have similarly been found to reduce financial transaction restrictions and increase financial flows. Less evident is the impact of human rights treaties. These treaties have been found to improve respect for civil and political rights, but only in countries with particular domestic institutions such as democracy,⁷¹ civil society,¹¹⁶⁻¹¹⁷ and judicial independence.¹¹⁸ International criminal treaties appear even more contested and uncertain. Some scholars have found war crimes prosecutions to have no effect on violations¹¹⁹ – with some even claiming it can worsen matters by lowering losing parties’ incentives to make peace¹²⁰ – whereas others have found it improves post-conflict reconstruction efforts by facilitating transitional justice.⁸⁵ International environmental treaties’ effects are similarly debated.

Some argue they can improve environmental protection,¹⁰⁶ especially by incentivizing private sector action,¹²¹ and others contend they merely codify existing practices, preferring incremental approaches that use non-treaty political mechanisms.¹²²

When categorizing each of the 90 quantitative impact evaluations according to whether they found positive, negative or no effects – defined based on the treaties’ own stated purposes as found in the preamble text – it appears that trade and finance is where international treaties have been most “successful” (see Panel 1.2 and 1.3). The nine studies evaluating international trade treaties overall found them to reduce trade volatility and increase trade flows,³¹ particularly between member states of the *General Agreement on Tariffs & Trade* (GATT) and World Trade Organization (WTO),²⁸ but also among non-member participants.²⁹ Preferential trade agreements conditional on human rights standards were associated with less repression than preferential trade agreements without them.²⁷ Although some studies suggest international trade treaties do not guarantee increased trade flows²⁵ and that any increases may be limited to industrialized states and liberalized economic sectors.²⁶⁻²⁷ The 33 studies evaluating international financial treaties mostly found they increase foreign investment among participating states,^{33-37,40-41,43-44,46-48,50,53,56-57,59-60,62-67} although some found they had no impact in certain circumstances,^{38-39,42,45,49,51-52,55,57,59,61-62} and others concluded they sometimes diminished investment.⁴⁹⁻

50,54-55,58,65

Panel 1.2: Impact of Different Areas of Laws on Any Outcome Measure

	Negative Impact	No Impact	Positive Impact
			Neumayer (2005) Cardenas (2007) ¹ Simmons (2009a) Simmons (2009b) Simmons (2009c) Greenhill (2010) Kim & Sikkink (2010)
International Human Rights Law (n=31)	Hathaway (2002) Hafner-Burton & Tsutsui (2005) Abouharb & Cingranelli (2007) <i>Basch et al. (2010)</i> Hill Jr. (2010) ² Cole (2011) ³ Conrad (2011) Cole (2013) ⁴ Neumayer (2013) ⁸	Keith (1999) Cardenas (2007) ¹ Hafner-Burton & Tsutsui (2007) Gilligan & Nesbitt (2009) <i>Palmer et al. (2009)</i> Powell & Staton (2009) <i>Hawkins & Jacoby (2010)</i> Kim & Boyle (2012) Conrad & Ritter (2013) ⁵ Lupu (2013a) ⁶ Lupu (2013b) ⁷ Neumayer (2013) ⁸	Linos (2011) Hill Jr. (2010) ² Cole (2011) ³ Hollyer & Rosendorff (2011) <i>Staton & Romero (2011)</i> Cole (2013) ⁴ Conrad & Ritter (2013) ⁵ Helfer & Voeten (2013) Lupu (2013a) ⁶ Lupu (2013b) ⁷ <i>Putnam & Shapiro (2013)</i>
International Humanitarian Law (n=7)	Hafner-Burton & Montgomery (2006) <i>Nooruddin & Payton (2010)</i> ⁹	<i>Meernik (2005)</i> Valentino et al. (2006)	<i>Kelley (2007)</i> Morrow (2007) <i>Simmons & Danner (2010)</i> <i>Nooruddin & Payton (2010)</i> ⁹
International Environmental Law (n=10)	<i>Mitchell (1994)</i> ¹⁰ Murdoch et al. (1997) ¹¹	Murdoch & Sandler (1997) <i>Helm & Sprinz (2000)</i> ¹² <i>Finus & Tjøtta (2003)</i> Ringquist & Kostadinova (2005) <i>Bernauer & Siegfried (2008)</i> ¹³	<i>Mitchell (1994)</i> ¹⁰ Murdoch et al. (1997) ¹¹ <i>Helm & Sprinz (2000)</i> ¹² <i>Miles et al. (2002)</i> <i>Breitmeier et al. (2006)</i> <i>Bernauer & Siegfried (2008)</i> ¹³ <i>Breitmeier et al. (2011)</i>
International Trade Law (n=9)	Hafner-Burton & Montgomery (2012) ¹⁶	Rose (2004) Gowa & Kim (2005) ¹⁴ Hafner-Burton (2005) ¹⁵	Bown (2004) Gowa & Kim (2005) ¹⁴ Hafner-Burton (2005) ¹⁵ Subramanian & Wei (2007) Tomz et al. (2007) Kucik & Reinhardt (2008) Mansfield & Reinhardt (2008) Hafner-Burton & Montgomery (2012) ¹⁶

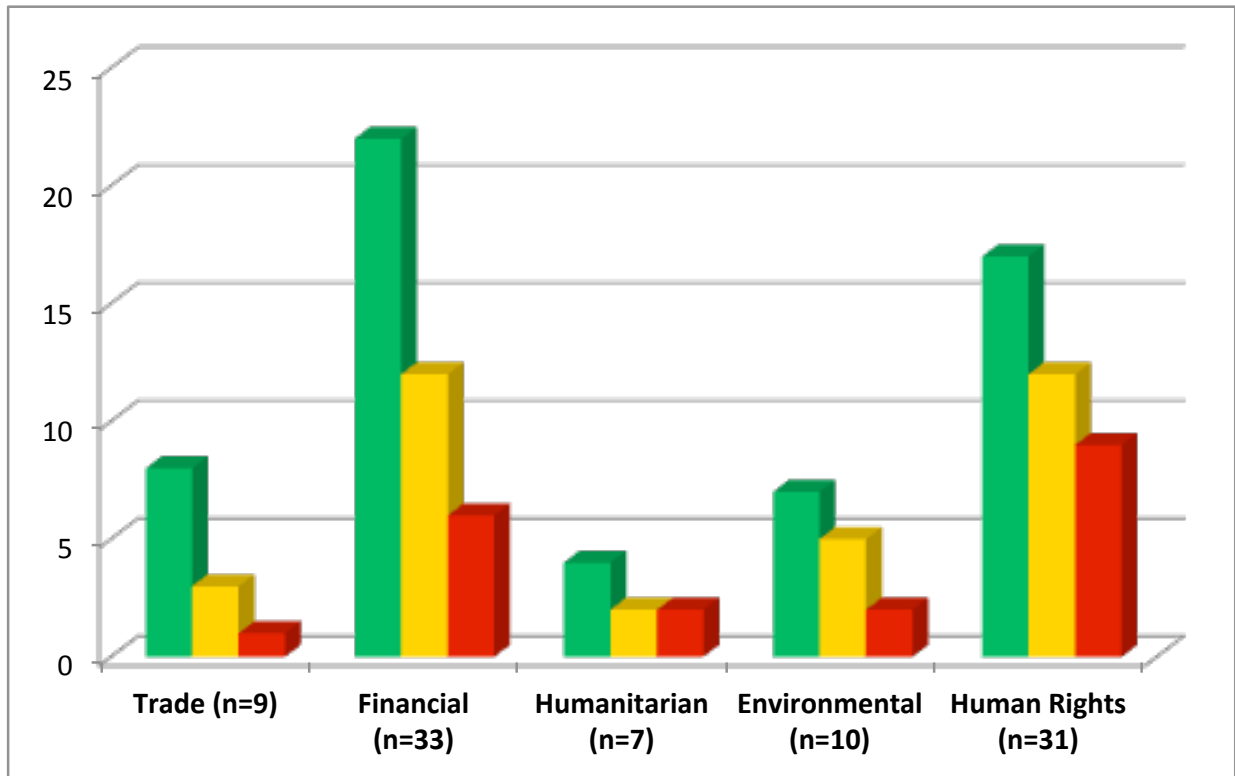
Panel 1.2: Impact of Different Areas of Laws on Any Outcome Measure (Continued)

	Negative Impact	No Impact	Positive Impact
			UNCTAD (1998) Simmons (2000) Banga (2003) Egger & Pfaffermayr (2004) di Giovanni (2005) Grosse & Trevino (2005) Neumayer & Spess (2005) Simmons & Hopkins (2005) <i>Egger & Merlo (2007)</i> Büthe & Milner (2008) <i>Millimet & Kumas (2008)¹⁸</i> Barthel et al. (2009) Büthe & Milner (2009) Coupé et al. (2009) ²⁰ Gallagher & Birch (2009) ²¹ Grieco et al. (2009) Millimet & Kumas (2009) ²² Neumayer (2009) Salacuse & Sullivan (2009) Yackee (2009) ²³ Busse et al. (2010) Tobin & Rose-Ackerman (2011)
International Financial Law (n=33)	Hafner-Burton & Montgomery (2008) ¹⁷ <i>Millimet & Kumas (2008)¹⁸</i> Blonigen & Davies (2009a) Blonigen & Davies (2009b) ¹⁹ <i>Egger et al. (2009)</i> Yackee (2009) ²³	Davies (2003) Hallward-Driemeier (2003) Ginsburg (2005) von Stein (2005) Hafner-Burton & Montgomery (2008) ¹⁷ Yackee (2008) Aisbett (2009) Blonigen & Davies (2009b) ¹⁹ Coupé et al. (2009) ²⁰ Gallagher & Birch (2009) ²¹ <i>Louie & Rousslang (2009)</i> Millimet & Kumas (2009) ²²	
	n = 20	n = 34	n = 59

¹⁻²³ These 23 studies are listed more than once as they featured multiple conclusions about the impact of international law on measured outcomes.

Typeface shading of citations relates to study design. Regular typeface indicates time-series cross-sectional analyses. *Italic* typeface indicates cross-sectional analyses, difference-in-difference analyses, formal model analyses, generalized method of moments analyses, survey designs, time-series analyses, and quantile treatment effect distributional analyses. Studies within each cell are listed in chronological order.

Panel 1.3: Percentage of 90 Studies Showing Positive, Negative and No Impact on Any Outcome Measure by Area of Law



Outcomes were deemed either “positive” or “negative” based on whether they aligned or contradicted treaties’ own stated goals as found in their preamble text. Studies that drew both positive and negative conclusions were coded twice in the bar chart coloring, but only once in the tally of studies presented beside each label.

Assessing Impact by Type of Objective

The impact of international treaties also varies according to the type of objective sought. The good news is that most studies evaluating changes in national government policies found treaties had a positive effect in the direction drafters desired (see Panel 1.4 and 1.5). For example, WTO/GATT membership increased trade liberalization^{24,30} just as the International Monetary Fund’s Articles of Agreement successfully reduced restrictions on financial transactions.^{34-36,46,60} International environmental treaties promoted desired changes in national environmental policies,^{110,113,115} International Labour Organization conventions increased the length of maternity leave,⁸⁹ and the *Rome Statute of the International Criminal Court* has succeeded in preventing immunity agreements for international crimes by state parties.^{102,104}

Panel 1.4: Impact of Treaties on Government Policies by Type of Objective

Outcome	Study Conclusions	Impact	Conditions
1. Civil and political rights (n=12)	• Keith (1999) found ratifying the ICCPR did not improve civil rights practices.	<i>None</i>	
	• Hathaway (2002) found ratifying the ICCPR did not improve civil liberties and did not increase fairness of trials, and ratifying the UN Covenant on the Political Rights of Women did not improve women's ability to take part in government.	<i>None</i>	
	• Neumayer (2005) found ratifying human rights treaties improved civil rights practices in democratic states or states with strong engagement in global civil society.	<i>Positive</i>	<i>Democracy Civil society</i>
	• Abouharb & Cingraelli (2007) found SAAs promoted an institutionalized democracy, freedom of assembly and association, freedom of speech, and free and fair elections.	<i>Positive</i>	
	• Cardenas (2007) found international and domestic human rights pressures did not improve civil rights practices, but increased ratification of human rights treaties in countries without a national security threat, where norm violations would threaten the elites' economic interests, and where pro-human rights groups have public support.	<i>None / positive</i>	<i>Security Elite interests Human rights groups</i>
	• Simmons (2009a) found ratifying the ICCPR slightly improved civil liberties after five years, reduced government restrictions on religious freedoms most strongly in states transitioning between autocracy and democracy, and improved the fairness of trials only in countries transitioning between autocracy and democracy.	<i>Positive</i>	<i>Transitional state</i>
	• Simmons (2009b) found ratifying six international human rights treaties (e.g., ICCPR, ICESCR, CERD, CEDAW, CAT and CRC) improved civil and political rights practices in states transitioning between autocracy and democracy.	<i>Positive</i>	<i>Transitional state</i>
	• Simmons (2009c) found ratifying the ICCPR's Optional Protocol slightly improved civil liberties.	<i>Positive</i>	
	• Hill Jr. (2010) found ratifying the CEDAW improved women's political rights practices.	<i>Positive</i>	
	• Cole (2011) found due process and personal liberty claims filed under the ICCPR's Optional Protocol were more successful than suffrage and family rights claims in HRC rulings.	<i>Both</i>	<i>Claim type</i>
	• Lupu (2013a) found ratifying the ICCPR improved government respect for freedoms of speech, association, assembly and religion.	<i>Positive</i>	
• Lupu (2013b) found ratifying CEDAW improved respect for women's political rights.	<i>Positive</i>		
2. Compliance with court rulings (n=3)	• Basch et al. (2010) found high non-compliance with remedies adopted by the IASHPR, with total compliance observed only after a long period of time.	<i>None</i>	
	• Hawkins & Jacoby (2010) found only partial compliance with rulings of the IACHR and ECtHR.	<i>None</i>	
	• Staton & Romero (2011) found high compliance with IACHR rulings that were clearly expressed.	<i>Positive</i>	<i>Ruling clarity</i>

Panel 1.4: Impact of Treaties on Government Policies by Type of Objective (Continued)

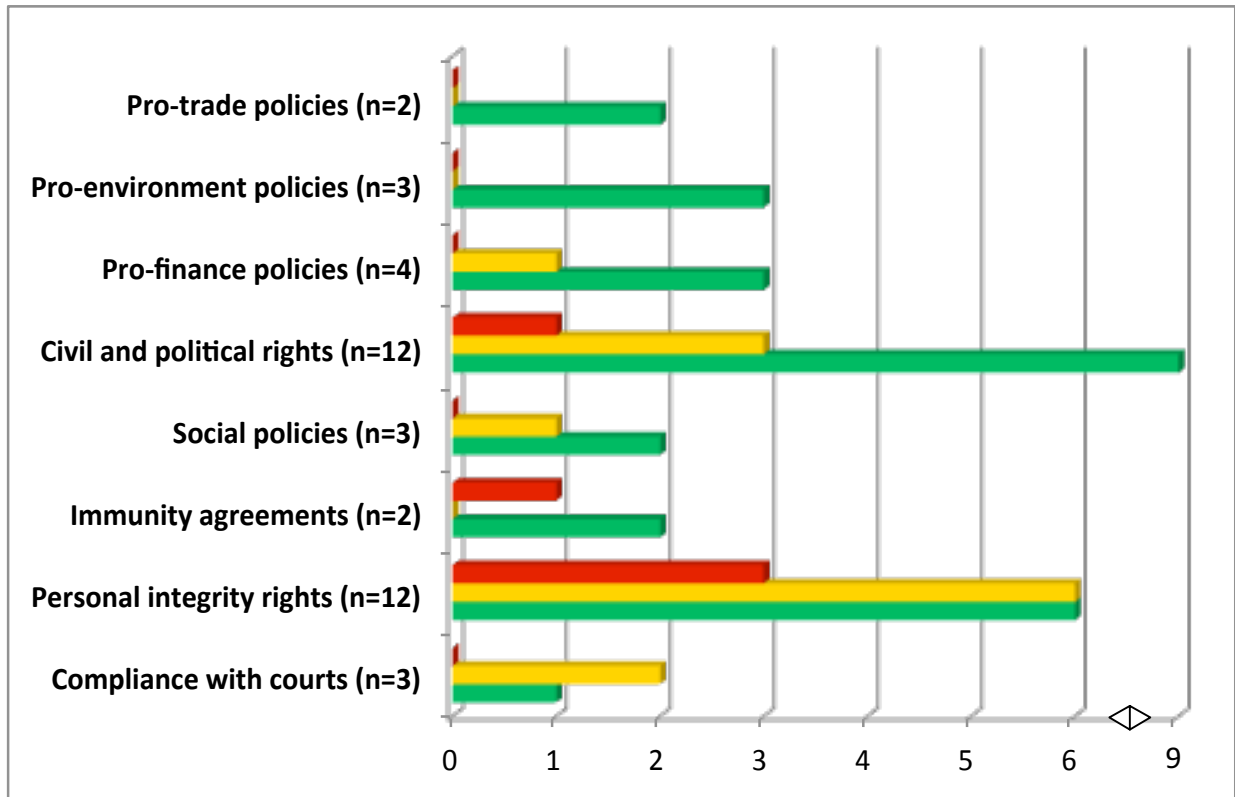
3. Derogation from rights (n=1)	<ul style="list-style-type: none"> Neumayer (2013) found that among ICCPR signatory states in declared states of emergency, democracies did not increase violations, while autocracies and some anocracies increased violations of both derogable and non-derogable rights. 	<i>Both</i>	<i>Regime type</i>
4. Economic sanctions (n=1)	<ul style="list-style-type: none"> Hafner-Burton & Montgomery (2008) found PTAs did not affect the likelihood of sanctions, but the likelihood was increased when the initiator had high centrality in the PTA network. 	<i>None / negative</i>	<i>Initiator centrality</i>
5. Environment policies (n=3)	<ul style="list-style-type: none"> Miles et al. (2002) found international environmental laws promoted positive behavioral changes by states, and to a lesser degree, improved the state of the environment. Breitmeier et al. (2006 & 2011) found international environmental laws promoted significant compliance behavior by signatory states and sometimes improved the state of the environment, with knowledge of the problem, member states' interests, and decision rule being key factors. 	<i>Positive</i>	<i>Knowledge Interests Decision rule</i>
6. Financial transactions restrictions (n=4)	<ul style="list-style-type: none"> Simmons (2000) found states that ratified Article VIII of the IMF's Articles of Agreement were less likely to impose restrictions on their accounts. von Stein (2005) found the positive effect in Simmons (2000) was not due to Article VIII itself, but to the IMF's informal conditions for selecting and pressuring states to ratify Article VIII. Simmons & Hopkins (2005) found ratifying IMF Article VIII reduced account restrictions, even after accounting for selection effects. Grieco et al. (2009) found states that ratified IMF Article VIII were less likely to impose account restrictions, even if their political orientation shifted away from monetary openness. 	<i>Positive</i>	<i>None</i>
7. Immunity agreements for international crimes (n=2)	<ul style="list-style-type: none"> Kelley (2007) found states that valued the ICC and respected the rule of law were more likely to reject a non-surrender agreement with the USA that would violate Art. 86 of the Rome Statute. Nooruddin & Payton (2010) found states that entered the ICC, especially those with high rule of law, had high GDP, had defense pacts with the USA, or were sanctioned by the USA, took longer to sign a BIA with the USA, while states that traded heavily with the USA signed more quickly. 	<i>Positive</i>	<i>Both</i> <i>ICC membership USA relations</i>
8. Personal integrity rights (n=12)	<ul style="list-style-type: none"> Keith (1999) found ratifying the ICCPR did not improve personal integrity rights practices. Hafner-Burton (2005) found PTAs requiring member states to improve their human rights practices were more effective than HRAs in improving personal integrity rights practices. Hafner-Burton & Tsutsui (2005) found ratifying human rights treaties did not improve personal integrity rights practices, but participation in global civil society activities did. Neumayer (2005) found ratifying human rights treaties improved personal integrity rights practices in democratic states or states with strong engagement in global civil society. Abouharb & Cingranelli (2007) found SAAs worsened personal integrity rights practices. 	<i>None</i>	<i>Positive / none</i>
		<i>None</i>	<i>Positive</i> <i>Democracy Civil society</i>
		<i>Negative</i>	

Panel 1.4: Impact of Treaties on Government Policies by Type of Objective (Continued)

	<ul style="list-style-type: none"> Hafner-Burton & Tsutsui (2007) found ratifying the CAT or ICCPR did not improve personal integrity rights practices of highly repressive states even long into the future, regardless of democracy and civil society. 	<i>None</i>	
	<ul style="list-style-type: none"> Greenhill (2010) found membership in IGOs whose member states have strong human rights records improved personal integrity rights practices. 	<i>Positive</i>	
	<ul style="list-style-type: none"> Hill Jr. (2010) found ratifying the ICCPR worsened personal integrity rights practices. 	<i>Negative</i>	
	<ul style="list-style-type: none"> Kim & Sikkink (2010) found domestic and international prosecutions of human rights violations and truth commissions reduced repressions of personal integrity rights. 	<i>Positive</i>	
	<ul style="list-style-type: none"> Cole (2013) found ratifying the ICESCR worsened labor rights laws but improved labor rights practices. 	<i>Both</i>	
	<ul style="list-style-type: none"> Lupu (2013a) found ratifying the ICCPR did not improve personal integrity rights practices. 	<i>None</i>	
	<ul style="list-style-type: none"> Lupu (2013b) found ratifying the CEDAW improved respect for women's economic and social rights and that ratifying the ICCPR did not improve personal integrity rights. 	<i>Positive / None</i>	
9. Social policies (n=3)	<ul style="list-style-type: none"> Linos (2011) found the promulgation of global norms (through ratifying International Labour Organization conventions and large presence of INGOs) increased length of maternity leave. 	<i>Positive</i>	
	<ul style="list-style-type: none"> Kim & Boyle (2012) found SAAs did not increase education spending but citizen engagement in global civil society did. 	<i>None</i>	
	<ul style="list-style-type: none"> Helfer & Voeten (2013) found ECtHR rulings on LGBT issues increased the likelihood that states under the ECtHR's jurisdiction that had not yet adopted a pro-LGBT policy would do so. 	<i>Positive</i>	
10. Trade policies (n=2)	<ul style="list-style-type: none"> Bown (2004) found commitment to trade liberalization following WTO/GATT trade disputes was greater if the trading partner had the ability to retaliate. 	<i>Positive</i>	<i>Ability to retaliate</i>
	<ul style="list-style-type: none"> Kucik & Reinhardt (2008) found WTO member states that could take advantage of the WTO's antidumping flexibility provision agreed to tighter tariff bindings and applied lower tariffs. 	<i>Positive</i>	<i>Flexibility provision</i>

BIA = Bilateral Immunity Agreement | CAT = Convention Against Torture | CEDAW = Convention to Eliminate All Forms of Discrimination Against Women | CERD = Committee on the Elimination of Racial Discrimination | CRC = Convention on the Rights of the Child | ECtHR = European Court of Human Rights | GATT = General Agreement on Tariffs and Trade | HRC = Human Rights Committee | IACHR = Inter-American Court of Human Rights | IASHRP = Inter-American System of Human Rights Protection | ICC = International Criminal Court | ICCPR = International Covenant on Civil and Political Rights | ICESCR = International Covenant on Economic, Social and Cultural Rights | IGO = Intergovernmental Organization | IMF = International Monetary Fund | INGO = International Nongovernmental Organization | LGBT = Lesbian, Gay, Bisexual and Transgender | PTA = Preferential Trade Agreement | SAA = Structural Adjustment Agreement | UN = United Nations | WTO = World Trade Organization

Panel 1.5: Studies Showing Positive, Negative and No Impact on Government Policies by Type of Objective



Outcomes were deemed either “positive” or “negative” based on whether they aligned or contradicted treaties’ own stated goals as found in their preamble text. Studies that drew both positive and negative conclusions were coded twice in the bar chart coloring, but only once in the tally of studies presented beside each label. This explains how there are two studies evaluating the impact of international law on immunity agreements for international crimes yet the bar chart coloring indicates 66% of studies found a positive impact and 33% found a negative impact. The impact of international laws on derogation from rights and economic sanctions are not presented in this panel given both of these outcome measures were only evaluated by one study each.

The bad news is that treaties’ influence on government policies did not always translate into positive changes for people, places or products – with “positive” defined based on treaties’ own stated goals in their preamble text (see Panel 1.6 and 1.7). Most studies that evaluated real-world outcomes found treaties either had no effect or the opposite effect than what was intended. For example, environmental agreements did not always reduce pollution,¹⁰⁶⁻¹¹² international humanitarian treaties did not reduce intentional civilian fatalities during wartime,¹⁰¹ human rights treaties did not improve life expectancy or infant mortality,⁷⁶ and structural adjustment agreements actually diminished these health indicators along with basic literacy rates and government stability.⁷² Eight studies are split on whether the *Convention Against Torture* improved, had no effect, or worsened torture practices.^{69,75,77,84,87,89,93,96}

Like the earlier analysis by policy area, one common trend here is that international treaties seem to be most successful in attaining economic objectives. This analysis additionally emphasizes how treaties seem to be least successful in realizing social goals. Indeed, whereas nearly all studies that evaluated these outcomes found treaties increased liberal economic policies, trade flows and foreign investment, few studies reported improvements in government stability, peace, pollution, torture, war crimes or health. More studies concluded that treaties had negative effects in these non-economic areas than either positive or no effects (see Panel 1.7).

Panel 1.6: Impact of Treaties on People, Places and Products by Type of Objective

Outcome	Study Conclusions	Impact	Conditions
11. Domestic institutions (n=2)	• Ginsburg (2005) found BITs did not improve, and in some cases worsened, domestic institutions.	<i>None</i>	
	• Busse et al. (2010) found BITs promoted institutional development, and may thus substitute for domestic measures to improve political governance.	<i>Positive</i>	
12. Foreign investment (n=27)	• UNCTAD (1998) found BITs slightly increased FDI to developing countries.	<i>Positive</i>	
	• Banga (2003) found BITs with developed countries increased FDI inflows to developing countries.	<i>Positive</i>	
	• Davies (2003) found renegotiations on BTTs involving the USA did not increase FDI stocks and affiliate sales in the USA.	<i>None</i>	
	• Hallward-Driemeier (2003) found BITs did not increase FDI inflows to developing countries.	<i>None</i>	
	• Egger & Pfaffermayr (2004) found BITs increased outward FDI stocks, but only if they have been fully implemented.	<i>Positive</i>	<i>Fully implemented</i>
	• di Giovanni (2005) found BTTs and bilateral service agreements increased M&A flows.	<i>Positive</i>	
	• Grosse & Trevino (2005) found BITs signed by states in Central and Eastern Europe increased FDI inflows to the region.	<i>Positive</i>	
	• Neumayer & Spess (2005) found BITs with developed countries increased FDI inflows to developing countries.	<i>Positive</i>	
	• Egger & Merlo (2007) found BITs increased outward FDI stocks to host countries, with their long-term impact being greater than their short-term impact.	<i>Positive</i>	<i>Time</i>
	• Bütthe & Milner (2008 & 2009) found WTO/GATT membership, PTAs and BITs increased FDI inflows to developing countries.	<i>Positive</i>	
• Millimet & Kumas (2008) found BTTs increased inbound and outbound USA FDI activity (i.e., flows, stocks and affiliate sales) in countries with low FDI activity, and decreased inbound and outbound USA FDI activity in countries with high FDI activity.	<i>Both</i>	<i>Base FDI activity</i>	

Panel 1.6: Impact of Treaties on People, Places and Products by Type of Objective (Continued)

	• Yackee (2008) found BITs, even the formally strongest ones with international arbitration provisions, did not increase FDI inflows to developing countries,	<i>None</i>	
	• Aisbett (2009) found that although BITs seemingly increased FDI outflows, the measured effect was simply due to the endogeneity of BIT adoption.	<i>None</i>	
	• Barthel et al. (2009) found DTTs increased FDI stocks between partner countries.	<i>Positive</i>	
	• Blonigen & Davies (2009a) found recently formed BTTs decreased outbound FDI stocks and flows to partner countries.	<i>Negative</i>	
	• Blonigen & Davies (2009b) found BTTs involving the USA decreased outbound FDI stocks and affiliate sales from the USA, and did not affect inbound FDI stocks and affiliate sales to the USA.	<i>Negative / none</i>	
	• Coupé et al. (2009) found BITs, but not DTTs, increased FDI inflows to countries undergoing economic transition.	<i>Positive / none</i>	<i>Economic transition</i>
	• Egger et al. (2009) found BTTs decreased outward FDI stocks to host countries.	<i>Negative</i>	
	• Gallagher & Birch (2009) found BITs with the USA did not increase FDI inflows from the USA to Latin American and Mesoamerican states, while BITs with all countries increased total FDI inflows to Latin American states.	<i>None / positive</i>	
	• Louie & Rousslang (2009) found BTTs with the USA did not affect the rates of return that USA companies required on their FDI.	<i>None</i>	
	• Millimet & Kumas (2009) found BTTs increased time-lagged inbound FDI stocks and flows, but did not affect inbound affiliate sales and outbound FDI stocks, flows and affiliate sales.	<i>Positive / none</i>	
	• Neumayer (2009) found DTTs with the USA increased outbound FDI stocks from the USA, while DTTs with all countries increased general inbound FDI stocks and FDI inflows, but only in middle-income countries.	<i>Positive</i>	<i>Economic status</i>
	• Salacuse & Sullivan (2009) found BITs with the USA increased FDI inflows to developing countries, both generally from other countries and specifically from the USA.	<i>Positive</i>	
	• Yackee (2009) found BITs decreased FDI inflows to developing countries, while those signed with countries at low political risk increased FDI inflows.	<i>Both</i>	<i>Political risk</i>
	• Busse et al. (2010) found BITs increased FDI inflows to developing countries.	<i>Positive</i>	
	• Tobin & Rose-Ackerman (2011) found BITs increased FDI inflows to developing countries that had a suitable political-economic environment.	<i>Positive</i>	<i>Investment environment</i>
13. Government stability (n=2)	• Abouharb & Cingranelli (2007) found SAAs increased the probability and prevalence of anti-government rebellion.	<i>Negative</i>	
	• Hollyer & Rosendorff (2011) found autocracies that ratified the CAT had longer tenures in office and experienced less oppositional activities.	<i>Positive</i>	

Panel 1.6: Impact of Treaties on People, Places and Products by Type of Objective (Continued)

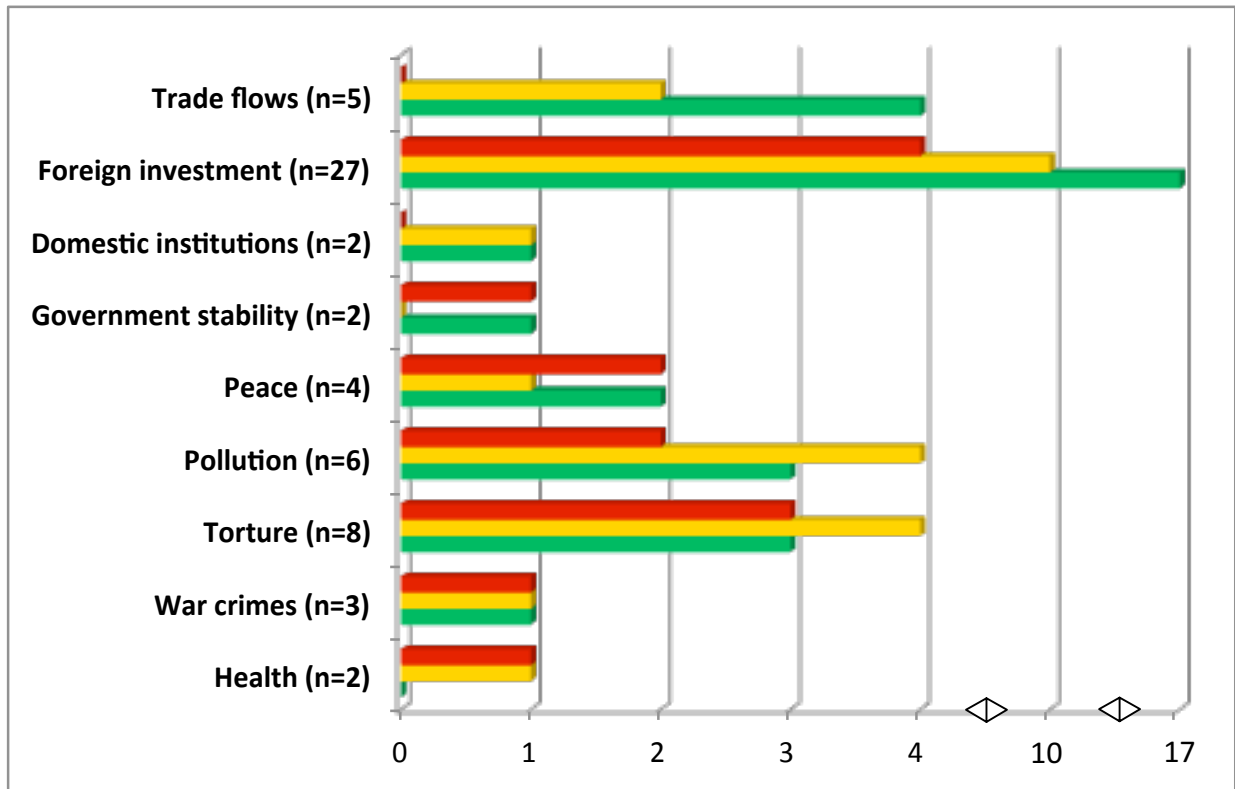
14. Health and well-being (n=2)	<ul style="list-style-type: none"> Abouharb & Cingranelli (2007) found SAAs led to worse quality of life, as measured by basic literacy rate, infant mortality, and life expectancy at age one. 	<i>Negative</i>	
	<ul style="list-style-type: none"> Palmer et al. (2009) found ratifying human rights treaties did not improve life expectancy, infant mortality, maternal mortality or child mortality. 	<i>None</i>	
15. Peace (n=4)	<ul style="list-style-type: none"> Meernik (2005) found judicial actions of the ICTY did not improve societal peace in Bosnia. 	<i>None</i>	
	<ul style="list-style-type: none"> Simmons & Danner (2010) found the ICC terminated civil conflicts and promoted engagement in peace agreements in nondemocratic and low rule-of-law member states. 	<i>Positive</i>	<i>Non-democracy</i>
	<ul style="list-style-type: none"> Hafner-Burton & Montgomery (2006) found membership in IGOs increased the likelihood of participation in militarized international disputes. 	<i>Negative</i>	
	<ul style="list-style-type: none"> Hafner-Burton & Montgomery (2012) found membership in trade institutions decreased the likelihood of militarized disputes between states with relatively equal economic positions and increased the likelihood of militarized disputes between states with unequal positions. 	<i>Both</i>	<i>Economic status</i>
16. Pollution (n=6)	<ul style="list-style-type: none"> Mitchell (1994) found a treaty mandating tankers to install pollution-reduction equipment was more effective than a treaty that set a legal limit to tanker oil discharges. 	<i>Both</i>	
	<ul style="list-style-type: none"> Murdoch & Sandler (1997) found the Montreal Protocol did not reduce CFC emissions, but rather codified previous voluntary reductions by member states. 	<i>None</i>	
	<ul style="list-style-type: none"> Murdoch et al. (1997) found the Helsinki Protocol reduced sulfur emissions but the Sofia Protocol did not reduce nitrogen oxides emissions in European states due to differences in the source and spread of each pollutant. 	<i>Both</i>	
	<ul style="list-style-type: none"> Helm & Sprinz (2000) found the Helsinki Protocol reduced sulfur dioxide emissions and the Oslo Protocol reduced nitrogen dioxide emissions, but fell short of the calculated optimum levels. 	<i>Positive / none</i>	
	<ul style="list-style-type: none"> Finus & Tjøtta (2003) found the sulfur emission reduction targets set by the Oslo Protocol were lower than those expected without an international agreement. 	<i>None</i>	
	<ul style="list-style-type: none"> Ringquist & Kostadinova (2005) found the Helsinki Protocol did not reduce sulfur emissions in Europe. 	<i>None</i>	
17. Public support (n=1)	<ul style="list-style-type: none"> Putnam & Shapiro (2013) found public support for government action against Myanmar increased when respondents were informed that Myanmar's forced labor practices violated international law. 	<i>Positive</i>	
18. Torture (n=8)	<ul style="list-style-type: none"> Hathaway (2002) found ratifying the CAT led to worse torture practices, while additionally ratifying Art. 21 of the CAT (which allows for state-to-state complaints) did not change them. 	<i>Negative / none</i>	
	<ul style="list-style-type: none"> Gilligan & Nesbitt (2009) found ratifying the CAT did not improve torture practices. 	<i>None</i>	
	<ul style="list-style-type: none"> Powell & Staton (2009) found ratifying the CAT improved torture practices in states with strong domestic systems of legal enforcement. 	<i>Positive</i>	<i>Legal enforcement</i>

Panel 1.6: Impact of Treaties on People, Places and Products by Type of Objective (Continued)

	<ul style="list-style-type: none"> Hill Jr. (2010) found ratifying the CAT led to worse torture practices. 	<i>Negative</i>	
	<ul style="list-style-type: none"> Hollyer & Rosendorff (2011) found autocracies that ratified the CAT continued their torture practices, but at slightly lower levels. 	<i>Positive</i>	
	<ul style="list-style-type: none"> Conrad (2011) found ratifying the CAT increased the likelihood of torture in dictatorships with power sharing, but only when judicial effectiveness was high. 	<i>Negative</i>	<i>Judicial effectiveness</i>
	<ul style="list-style-type: none"> Conrad & Ritter (2013) found ratifying the CAT improved torture practices in dictatorships with politically secure leaders, but did not change practices in those with politically insecure leaders. 	<i>Positive</i> <i>/ none</i>	<i>Leader security</i>
	<ul style="list-style-type: none"> Lupu (2013b) found ratifying the CAT was not associated with lower torture rates. 	<i>None</i>	
19. Trade flows (n=5)	<ul style="list-style-type: none"> Rose (2004) found WTO/GATT membership did not increase trade. 	<i>None</i>	
	<ul style="list-style-type: none"> Gowa & Kim (2005) found GATT membership increased trade between Canada, France, Germany, UK and USA, but did not impact trade between other member states. 	<i>Positive</i> <i>/ none</i>	
	<ul style="list-style-type: none"> Subramanian & Wei (2007) found WTO/GATT membership increased trade for industrial states, especially when trading partners were also WTO/GATT members. 	<i>Positive</i>	<i>Industrialized Partners</i>
	<ul style="list-style-type: none"> Tomz et al (2007) found WTO/GATT participation, formally or as a non-member, increased trade. 	<i>Positive</i>	
	<ul style="list-style-type: none"> Mansfield & Reinhardt (2008) found membership in the WTO/GATT and PTAs reduced export volatility, and thereby increased export levels. 	<i>Positive</i>	
20. War crimes and genocide (n=3)	<ul style="list-style-type: none"> Hathaway (2002) found ratifying the UN Convention on the Prevention and Punishment of the Crime of Genocide led to worse genocide practices. 	<i>Negative</i>	
	<ul style="list-style-type: none"> Valentino et al. (2006) found international humanitarian law did not reduce intentional civilian fatalities during wartime, regardless of regime type and identity of enemy combatants. 	<i>None</i>	
	<ul style="list-style-type: none"> Morrow (2007) found democracies had fewer violations of international humanitarian laws during wartime, and joint ratification of laws promoted reciprocity between warring states. 	<i>Positive</i>	<i>Democracy</i>
21. Water levels (n=1)	<ul style="list-style-type: none"> Bernauer & Siegfried (2008) found water release from the Toktogul reservoir after the 1998 Naryn/Syr Darya basin agreement met mandated levels, but was significantly higher than the calculated optimum levels. 	<i>Positive</i> <i>/ none</i>	

BIT = Bilateral Investment Treaty | BTT = Bilateral Tax Treaty | CAT = Convention Against Torture | CFC = Chlorofluorocarbon | DTT = Double Taxation Treaty | FDI = Foreign Direct Investment | GATT = General Agreement on Tariffs and Trade | ICC = International Criminal Court | ICTY = International Criminal Tribunal for the Former Yugoslavia | IGO = Intergovernmental Organization | M&A = Merger & Acquisition | PTA = Preferential Trade Agreement | SAA = Structural Adjustment Agreement | UN = United Nations | USA = United States of America | WTO = World Trade Organization

Panel 1.7: Studies Showing Positive, Negative and No Impact on People, Places and Products by Type of Objective



Outcomes were deemed either “positive” or “negative” based on whether they aligned or contradicted treaties’ own stated goals as found in their preamble text. Studies that drew both positive and negative conclusions were coded twice in the bar chart coloring, but only once in the tally of studies presented beside each label. This explains how there are four studies evaluating the impact of international law on peace yet the bar chart coloring indicates two studies found a positive impact, two found a negative impact, and one found no impact. The impact of international laws on public support and water levels are not presented in this panel given both of these outcome measures were only evaluated by one study each.

Incentives, Institutions and Interests May Be Important for Impact

What impact can be expected from global health treaties? According to this analysis, not very much. International treaties have consistently succeeded in shaping economic matters just as they have consistently failed in achieving social progress (including improved health status).

But global health treaties are not necessarily destined to fail. While there may be intrinsic differences between economic and social domains, there are at least three differences in how treaties are characteristically designed between these areas that suggest ways new global health treaties could be constructed to achieve positive impact.

First, international economic treaties tend to provide immediate benefits to states and governing elites such that action aligns with their short-term self-interests. International treaties on social issues rarely offer immediate benefits and usually impose costs on those in charge. This suggests new global health treaties can have greater impact if they too include *incentives* for those with power to act upon them. This hypothesis aligns with neorealist theories from political science and international relations, and game theory from economics that emphasize the role of incentives in shaping national agendas and the priorities of elites.^{79,123-124}

Second, international economic treaties tend to incorporate institutional mechanisms for promoting compliance, dispute resolution and accountability that are typically absent from socially focused treaties that must instead rely on the “naming and shaming” efforts of progressive states and civil society. Examples of institutional mechanisms include automatic penalties, sanctions, mandatory arbitration, regular reporting requirements and compliance assessments. This suggests new global health treaties can have greater impact if they include *institutions* specifically designed to bring edicts into effect. This hypothesis aligns with institutionalist theories that emphasize the role of implicit or explicit structures in defining expectations, constraining decisions, distributing power, and incentivizing behavior,¹²⁵⁻¹²⁶ as well as international legal process theories that view treaties as organizing devices and constraints on diplomatic practice.¹²⁷

Third, international economic treaties tend to have the support of powerful interest groups who advocate for their full implementation, and few strong opponents who can advocate against them. This most notably includes those industry groups and multinational corporations with extremely generous lobbying budgets, worldwide affiliates, and access to sophisticated advocacy professionals, which are resources not typically utilized by industry to address social challenges. Progressive civil society organizations are comparatively underfunded. This suggests new global health treaties can have greater impact either if their aims align with those of powerful *interests* or if supporters can build sufficiently

strong coalitions of their own. This hypothesis aligns with institutionalist theories that stress how treaties serves as focal points for social mobilization and provide resources for political movements,^{79,124} critical legal theories that view treaties as offering language with which actors assert claims,¹²⁸⁻¹²⁹ and network theories that emphasize the role of transnational advocacy networks and networked governmental authorities in shaping domestic political decision-making.¹³⁰⁻¹³¹

Less important, this analysis suggests, is for new global health treaties to 1) allow *individuals* to bring claims against their own governments (e.g., domestic human rights litigation), 2) address an urgent *imperative* requiring immediate action (e.g., climate change), or 3) promote *ideals* of an ethical world (e.g., peace). These features are typically absent from the seemingly impactful international economic treaties and characteristic of the seemingly less impactful treaties addressing social problems. This hypothesis is in opposition to legal theories supporting individual litigation,¹³² cosmopolitanism's ideal of shared morality,¹³³⁻¹³⁴ and constructivist theories that emphasize ideas, norms, language and the power of treaty-making processes.^{22,135-138}

Future Research Should Employ Experimental and Quasi-Experimental Methods

This analysis of 90 quantitative impact evaluations represents a start in assessing what impact can be expected from global health treaties and identifying design characteristics of treaties that have historically achieved greater impact. But global health decision-makers need stronger and more specific conclusions than existing research can offer. This is not just a matter of needing more research, but also needing a greater diversity of methodological approaches.

All but two of the 90 quantitative impact evaluations relied upon observational study designs which by themselves do not facilitate causal inferences. The vast majority employed time-series-cross-sectional analysis (n=75), with the remaining studies using time-series analysis (n=3), cross-sectional analysis (n=6), Cox proportionate hazard models (n=4), generalized method of moments analysis (n=1),

quantile treatment effect distribution analysis (n=1), formal model analysis (n=1) and descriptive statistics (n=7).

This is not all bad news. Time-series-cross-sectional analyses are relatively strong designs that increase the number of and variation across observations by incorporating both the temporal (e.g., year) and spatial (e.g., country) dimensions of data. This makes parameter estimates more robust and allows testing variables that would display negligible variability when examined across either time or space alone.¹³⁹⁻¹⁴⁰ But like most models of observational data, causal inferences from time-series-cross-sectional analyses are undermined by the possibility of confounding, reverse causation, and the non-random distribution of interventions (i.e., international treaties) that may be linked to the outcomes measured.¹⁴¹⁻¹⁴²

Unfortunately only two experimental or quasi-experimental evaluations of specific international treaties were found for any policy area, despite these representing stronger methodological designs for measuring impact. The one experiment found was a survey of 2,724 American adults testing public reaction to Myanmar's forced labor practices, finding that respondents who were told Myanmar's actions violated an international law were more likely to support sanctions than uninformed respondents.⁹⁸ The one quasi-experiment was a difference-in-difference analysis of bilateral tax treaties' impact on foreign investment.⁵⁸ Quasi-experimental methods have been used extensively to evaluate the effects of legislation, policies and regulations in domestic contexts,¹⁴³⁻¹⁴⁶ but they do not appear to be popular in the study of international instruments thus far.

Positive Outcomes Cannot Be Assumed

States have increasingly relied on international treaties to manage the harmful effects of globalization and reap its potential benefits. Sometimes they seek to mitigate a threat or resolve a collective action problem; other times they hope to promote a specific norm, signal intentions or

encourage the production of global public goods. Motivating such international treaty-making is the idea that states are willing to constrain their behavior or accept positive obligations if other states do the same. This type of international cooperation is viewed by many as essential for progress across many policy areas, including for health, given how risks now travel between states irrespective of national boundaries (e.g., pandemics) and where attaining rewards often requires coordinated action or resources on a scale beyond any one country's willingness to pay (e.g., R&D for neglected diseases).

But evidence of international treaties' impact on health is scant, making it difficult to draw reasonable inferences on what effects can be expected from new treaties that either regulate health matters or aim to promote better health outcomes. The only two studies that evaluated health outcomes found human rights treaties had no impact on a variety of health indicators⁷⁶ and that structural adjustment agreements had a negative effect on them.⁷²

So long as the evidence remains unclear, we should not assume new global health treaties will achieve positive outcomes. Their inconsistent effects undermine the oft-cited claim that treaties can have greater impact on people, places, products or policies than other instruments like political declarations, codes of practice or resolutions.¹⁴⁷ The precise mechanism through which states make commitments to each other seems less important than the content of the commitment, the regime complexes it joins,¹⁴⁸⁻¹⁴⁹ financial allocations,¹⁵⁰ dispute resolution procedures,¹⁵¹ processes for promoting accountability,¹⁵² and the support of states and other stakeholders to see commitments fully implemented.¹⁵³ Arguments about "hard law" versus "soft law" and "binding" versus "non-binding" seem less important than strategic conversations about incentivizing elites, institutionalizing compliance mechanisms and activating interest groups (see Panel 1.8). Without such conversations, new global health treaties will have less chance of achieving their intended impact, or worse, they could even cause harm as some treaties may already have done.

Panel 1.8: Potential Factors Influencing Whether Treaties Will Achieve their Intended Impact

Potentially More Important Factors	
<i>Incentives</i>	Providing immediate benefits to states and governing elites such that action aligns with their short-term self-interests
<i>Institutions</i>	Incorporating institutional mechanisms that promote compliance, dispute resolution and accountability
<i>Interests</i>	Being supported by powerful interest groups advocating for their full implementation and few strong opponents advocating against them
Potentially Less Important Factors	
<i>Individuals</i>	Allowing individuals to bring claims against governments and holding them responsible for not meeting expected standards
<i>Imperatives</i>	Addressing a pressing global challenge that requires urgent action to solve
<i>Ideals</i>	Promoting ideal norms, standards, values or other features of an ethical world

Part 2: Assessing Proposals for New Global Health Treaties

Multiple Considerations

Even if prospects for benefits are great, international treaties are still not always appropriate solutions to global health challenges. This is because the potential value of any new treaty depends not only on its expected benefits but also its costs, risks of harm and trade-offs.¹⁶⁰ Conventional wisdom suggests international treaties are inexpensive interventions that just need to be written, endorsed by governments and disseminated. Knowledge of national governance makes this assumption reasonable: most countries' law-making systems have high fixed costs for basic operations and thereafter incur relatively low marginal costs for each additional legislative act pursued. But at the international level, law-making is expensive. Calls for new treaties do not fully consider these costs. Even rarer is adequate consideration of treaties' potentially harmful, coercive and paternalistic effects, and how treaties represent competing claims on limited resources.¹⁵⁷⁻¹⁶⁰

When might global health treaties be worth their many costs? Like all interventions and implementation mechanisms, the answer depends on what these costs entail, the associated risks of harm, the complicated trade-offs involved, and whether these factors all outweigh the benefits that can

reasonably be expected. This part of the chapter reviews the important issues at stake and offers an analytic framework and four criteria for assessing when new global health treaties should be pursued.

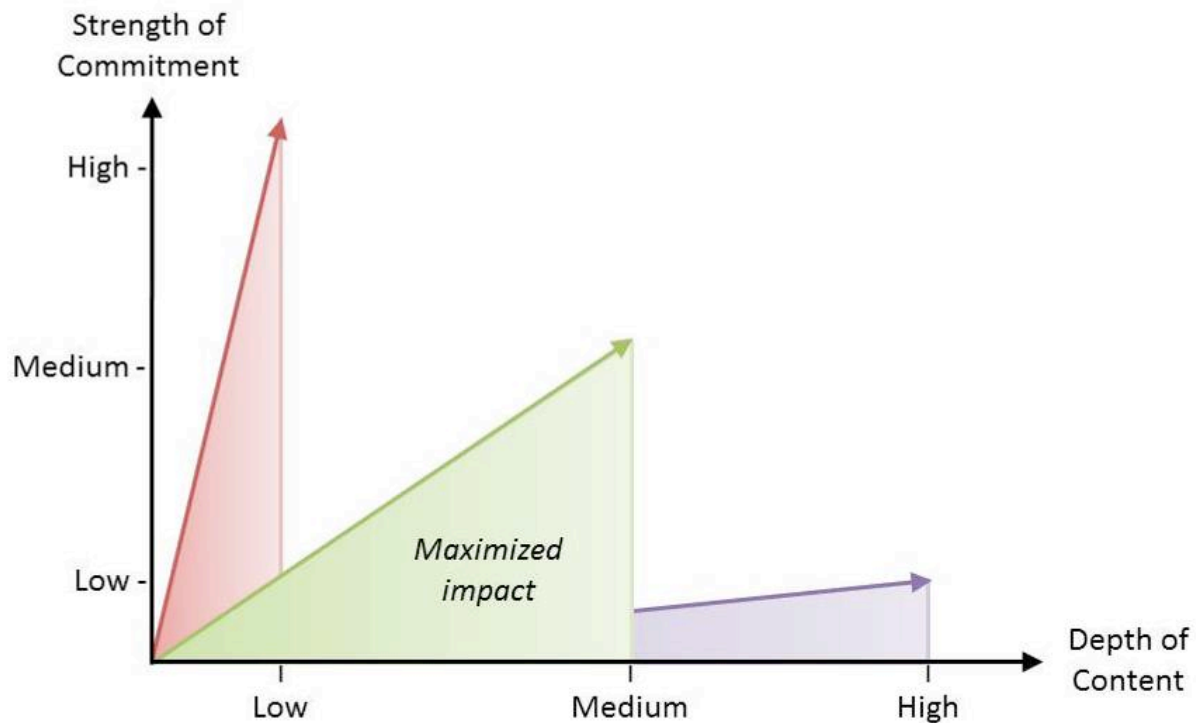
All International Treaties Have Costs

International treaty-making can be incredibly expensive, usually more so than other types of international commitment mechanisms like political declarations, codes of practice, or resolutions, which government negotiators often take less seriously.^{153,161} The direct financial costs associated with drafting, ratifying and enforcing international treaties include not only many meetings, air travel and legal fees, but also potentially new duplicative governance structures – namely, conferences of parties, secretariats and national focal points – which must be maintained. It is particularly this need for new governance structures that makes international treaties different than their national equivalents, the latter of which typically benefit from relatively higher functioning and more centralized regulatory systems already established for administering, coordinating and implementing them.¹⁶⁰ Indirectly, there are non-financial opportunity costs in focusing limited resources, energy and rhetorical space on one particular issue and approach such that other important initiatives will realistically have to be shelved.¹⁶²

The legalization of global health issues otherwise left in the political domain may have the additional consequence of prioritizing process over outcomes, consensus over plurality, homogeneity over diversity, generality over specificity, stability over flexibility, precedent over evidence, governments over non-governmental organizations (NGOs), ministries of foreign affairs over ministries of health, and lawyers over health professionals. International treaties are often vague on specific commitments, slow to be implemented, hard to enforce and difficult to update. They can constrain future decision-making and crowd out alternative approaches.¹⁶³ Confusing patchworks of issue-specific treaties may also deepen rather than contribute to solving challenges in global governance for health. Alternative international commitment mechanisms may achieve greater impact given countries are often willing to

assume more ambitious obligations faster if the agreement does not clearly and perpetually bind them (see Panel 1.9).^{23,153}

Panel 1.9: International Treaties' High Strength of Commitment May Diminish their Depth of Content



The expected impact of any international agreement depends on both the content provisions it contains and the strength in which they are imposed or enforced on countries that adopted it. While not always true, the strength of an agreement's commitment is often inversely proportional to the depth of its content. International treaties are the strongest way countries can communicate their intent to behave in a certain way. Countries may be willing to include more ambitious or aspirational content in agreements like declarations or codes of practice that do not commit them as forcefully.¹⁶¹ Strength of commitment and depth of content must be strategically balanced to maximize impact, a point that is illustrated in this stylized panel.

Risk of Coercion and Paternalism

Proponents of international treaties often envision a future with higher minimal standards and new forms of accountability, which are both supported by NGO advocacy and litigation. While no doubt well-intended, international treaties that impose domestic obligations may have coercive and paternalistic effects for three reasons.

First, the terms of standard-setting international treaties are largely dictated by powerful countries based on minimal expectations they already meet such that new domestic standards often

only affect poorer countries or countries with less governmental capacity. One prominent example is the World Trade Organization's *Agreement on Trade-Related Aspects of Intellectual Property Rights* (TRIPS) which obliges countries to regulate expression (i.e., copyright), indicators of source (i.e., trademarks) and practical inventions (i.e., patents) in ways that may disadvantage their economic development or diverge from historic cultural norms. Given resource and technical limitations, this legally obliges poor countries to implement these 'enlightened' policies – often instead of local priorities – even if they have no effect on other countries, cost more, and potentially achieve far fewer benefits than local alternatives. Promised financial support from wealthy countries for implementing these policies is often not delivered, and poor countries usually cannot take full advantage of flexibilities or withdraw from international treaties without financial, security or reputational consequences.¹⁶¹

Second, what on the surface may appear to be “voluntary” ratification of treaties may actually be something else and far from how legal systems in democratic countries would define this word. Involuntariness may result from incapacity (e.g., ratifying countries not having the technical expertise to fully assess the consequences of proposed treaties), lack of consent (e.g., despotic leaders ratifying treaties for their own benefit without the support of their citizens), corruption (e.g., negotiating agents being influenced to act against their countries' interests), duress (e.g., credible threats of disproportionate consequences forcing countries to ratify treaties out of fear), and desperation (e.g., tragic circumstances encouraging countries to accept unconscionable terms in exchange for short-term assistance).

Third, pressure and litigation from foreign NGOs forcing compliance with 'international standards' can be unhelpful foreign interference in domestic policymaking and priority-setting processes, especially considering how many NGOs are funded by organizations based in rich countries, to whom they are legally accountable rather than the people they intend to serve.¹²⁴ Most NGOs make important contributions, but some are “a mirage that obscures the interests of powerful states, national

elites and private capital”.¹⁶⁴ This would especially include those NGOs set up by industry to lobby for unhealthy policies, like the U.S. National Rifle Association (which calls itself “America’s longest-standing civil rights organization” and advocates fewer gun controls internationally),¹⁶⁵ the International Chrysotile Association (which promotes asbestos’s “environmental occupational health safe and responsible use”),¹⁶⁶ and the International Tobacco Growers’ Association (which aims “to ensure the long-term security of tobacco markets”).¹⁶⁷ But this could also include those well-meaning foreign NGOs that succeed in getting their preferred interventions financed (e.g., high-tech hospitals in capital cities) at the expense of more cost-effective solutions (e.g., primary school education for girls).¹⁶⁸

Trade-offs and Choices Are Unavoidable

Limited resources mean governance unavoidably involves complicated trade-offs and difficult social choices. Competing demands force governments to prioritize, which converts every budgetary or regulatory decision into an expression of local values, ethics and priorities.¹⁶⁹ Since all international treaties have domestic costs which must be budgeted, they cannot be considered undeniable demands but rather as competing claims on limited national public resources. This dependence on public resources in turn entitles people to democratic accountability and distributive justice regarding the international treaties they choose to implement, which necessarily subjects them to political contestation. While basic human rights and some other ground rules should be protected from such bargaining, prioritizing compliance with new international treaties beyond usual priority-setting processes and trade-offs is not always justified.⁷⁹ International law only recognizes a few peremptory *jus cogens* norms – genocide, human trafficking, slavery, torture and wars of aggression – that are beyond state sovereignty and from which countries can never derogate no matter the circumstances.¹⁶⁰ These are the kind of ground rules that are justifiably beyond usual priority-setting processes and trade-offs. Other rules from proposed new international treaties are unlikely to all be at this level.

Four Criteria for New Global Health Treaties

Treaties are certainly one among many important implementation mechanisms for international agreements,¹⁵³ but given their unproven benefits and significant costs, risks of harm and trade-offs, an analytic framework is needed to guide global decision-makers, national governments and civil society advocates in *ex ante* evaluating whether to pursue new ones. We propose four criteria, which, if met, can help decision-makers ensure that any new global health treaties they adopt have reasonable prospects of yielding net positive effects.

First, there should be a *significant transnational dimension* to the problem that proposed treaties are seeking to address, involving many countries, transcending national borders, and transferring risks of harm or benefit across countries. Transnationality often involves interconnectedness (i.e., countries affecting one another) and interdependence (i.e., countries dependent on one another). Pandemics represent one example, along with trade in health products, R&D for new health technologies, and international migration of health professionals. In these examples, effects of the problem or benefits of the solution cannot or should not be limited to their countries of origin. Problems that are contained within individual countries, or problems that can be stopped at national borders, do not meet this criterion.

Second, the goal and expected benefits should *justify the coercive nature of treaties*. For example, the proposed global health treaty could address multilateral challenges that cannot practically be resolved by any one country acting alone (e.g., tobacco smuggling, which is regulated by the *Framework Convention on Tobacco Control*). Alternatively, perhaps it helps overcome collective action problems where benefits are only accrued if multiple countries coordinate their responses (e.g., pandemic outbreaks, which are governed by the *International Health Regulations*). This could include addressing the underprovision of public goods (e.g., health R&D) or overutilization of common goods

(e.g., antimicrobial medications). A proposed global health treaty may also justify its coercive nature if it advances superordinate norms that embody humanity and reflect near-universal values (e.g., basic human rights, including freedom from torture).

Third, international treaties should have a *reasonable chance of achieving benefits* through facilitating positive change. This means taking a realist and realistic view on what different actors can and will do both domestically and internationally, whether by choice or limited by regulations, resources, governmental capacity and/or political constraints. This also means proposals for new treaties should probably mobilize the full range of incentives for those with power to act upon them, institutions specifically designed to bring edicts into effect, and interest groups that advocate for their implementation.¹⁵⁴

Fourth, treaties should be the *best commitment mechanism* for addressing the challenge among the many feasible competing alternatives for implementing agreements, such as political declarations, contracts and institutional reforms.¹⁵³ The best available research evidence should indicate that a new international treaty would achieve greater benefit for its direct and indirect costs than all other possible options. At the very least, treaties should not be strategically dominated by other available mechanisms for committing countries to each other considering expected impact, financial costs, and political feasibility, meaning there should not be a less costly and more realistic mechanism that is expected to be equally effective. The use of global health treaties would also be inappropriate to dictate poor countries' domestic policies and priorities from afar (see Panel 1.10).

Panel 1.10: Four Criteria for New Global Health Treaties

	Criterion	Details
Nature of the Problem	1. Significant transnational dimension	Involves multiple countries, transcends national borders, and transfers risks of harm or benefit across countries.
Nature of the Solution	2. Justifies the coercive nature of treaties	Addresses multilateral challenges that cannot practically be addressed by any one country alone, resolves collective action problems where benefits are only accrued if multiple countries coordinate their responses, or advances superordinate norms that embody humanity and reflect near-universal values.
Nature of Likely Outcome	3. Reasonable chance of achieving benefits	Incentivizes those with power to act, institutionalizes accountability mechanisms designed to bring rules into reality, and/or activates interest groups to advocate for its full implementation
Nature of Implementation	4. Best commitment mechanism	Projected to achieve greater benefit for its costs than competing alternative mechanisms for facilitating commitment to international agreements.

Assessing proposals for new treaties on the basis of these four criteria is an exercise of interdisciplinarity in action. Each relies on the conceptual tools, theories and perspectives of a different field of study. Assessing the first criterion, transnationality, depends on knowledge of political science and governmental capacity to stop threats at national borders. Assessing whether the second criterion of justifying coercion is satisfied involves ethical and legal analysis of norms, virtues, intentions and consequences. Economics and epidemiology can both help decision-makers evaluate the third and fourth criteria, namely whether there is a reasonable chance of the proposed treaty achieving benefits and whether a treaty is actually the best commitment mechanism for achieving their particular goals.

If these four criteria are met, there may be comparative advantages for using treaties to address global health challenges, as its supporters have long claimed. Treaties are the most powerful expression of countries' intent to behave in a certain way, they are rhetorically powerful for encouraging compliance with commitments, and they build on an established (albeit contested) international system of principles, rules and adjudicative procedures.⁷⁹ The intense process of international treaty-making itself can have profound impacts through coalition-building, norm-setting, and fostering consensus

which may emerge during negotiations.^{22,170} These qualities may be particularly important for high-stakes and highly divisive issues of transnational significance. But if these four criteria are not met, alternative instruments may be more appropriate, because the costs, risks of harm and trade-offs are probably not worth the benefits.

Application to Proposals for New Treaties

Applying this analytic framework to nine recent calls for new global health treaties reveals that none fully meet the four criteria. In most cases, this is because the goals and expected benefits did not justify the coercive nature of treaties and because competing options for commitment mechanisms may be more appropriate (see Panel 1.11).^{1-9,155-156}

Panel 1.11: Applying the Criteria to Proposals for New Global Health Treaties

Proposal	Goal	Nature of the Problem	Nature of the Solution	Nature of Likely Outcome	Nature of Implementation	Meet criteria?
		1. <i>Transnational</i>	2. <i>Justifies coercion</i>	3. <i>Benefits</i>	4. <i>Best mechanism</i>	
1) Framework Convention on Alcohol Control ¹	Encourage action on unhealthy alcohol consumption	No Except illicit trade, mostly requires domestic action	No Does not meet requirements justifying coercion*	No Few incentives and likely weak accountability ⁺	No No evidence a treaty is better than alternatives	No
2) Treaty on the Treatment of Elder Individuals ¹⁵⁵	Promote healthy and dignified aging as a human right	No Except illicit trade, mostly requires domestic action	No Does not meet requirements justifying coercion*	No Few incentives and likely weak accountability ⁺	No No evidence a treaty is better than alternatives	No
3) Falsified/Substandard Medicines Treaty ^{3,4}	Thwart substandard drug trade and promote medicine quality	Yes Rampant Illicit cross-border trade requires global action	Maybe Problem may be unresolvable by any one country alone	Yes Incentives and accountability mechanisms likely ⁺	Maybe Related regimes of trade, IP, drugs are highly legalized	Maybe
4) Framework for Mandatory Impact Evaluations ⁶	Require impact evaluations of public policies	No Mostly requires domestic action	No Does not meet requirements justifying coercion*	No Few incentives and likely weak accountability ⁺	No No evidence a treaty is better than alternatives	No

Panel 1.11: Applying the Criteria to Proposals for New Global Health Treaties (Continued)

5) Convention on Non-Communicable Diseases ^{2,156}	Encourage action on NCD risk factors like alcohol, tobacco, diet and exercise	No Except illicit trade, mostly requires domestic action	No Does not meet requirements justifying coercion*	No Few incentives and likely weak accountability ⁺	No No evidence a treaty is better than alternatives	No
6) Global Nutrition Treaty ⁷	Promote better nutrition and combat malnutrition	No Except illicit trade, mostly requires domestic action	No Does not meet requirements justifying coercion*	No Few incentives and likely weak accountability ⁺	No No evidence a treaty is better than alternatives	No
7) Framework Convention on Obesity Control ⁵	Encourage action on obesity risk factors like diet and exercise	No Except illicit trade, mostly requires domestic action	No Does not meet requirements justifying coercion*	No Few incentives and likely weak accountability ⁺	No No evidence a treaty is better than alternatives	No
8) Health Research and Development Treaty ⁸	Promote health R&D that address needs of the world's poor	Yes Costs necessitate transnational financial burden sharing	Yes Multilateral challenge and collective action problem	Maybe Some incentives and perhaps some accountability ⁺	Maybe No evidence a treaty is best, but other tools haven't delivered	Maybe
9) Framework Convention on Global Health ⁹	Create framework of responsibilities on national and global health issues	Yes Many dimensions of global health are transnational	No Does not meet requirements justifying coercion*	No Few incentives and likely weak accountability ⁺	No No evidence a treaty is better than alternatives	No
Antimicrobial Resistance Treaty	Address the spread of resistant microbes and dearth of new antimicrobials	Yes Risk spreads irrespective of national borders	Yes Multilateral challenge and collective action problem	Yes Incentives and accountability mechanisms likely ⁺	Probably Regime is highly legalized and other tools haven't delivered	Probably

* To justify coercion, proposed global health treaties should either: a) address multilateral challenges that cannot practically be addressed by any one country alone; b) resolve collective action problems where benefits are only accrued if multiple countries coordinate their responses; or c) advance superordinate norms that embody humanity and reflect near-universal values.

⁺ For a reasonable chance of achieving benefits, proposed global health treaties should incentivize those with power to act, institutionalize accountability mechanisms designed to bring rules into reality, and/or activate interest groups to advocate for its full implementation.

According to this analysis, proposals for R&D and falsified/substandard medicines treaties may be the existing calls for new global health treaties that most closely meet these criteria. Securing R&D for health products needed in the least developed countries has proven to be a significant transnational

challenge involving a market failure that requires collective action among countries to address the underprovision of this global public good.¹⁷¹⁻¹⁷⁴ However, whether a treaty is needed to achieve what other international commitment mechanisms have not, is still uncertain and heavily debated. If a treaty is indeed the best commitment mechanism for addressing this market failure, an R&D treaty would meet the four criteria.

Similarly, medicine quality is a cross-border challenge beyond the control of any one country alone. Up to 15% of all medicines globally may be substandard, dangerous and fake, with the severity of this problem fundamentally rooted in and deepened by globalization.³ The challenge of falsified/substandard medicines also implicates several highly legalized regimes such as trade, intellectual property, fraud, organized crime and narcotics, which perhaps – but not necessarily – make treaties the best international commitment mechanism for implementing agreements among countries in this domain.

While no existing call for new global health treaties met all four criteria, this does not mean it is impossible. Antimicrobial resistance may represent the best candidate for an international treaty, or at least compared to existing proposals. In this case, it is a multilateral challenge involving the overexploitation of a vital common-pool resource,¹⁷⁵⁻¹⁷⁶ as well as a global public good challenge for ensuring the proper use of existing antimicrobials (which benefits all people well-beyond the actual user) and continued progress in R&D towards new antimicrobials (which also benefits all).¹⁷⁷⁻¹⁸⁰ Antimicrobials can only be used so many times before bacteria, viruses, parasites and fungi evolve, adapt, develop resistance and render these medicines ineffective. So while it is in every person's and country's rational interest to consume as much of these medicines as would be helpful to them, each use degrades the overall effectiveness of these medicines for everyone. Further exacerbating this challenge is the structural misalignment between pharmaceutical company's market incentives to sell as many antimicrobial products as possible and the microbiological imperative of limiting use to prevent

resistance. Inevitable competition from generic firms after the patent monopoly period – which is important for promoting access to medicines – further deepens these market dynamics and erodes any countervailing incentive to preserve antimicrobial effectiveness for the long-term. The actual value of an antimicrobial resistance treaty, however, depends greatly on continued difficulties in developing new antimicrobials and countries’ ability to near-universally adopt an international treaty containing sufficiently strong commitments and robust implementation mechanisms for resolving this challenge.

Conclusion

International treaties may in theory yield transformative benefits for global health, but they also carry high costs, risks of harm and trade-offs. Calls for unjustified and unhelpful global health treaties diminish the possibility of worthy initiatives from being taken seriously. It is essential to determine when treaties should be used and when alternatives may be more appropriate. A commission on global health law could help identify such opportunities in ways that do not further complicate global governance architecture, including considering the role of WHO’s existing secretariat and governing bodies.^{1,160,13} Greater investments in empirically evaluating the range of international instruments and commitment mechanisms are also essential to learn which tools are best suited for addressing each global health challenge.¹⁸¹ For example, a robust impact evaluation of the *Framework Convention on Tobacco Control* could inform future decisions on potential treaties in other areas. In the meantime, unless proposals meet the four identified criteria, efforts aiming to better utilize or revise existing international instruments for global health purposes may be more productive for achieving health outcomes than advocating for new treaties.

References

1. Sridhar D (2012) Regulate alcohol for global health. *Nature* 482: 302. doi:10.1038/482302a.
2. Magnusson RS (2009) Rethinking global health challenges: towards a 'global compact' for reducing the burden of chronic disease. *Public Health* 123(3): 265-274. doi:10.1016/j.puhe.2008.12.023.
3. Editorial (2011) Fighting fake drugs: the role of WHO and pharma. *The Lancet* 377(9778): 1626. doi:10.1016/S0140-6736(11)60656-9.
4. Kohler JC, Makady A (2013) Harnessing global health diplomacy to curb corruption in health. *Journal of Health Diplomacy* 1(1): 1-14.
5. Editorial (2011) Urgently needed: a framework convention for obesity control. *The Lancet* 378(9793): 741. doi:10.1016/S0140-6736(11)61356-1.
6. Oxman AD et al. (2010) A framework for mandatory impact evaluation to ensure well informed public policy decisions. *The Lancet* 375(9712): 427-31. doi:10.1016/S0140-6736(09)61251-4.
7. Basu S (2012) Should we propose a global nutrition treaty? EpiAnalysis Blog [Internet]. [cited 2015 Aug 10]; Available from: <http://epianalysis.wordpress.com/2012/06/26/nutritiontreaty/>.
8. Dentico N, Ford N (2005) The courage to change the rules: a proposal for an essential health R&D treaty. *PLoS Medicine* 2(2): e14. doi: 10.1371/journal.pmed.0020014.
9. Gostin LO (2008) Meeting basic survival needs of the world's least healthy people: toward a framework convention on global health. *Georgetown Law Journal* 96(2): 331-392.
10. Fidler DP (2001) The globalization of public health: the first 100 years of international health diplomacy. *Bulletin of the World Health Organization*, 79(9): 42-849.
11. Taylor AL (2002) Global governance, international health law and WHO: looking towards the future. *Bulletin of the World Health Organization* 80(12): 975-80.
12. Gostin LO (2005) World health law: toward a new conception of global health governance for the 21st century. *Yale Journal of Health Policy, Law and Ethics* 5(1): 413-424.
13. Hoffman SJ, Røttingen JA (2014) Split WHO in two: strengthening political decision-making and securing independent scientific advice. *Public Health* 128(1): 78-84. doi:10.1016/j.puhe.2013.08.021.
14. WHO (2005) Constitution of the World Health Organization. 45th ed. Geneva: World Health Organization [PDF Document]. [cited 2014 Jan 4]; Available from: http://www.who.int/governance/eb/who_constitution_en.pdf.
15. Hoffman SJ (2011) Ending medical complicity in state-sponsored torture. *The Lancet* 378(9802): 1535-1537. doi:10.1016/S0140-6736(11)60816-7.

16. Hathaway OA (2007) Why do countries commit to human rights treaties? *Journal of Conflict Resolution* 51(4): 588-621. doi:10.1177/0022002707303046.
17. Hafner-Burton EM, Victor DG, Lupu Y (2012) Political science research on international law: the state of the field. *American Journal of International Law* 106(1): 47-97.
18. Shaffer G, Ginsburg T (2012) The empirical turn in international legal scholarship. *American Journal of International Law* 106(1): 1-46.
19. Hoffman SJ, Røttingen JA, Frenk J (2015) Assessing proposals for new global health treaties: an analytic framework. *American Journal of Public Health* 105(8): 1523-1530.
20. Wipfli HL, Fujimoto K, Valente TW (2010) Global tobacco control diffusion: the case of the framework convention on tobacco control. *American Journal of Public Health* 100(7): 1260-1266.
21. Sanders-Jackson AN, Song AV, Hiilamo H, Glantz SA (2013) Effect of the Framework Convention on Tobacco Control and voluntary industry health warning labels on passage of mandated cigarette warning labels from 1965 to 2012: transition probability and event history analyses. *American Journal of Public Health* 103(11): 2041-7. doi:10.2105/AJPH.2013.301324.
22. Wipfli H, Huang G (2011) Power of the process: evaluating the impact of the Framework Convention on Tobacco Control negotiations. *Health Policy* 100(2): 107-115. doi:10.1016/j.healthpol.2010.08.014.
23. Edge JS, Hoffman SJ (2013) Empirical impact evaluation of the WHO global code of practice on the international recruitment of health personnel in Australia, Canada, UK and USA. *Globalization and Health* 9: 60. doi:10.1186/1744-8603-9-60.
24. Bown CP (2004) On the economic success of GATT/WTO dispute settlement. *Review of Economic Statistics* 86: 811-823. doi:10.1162/0034653041811680.
25. Rose AK (2004) Do we really know that the WTO increases trade? *American Economic Review* 94: 98-114.
26. Gowa J, Kim SY (2005) An exclusive country club: the effects of the GATT on trade, 1950-94. *World Politics* 57: 453-478. doi:10.1353/wp.2006.0010.
27. Hafner-Burton EM (2005) Trading human rights: how preferential trade agreements influence government repression. *International Organization* 59: 593-629. doi:10.1017/S0020818305050216.
28. Subramanian A, Wei SJ (2007) The WTO promotes trade, strongly but unevenly. *Journal of International Economics* 72: 151-175. doi:10.1016/j.jinteco.2006.07.007.
29. Tomz M, Goldstein JL, Rivers D (2007) Do we really know that the WTO increases trade? Comment. *American Economic Review* 97: 2005-2018. doi:10.1257/aer.97.5.2005.
30. Kucik J, Reinhardt E (2008) Does flexibility promote cooperation? An application to the global trade regime. *International Organization* 62: 477-505. doi:10.1017/S0020818308080168.

31. Mansfield ED, Reinhardt E (2008) International institutions and the volatility of international trade. *International Organization* 62: 621-652. doi:10.1017/S0020818308080223.
32. Hafner-Burton EM, Montgomery AH (2012) War, trade and distrust: why trade agreements don't always keep the peace. *Conflict Management & Peace Science* 29: 257-278.
33. UNCTAD (1998) *Bilateral Investment Treaties in the Mid-1990s*. Geneva: World Health Organization.
34. Simmons BA (2000) International law and state behavior: commitment and compliance in international monetary affairs. *American Political Science Review* 94: 819-835.
35. Simmons BA (2000) Money and the law: why comply with the public international law of money? *Yale Journal of International Law* 25: 323-362.
36. Simmons BA (2000) The legalization of international monetary affairs. *International Organization* 54: 573-602.
37. Banga R (2003) Impact of government policies and investment agreements on FDI inflows. [Working Paper No. 116] New Delhi, India: Indian Council for Research on International Economic Relations.
38. Davies RB (2003) Tax treaties, renegotiations, and foreign direct investment. *Economic Analysis and Policy* 33: 251-273.
39. Hallward-Driemeier M (2003) Do bilateral investment treaties attract foreign direct investment? Only a bit – and they could bite. [Working Paper No. 3121] Washington DC: World Bank Policy Research.
40. Egger P, Pfaffermayr M (2004) The impact of bilateral investment treaties on foreign direct investment. *Journal of Comparative Economics* 32: 788-804.
41. di Giovanni J (2005) What drives capital flows? The case of cross-border M&A activity and financial deepening. *Journal of International Economics* 65: 127-149. doi:10.1016/j.jinteco.2003.11.007.
42. Ginsburg T (2005) International substitutes for domestic institutions: bilateral investment treaties and governance. *International Review of Law and Economics* 25: 107-123. doi:10.1016/j.irle.2004.06.002.
43. Grosse R, Trevino LJ (2005) New institutional economics and FDI location in central and eastern Europe. *Management International Review* 45: 123-145. doi:10.1093/acprof:oso/9780195388534.001.0001.
44. Neumayer E, Spess L (2005) Do bilateral investment treaties increase foreign direct investment to developing countries? *World Development* 33: 1567-1585. doi:10.1016/j.worlddev.2005.07.001.
45. von Stein J (2005) Do treaties constrain or screen? Selection bias and treaty compliance. *American Political Science Review* 99: 611-622. doi:10.1017/S0003055405051919.
46. Simmons BA, Hopkins DJ (2005) The constraining power of international treaties: theory and methods. *American Political Science Review* 99: 623-631.

47. Egger P, Merlo V (2007) The impact of bilateral investment treaties on FDI dynamics. *World Economics* 30: 1536-1549. doi:10.1111/j.1467-9701.2007.01063.x.
48. Büthe T, Milner HV (2008) The politics of foreign direct investment into developing countries: increasing FDI through international trade agreements? *American Journal of Political Science* 52: 741-762. doi:10.1111/j.1540-5907.2008.00340.x.
49. Hafner-Burton EM, Montgomery AH (2008) Power or plenty: how do international trade institutions affect economic sanctions? *Journal of Conflict Resolution* 52: 213-242.
50. Millimet DL, Kumas A (2008) Reassessing the effects of bilateral tax treaties on US FDI activity. [Working Paper No. 704] Dallas: Southern Methodist University.
51. Yackee JW (2008) Bilateral investment treaties, credible commitment, and the rule of (international) law: do BITs promote foreign direct investment? *Law & Society Review* 42: 805-832.
52. Aisbett E (2009) Bilateral investment treaties and foreign direct investment: correlation versus causation. In: Sauvant K, Sachs L, editors. *The Effect of Treaties on Foreign Direct Investment: Bilateral Investment Treaties, Double Taxation Treaties, and Investment Flows*. Oxford: Oxford University Press; p.395-437. doi:10.5148/tncr.2011.
53. Barthel F, Busse M, Neumayer E (2009) The impact of double taxation treaties on foreign direct investment: evidence from large dyadic panel data. *Contemporary Economic Policy* 28: 366-377. doi:10.1111/j.1465-7287.2009.00185.x.
54. Blonigen BA, Davies RB (2009) Do bilateral tax treaties promote foreign direct investment? In: Sauvant K, Sachs L, editors. *The Effect of Treaties on Foreign Direct Investment: Bilateral Investment Treaties, Double Taxation Treaties, and Investment Flows*. Oxford: Oxford University Press; p.461-485.
55. Blonigen BA, Davies RB (2009) The effects of bilateral tax treaties on U.S. FDI Activity. In: Sauvant K, Sachs L, editors. *The Effect of Treaties on Foreign Direct Investment: Bilateral Investment Treaties, Double Taxation Treaties, and Investment Flows*. Oxford: Oxford University Press; p.485-513.
56. Büthe T, Milner HV (2009) Bilateral investment treaties and foreign direct investment: a political analysis. In: Sauvant K, Sachs L, editors. *The Effect of Treaties on Foreign Direct Investment: Bilateral Investment Treaties, Double Taxation Treaties, and Investment Flows*. Oxford: Oxford University Press; p.171-225.
57. Coupé T, Orlova I, Skiba A (2009) The effect of tax and investment treaties on bilateral FDI flows to transition countries. In: Sauvant K, Sachs L, editors. *The Effect of Treaties on Foreign Direct Investment: Bilateral Investment Treaties, Double Taxation Treaties, and Investment Flows*. Oxford: Oxford University Press; p.681-715.
58. Egger P, Larch M, Pfaffermayr M, Winner H (2009) The impact of endogenous tax treaties on foreign direct investment: theory and empirical evidence. In: Sauvant K, Sachs L, editors. *The Effect of Treaties on Foreign Direct Investment: Bilateral Investment Treaties, Double Taxation Treaties, and Investment Flows*. Oxford: Oxford University Press; p.513-541.

59. Gallagher KP, Birch MBL (2009) Do investment agreements attract investment? Evidence from Latin America. In: Sauvant K, Sachs L, editors. *The Effect of Treaties on Foreign Direct Investment: Bilateral Investment Treaties, Double Taxation Treaties, and Investment Flows*. Oxford: Oxford University Press; p.295-311.
60. Grieco JM, Gelpi CF, Warren TC (2009) When preferences and commitments collide: the effect of relative partisan shifts on international treaty compliance. *International Organization* 63: 341-355. doi:10.1017/S0020818309090110.
61. Louie HJ, Rousslang DJ (2009) Host-country governance, tax treaties, and U.S. direct investment abroad. In: Sauvant K, Sachs L, editors. *The Effect of Treaties on Foreign Direct Investment: Bilateral Investment Treaties, Double Taxation Treaties, and Investment Flows*. Oxford: Oxford University Press; p.541-563. doi:10.1007/s10797-007-9020-5.
62. Millimet DL, Kumas A (2009) It's all in the timing: assessing the impact of bilateral tax treaties on U.S. FDI activity. In: Sauvant K, Sachs L, editors. *The Effect of Treaties on Foreign Direct Investment: Bilateral Investment Treaties, Double Taxation Treaties, and Investment Flows*. Oxford: Oxford University Press; p.635-659. doi:10.1093/acprof:oso/9780195388534.001.0001.
63. Neumayer E (2009) Do double taxation treaties increase foreign direct investment to developing countries? In: Sauvant K, Sachs L, editors. *The Effect of Treaties on Foreign Direct Investment: Bilateral Investment Treaties, Double Taxation Treaties, and Investment Flows*. Oxford: Oxford University Press; p.659-687.
64. Salacuse JW, Sullivan NP (2009) Do BITS really work?: An evaluation of bilateral investment treaties and their grand bargain. In: Sauvant K, Sachs L, editors. *The Effect of Treaties on Foreign Direct Investment: Bilateral Investment Treaties, Double Taxation Treaties, and Investment Flows*. Oxford: Oxford University Press; p. 171. doi:10.1093/acprof:oso/9780195388534.001.0001.
65. Yackee J (2009) Do BITs Really Work? revisiting the empirical link between investment treaties and foreign direct investment. In: Sauvant K, Sachs L, editors. *The Effect of Treaties on Foreign Direct Investment: Bilateral Investment Treaties, Double Taxation Treaties, and Investment Flows*. Oxford: Oxford University Press; p. 379-395. doi:10.2139/ssrn.1015083.
66. Busse M, Königer J, Nunnenkamp P (2010) FDI promotion through bilateral investment treaties: more than a bit? *Review of World Economics* 146: 147-177. doi:10.1007/s10290-009-0046-x.
67. Tobin JL, Rose-Ackerman S (2011) When BITs have some bite: the political-economic environment for bilateral investment treaties. *Review of International Organizations* 6: 1-32. doi:10.1007/s11558-010-9089-y.
68. Keith LC (1999) The United Nations International Covenant on Civil and Political Rights: does it make a difference in human rights behavior? *Journal of Peace Research* 36: 95-118. doi:10.1177/0022343399036001006.
69. Hathaway OA (2002) Do human rights treaties make a difference? *Yale Law Journal* 111: 1935-2042.
70. Hafner-Burton EM, Tsutsui K (2005) Human rights in a globalizing world: the paradox of empty

- promises. *American Journal of Sociology* 110: 1373-1411.
71. Neumayer E (2005) Do international human rights treaties improve respect for human rights? *Journal of Conflict Resolution* 49: 925-953. doi:10.1177/0022002705281667.
 72. Abouharb R, Cingranelli D (2007) *Human Rights and Structural Adjustment*. Cambridge: Cambridge University Press.
 73. Cardenas S (2007) *Conflict and Compliance: State Responses to International Human Rights Pressure*. Philadelphia: University of Pennsylvania Press.
 74. Hafner-Burton EM, Tsutsui K (2007) Justice lost! The failure of international human rights law to matter where needed most. *Journal of Peace Research* 44: 407-425. doi:10.1177/0022343307078942.
 75. Gilligan MJ, Nesbitt NH (2009) Do norms reduce torture? *Journal of Legal Studies* 38: 445-470.
 76. Palmer A, Tomkinson J, Phung C, Ford N, Joffres M, Fernandes KA, Zeng L, Lima V, Montaner JSG, Guyatt GH, Mills EJ (2009) Does ratification of human-rights treaties have effects on population health? *The Lancet* 373: 1987-1992. doi:0.1086/593112.
 77. Powell EJ, Staton JK (2009) Domestic judicial institutions and human rights treaty violation. *International Studies Quarterly* 53: 149-174. doi:10.1111/j.1468-2478.2008.01527.x.
 78. Simmons BA (2009) Civil rights in international law: compliance with aspects of the "International Bill of Rights". *Indiana Journal of Global Legal Studies* 16: 437-481.
 79. Simmons BA (2009) *Mobilizing for Human Rights: International Law In Domestic Politics*. Cambridge: Cambridge University Press.
 80. Simmons BA (2009) Should states ratify protocol? Process and consequences of the optional protocol of the ICESCR. *Norwegian Journal of Human Rights* 27: 64-81.
 81. Basch F, Filippini L, Laya A, Nino M, Rossi F, Schreiber B (2010) The effectiveness of the inter-American system of human rights protection: a quantitative approach to it functioning and compliance with its decisions. *Sur – International Journal on Human Rights* 7: 9-35.
 82. Greenhill B (2010) The company you keep: international socialization and the diffusion of human rights norms. *International Studies Quarterly* 54: 127-145. doi:10.1111/j.1468-2478.2009.00580.x.
 83. Hawkins D, Jacoby W (2010) Partial compliance: a comparison of the European and inter-American courts of human rights. *Journal of International Law and International Relations* 6: 35-85.
 84. Hill Jr DW (2010) Estimating the effects of human rights treaties on state behavior. *Journal of Politics* 72: 1161-1174. doi:10.1017/S0022381610000599.
 85. Kim H, Sikkink K (2010) Explaining the deterrence effect of human rights prosecutions for transitional countries. *International Studies Quarterly* 54: 939-963. doi:10.1111/j.1468-

2478.2010.00621.x.

86. Cole W (2011) Individuals V. States: An Analysis Of Human Rights Committee Rulings, 1979-2007. [Working Paper]. Bozeman, MN: Montana State University.
87. Conrad CR (2011) Divergent incentives for dictators: domestic institutions and (international promises not to) torture. [Working Paper]. Charlotte, NC: University of North Carolina at Charlotte. doi:10.1177/0022002712459707.
88. Hollyer JR, Rosendorff PB (2011) Why do authoritarian regimes sign the convention against torture? Signaling, domestic politics and non-compliance. *Quarterly Journal of Political Science* 6: 275-327. doi:10.2139/ssrn.1876843.
89. Linos K (2011) Diffusion through democracy. *American Journal of Political Science* 55: 678-695. doi:10.1111/j.1540-5907.2011.00513.x.
90. Staton JK, Romero A (2011) Clarity and compliance in the inter-American human rights system. Presented at the International Political Science Association in Sao Paulo, Brazil.
91. Kim M, Boyle EH (2012) Neoliberalism, transnational education norms, and education spending in the developing world, 1983–2004. *Law & Social Inquiry* 37: 367-394. doi:10.1111/j.1747-4469.2011.01267.x.
92. Cole W (2013) Strong walk and cheap talk: the effect of the International Covenant of Economic, Social and Cultural Rights on policies and practices. *Social and Economic Rights in Law and Practice* 92(1): 165-194.
93. Conrad CR, Ritter EH (2013) Treaties, tenure, and torture: the conflicting domestic effects of international law. *Journal of Politics* 75: 397-409. doi:10.1017/S0022381613000091.
94. Helfer LR, Voeten E (2014) International courts as agents of legal change: evidence from LGBT rights in Europe. *International Organization* 68(1): 77-110.
95. Lupu Y (2013a) Best evidence: the role of information in domestic judicial enforcement of international human rights agreements. [Working Paper] San Diego, CA: University of California–San Diego. doi:10.2139/ssrn.1876728.
96. Lupu Y (2013b) The informative power of treaty commitment: using the spatial model to address selection effects. *American Journal of Political Science* 57(4): 912-925.
97. Neumayer E (2013) Do governments mean business when they derogate? Human rights violations during declared states of emergency. *Review of International Organizations* 8: 1-31. doi:10.2139/ssrn.1654001.
98. Putnam TL, Shapiro JN (2013) International law and voter preferences: the case of foreign human rights violations. [Working Paper] New York: Columbia University.
99. Meernik J (2005) Justice and peace? How the International Criminal Tribunal affects societal peace in Bosnia. *Journal of Peace Research* 42: 271-289. doi:10.1177/0022343305052012.

100. Hafner-Burton EM, Montgomery AH (2006) Power positions: international organizations, social networks, and conflict. *Journal of Conflict Resolution* 50: 3-27.
101. Valentino B, Huth P, Croco S (2006) Covenants without the sword: international law and the protection of civilians in times of war. *World Politics* 58: 339-377. doi:10.1353/wp.2007.0004.
102. Kelley J (2007) Who keeps international commitments and why? The International Criminal Court and bilateral nonsurrender agreements. *American Political Science Review* 101: 573-589. doi:10.1017/S0003055407070426.
103. Morrow JD (2007) When do states follow the laws of war? *American Political Science Review* 101: 559-572. doi:10.1017/S000305540707027X.
104. Nooruddin I, Payton AL (2010) Dynamics of influence in international politics: The ICCs, BIAs, and economic sanctions. *Journal of Peace Research* 47: 711-721. doi:10.1177/0022343310381854.
105. Simmons BA, Danner A (2010) Credible commitments and the International Criminal Court. *International Organization* 64: 225-256. doi:10.2139/ssrn.991128.
106. Mitchell RB (1994) Regime design matters: intentional oil pollution and treaty compliance. *International Organization* 48: 425-458. doi:10.1017/S0020818300028253.
107. Murdoch JC, Sandler T (1997) The voluntary provision of a pure public good: the case of reduced CFC Emissions and the Montreal Protocol. *Journal of Public Economics* 63: 331-349. doi:10.1016/S0047-2727(96)01598-8.
108. Murdoch JC, Sandler T, Sargent K (1997) A tale of two collectives: sulphur versus nitrogen oxides emission reduction in Europe. *Economica* 64: 281-301. doi:10.1111/1468-0335.00078.
109. Helm C, Sprinz D (2000) Measuring the effectiveness of international environmental regimes. *Journal of Conflict Resolution* 44: 630-652.
110. Miles E, Underdal A, Andresen S, Wetttestad J, Skjaereth JB, Carlin EM (2002) *Environmental Regime Effectiveness: Confronting Theory with Evidence*. Cambridge, MA: MIT Press.
111. Finus M, Tjøtta S (2003) The Oslo Protocol on sulfur reduction: the great leap forward? *Journal of Public Economics* 87: 2031-2048. doi:10.1016/S0047-2727(02)00042-7.
112. Ringquist EJ, Kostadinova T (2005) Assessing the effectiveness of international environmental agreements: the case of the 1985 Helsinki Protocol. *American Journal of Political Science* 49: 86-102. doi:10.1111/j.0092-5853.2005.00112.x.
113. Breitmeier H, Young O, Zurn M (2006) *Analyzing International Environmental Regimes: From Case Study to Database*. Cambridge, MA: MIT Press.
114. Bernauer T, Siegfried T (2008) Compliance and performance in international water agreements: the case of the Naryn/Syr Darya Basin. *Global Governance* 14: 479-501.
115. Breitmeier H, Underdal A, Young OR (2011) The effectiveness of international environmental

- regimes: comparing and contrasting findings from quantitative research. *International Studies Review* 13: 579-605. doi:10.1111/j.1468-2486.2011.01045.x.
116. Merry SE (2006) Transnational human rights and local activism: mapping the middle. *American Anthropologist* 108(1): 38-51. doi:10.1525/aa.2006.108.1.38.
117. Merry SE (2006) New legal realism and the ethnography of transnational law. *Law & Social Inquiry* 31(4): 975-995. doi:0.1111/j.1747-4469.2006.00042.x.
118. Keith LC (2002) Judicial independence and human rights protection around the world. *Judicature* 85: 195-200.
119. Snyder J, Vinjamuri L (2003) Trials and errors: principle and pragmatism in strategies of international justice. *International Security* 28(3): 5-44.
120. Ku J, Nzelibe J (2006) Do international criminal tribunals deter or exacerbate humanitarian atrocities? *Washington University Law Review* 84: 777-833.
121. Prakash A, Potoski M (2006) Racing to the bottom? Trade, environmental governance and ISO 14001. *American Journal of Political Science*. 50: 350-364.
122. Victor DG (2006) Toward effective international cooperation on climate change: numbers, interests and institutions. *Global Environmental Politics* 6(3): 90-103. doi:10.1162/glep.2006.6.3.90.
123. Snidal D (1985) The game theory of international politics. *World Politics* 38(1): 25-57.
124. Hoffman SJ (2012) Mitigating inequalities of influence among states in global decision-making. *Global Policy* 3(4): 421-432. doi:10.1111/j.1758-5899.2011.00153.x.
125. Krasner SD (1982) Structural causes and regime consequences: regimes as intervening variables. *International Organization* 36(2): 185-205 doi:10.1017/S0020818300018920.
126. Waltz K (1979) *Theory of International Politics*. New York: McGraw-Hill.
127. Chayes A, Ehrlich T, Lowenfeld AF (1968) *International Legal Process*. New York: Little, Brown and Company.
128. Koskenniemi M (1990) The politics of international law. *European Journal of International Law* 1: 4-32.
129. Kennedy D (2004) *The Dark Sides of Virtue: Reassessing International Humanitarianism*. Princeton: Princeton University Press.
130. Keck ME, Sikkink K (1998) *Activists Beyond Borders: Advocacy Networks in International Politics*. Cambridge, UK: Cambridge University Press.
131. Slaughter AM (2004) *A New World Order*. Princeton: Princeton University Press.

132. Koh HH (1999) How is international human rights law enforced? *Indiana Law Journal* 74(4): 1397-1417.
133. Archibugi D (2008) *The Global Commonwealth of Citizens: Toward Cosmopolitan Democracy*. Princeton: Princeton University Press, 2008.
134. Held D (2009) Restructuring global governance: cosmopolitanism, democracy and the global order. *Millennium Journal of International Studies*. 37(3): 535-547. doi:10.1177/0305829809103231.
135. Finnemore M (1996) *National Interests in International Society*. New York: Cornell University Press.
136. Ruggie JG (1998) What makes the world hang together? Neo-utilitarianism and the social constructivist challenge. *International Organization* 52(4): 855. doi:10.1162/002081898550770.
137. Wendt A (1992) Anarchy is what states make of it: the social construction of power politics. *International Organization* 46(2): 391-425.
138. Yach D, Bettcher D (2000) Globalisation of tobacco industry influence and new global responses. *Tobacco Control* 9(2): 206–16. doi:10.1136/tc.9.2.206.
139. Franzese R (2010) Models for time-series-cross-section data [PDF document]. [cited 2015 Aug 10]; Available from: <http://www-personal.umich.edu/~franzese/Franzese.JWAC.TSCS.1.Introduction.pdf>.
140. Podesta F (2002) Recent developments in quantitative comparative methodology: the case of pooled time series-cross sectional analysis. *Decision Support Systems Papers, SOC* 3-02.
141. Beck N, Katz JN (1995) What to do (and not to do) with time-series cross-section data. *American Political Science Review* 89(3): 634-647. doi:10.2139/ssrn.1658640.
142. Sekhon JS (2012) The statistics of causal inference in the social sciences [PDF document]. [cited 2015 Aug 10]; Available from: <http://sekhon.berkeley.edu/causalinf/causalinf.pres.pdf>.
143. Loftin C, McDowall D, Wiersema B, Talbert JC (1991) Effects of restrictive licensing of handguns on homicide and suicide in the District of Columbia. *New England Journal of Medicine* 325: 1615-20. doi:10.1056/NEJM199112053252305.
144. Humphreys DK, Eisner MP, Wiebe DJ (2013) Evaluating the impact of flexible alcohol trading hours on violence: an interrupted time series analysis. *PLoS ONE* 8(2): e55581. doi:10.1371/journal.pone.0055581.
145. Ma Z, Kuller LH, Fisher MA, Ostroff SM (2013) Use of interrupted time-series method to evaluate the impact of cigarette excise tax increases in Pennsylvania, 2000–2009. *Preventing Chronic Disease* 10: 120268. doi:10.5888/pcd10.120268.
146. Morgan OW, Griffiths C, Majeed A (2007) Interrupted time-series analysis of regulations to reduce paracetamol (acetaminophen) poisoning. *PLoS Medicine* 4(4): e105. doi:10.1371/journal.pmed.0040105.

147. Gostin LO, Friedman E (2013) Towards a framework convention on global health: a transformative agenda for global health justice. *Yale Journal of Health Policy, Law, and Ethics* 13(1): 1-75.
148. Alter KJ, Meunier S (2009) The politics of international regime complexity. *Perspectives on Politics* 7(1): 13-24.
149. Drezner DW (2009) The power and peril of international regime complexity. *Perspectives on Politics* 7(1): 65-70.
150. Chang AY, Røttingen JA, Hoffman SJ, Moon S (2014) Governance Arrangements for Health R&D. [Report]. Graduate Institute of International & Development Studies, Geneva, Switzerland, and Harvard Global Health Institute, Cambridge, MA.
151. Hoffman SJ (2014) Making the International Health Regulations matter: promoting compliance through effective dispute resolution. In: Rushton S, Youde J, editors. *Routledge Handbook on Global Health Security*. Oxford: Routledge; p. 239-251.
152. Hoffman SJ, Røttingen JA (2013) Global health governance after 2015. *The Lancet* 382(9897): 1018. doi:10.1016/S0140-6736(13)61966-2.
153. Hoffman SJ, Røttingen JA (2012) Assessing implementation mechanisms for an international agreement on research and development for health products. *Bulletin of the World Health Organization* 90(11): 854-863.
154. Hoffman SJ, Røttingen JA (2015) Assessing the expected impact of global health treaties: evidence from 90 quantitative evaluations. *American Journal of Public Health*. 105(1): 26-40.
155. Gostin LO, Garsia A (2014) Governing for health as the world grows older: healthy lifespans in aging societies. *Elder Law Journal* 22: 112-140.
156. Gostin LO (2014) Healthy living needs global governance. *Nature* 511: 147-149. doi:10.1038/511147a.
157. Flood CM, Lemmens T (2013) Global health challenges and the role of law. *Journal of Law, Medicine & Ethics* 41(1): 9-15. doi:10.1111/jlme.12001.
158. Gostin LO (2014) *Global Health Law*. Cambridge, MA: Harvard University Press.
159. Gostin LO, Sridhar D (2014) Global health and the law. *New England Journal of Medicine* 370(18): 1732-1740. doi:10.1056/NEJMr1314094.
160. Hoffman SJ, Røttingen JA (2013) Dark sides of the proposed Framework Convention on Global Health's many virtues: a systematic review and critical analysis. *Health & Human Rights Journal* 15(1): 117-134.
161. Hoffman SJ, Røttingen JA (2012) Be sparing with international laws. *Nature* 483: 275. doi:10.1038/483275e.

162. Hoffman SJ, Røttingen JA (2011) A framework convention on obesity control? *The Lancet* 378: 2068. doi:10.1016/S0140-6736(11)61894-1.
163. Kennedy D (2002) The international human rights movement: part of the problem? *Harvard Human Rights Journal* 15: 101-126.
164. Kamat S (2003) NGOs and the new democracy: the false saviours of international development. *Harvard International Review* 25(1): 65-69.
165. National Rifle Association (2014) History: America's Longest-Standing Civil Rights Organization [Internet]. [cited 2015 Aug 10]; Available from: <http://home.nra.org/history>.
166. International Tobacco Growers' Association (2014) About the International Tobacco Growers' Association: Who We Are and What We Do [Internet]. [cited 2015 Aug 10]; Available from: <http://www.tobaccoleaf.org/conteudos/default.asp?ID=7&IDP=2&P=2>.
167. Asbestos Cement Products Manufacturers Association (2014) About Us [Internet]. [cited 2014 Oct 12]; Available from: <http://www.acpma.com/aboutus.html>.
168. Copenhagen Consensus Center (2008) Copenhagen Consensus 2008 – Results [PDF document]. [cited 2015 Aug 10]; Available from: http://www.copenhagenconsensus.com/sites/default/files/cc08_results_final_0.pdf.
169. Holmes S, Sunstein CR (1999) *The Cost of Rights: Why Liberty Depends on Taxes*. New York: Norton.
170. Yach D, Bettcher D (2000) Globalisation of tobacco industry influence and new global responses. *Tobacco Control* 9: 206-216. doi:10.1136/tc.9.2.206.
171. Consultative Expert Working Group on Research & Development: Financing & Coordination (2012) *Research and Development to Meet Health Needs in Developing Countries: Strengthening Global Financing and Coordination*. Geneva: World Health Organization [PDF document]. [cited 2015 Jan 6]; Available from: http://www.who.int/phi/CEWG_Report_5_April_2012.pdf.
172. World Health Organization (2012) Resolution WHA65.24. Consultative Expert Working Group on Research and Development: Financing and Coordination. In: Sixty-fifth World Health Assembly, Geneva, 21–26 May 2012. Volume 1. Resolutions, decisions and annexes. Geneva: World Health Organization; 2012 (WHA65/2012/REC/1) [Internet]. [cited 2015 Aug 10]; Available from: http://apps.who.int/gb/e/e_wha65.html.
173. Røttingen JA, Chamas C, Goyal LC, Harb H, Lagrada L, et al. (2012) Securing the public good of health research and development for developing countries. *Bulletin of the World Health Organization* 90(5): 398-400. doi:10.2471/BLT.12.105460.
174. Røttingen JA, Chamas C (2012) A new deal for global health R&D? The recommendations of the Consultative Expert Working Group on Research and Development (CEWG). *PLoS Medicine* 9(5): e1001219. doi:10.1371/journal.pmed.1001219.
175. Ostrom E (1990) *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge, UK: Cambridge University Press.

176. Ostrom E (2010) Beyond markets and states: polycentric governance of complex economic systems. *American Economic Review* 100(3): 641-672. doi:10.1257/aer.100.3.641.
177. Cars O, Högberg LD, Murray M, Nordberg O, Sivaraman S, et al. (2008) Meeting the challenge of antibiotic resistance. *British Medical Journal* 337: a1438. doi:10.1136/bmj.a1438.
178. Kesselheim AS, Outtersen K (2011) Improving antibiotic markets for long-term sustainability. *Yale Journal of Health Policy, Law & Ethics* 11(1): 101-167.
179. Laxminarayan R, Heymann DL (2012) Challenges of drug resistance in the developing world. *British Medical Journal* 344: e1567. doi:10.1136/bmj.e1567.
180. Laxminarayan R, Duse A, Wattal C, Zaidi AKM, Wertheim HFL, et al. (2013) Antibiotic resistance—the need for global solutions. *The Lancet Infectious Diseases* 13(12): 1057-1098. doi:10.1016/S1473-3099(13)70318-9.
181. Hoffman SJ (2015) A science of global strategy. In: Frenk J, Hoffman SJ, editors. *“To Save Humanity”: What Matters Most for a Healthy Future*. New York: Oxford University Press; p. 173-175.

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Chapter 2

Towards Global Collective Action on Antimicrobial Resistance[†]

Abstract

Access to antimicrobials and the sustainability of their effectiveness is undermined by deep-seated failures in both global governance and global markets. These failures can be conceptualized as political economy challenges unique to each antimicrobial policy goal, including global commons dilemmas, negative externalities, unrealized positive externalities, coordination issues and free-rider problems. Many actors, instruments and initiatives that form part of the global antimicrobial regime are addressing these challenges, yet they are insufficiently coordinated, compliant, led or financed. Taking an evidence-based approach to global strategy reveals at least ten options for promoting collective action on antimicrobial access and effectiveness, including those that involve building institutions, crafting incentives and mobilizing interests. While no single option is individually sufficient to tackle all political economy challenges facing the global antimicrobial regime, the most promising options seem to be monitored milestones (institution), an inter-agency task force (institution), a global pooled fund (incentive) and a special representative (interest mobilizer), perhaps with an international antimicrobial treaty driving forward their implementation. Whichever are chosen, their real-world impact will depend on strong accountability relationships and robust accountability mechanisms that facilitate transparency, oversight, complaint, and enforcement. Such relationships and mechanisms, if designed properly, can promote compliance help bring about the changes that any new international agreement on antimicrobial resistance will aspire to achieve. Progress should be possible if only we find the right mix of options matched with the right forum and making this grand bargain politically possible by ensuring it addresses access, conservation and innovation simultaneously.

[†] Co-authored with Trygve Ottersen, Benn McGrady, Grazia M. Caleo, Nils Daulaire, Stefan Elbe, Danilo Lo Fo Wong, Precious Matsoso, Elias Mossialos, Zain Rizvi and John-Arne Røttingen.

Introduction

So much progress in health and well-being over the past century can be attributed to antimicrobials like penicillin, sulfonamide and tetracycline. They have been essential for treating infections, preventing complications from surgery and cancer care, providing life-saving neonatology interventions, and keeping cattle and livestock healthy for human consumption, much of which was impossible or dangerous until their discovery. Access to antimicrobials now save millions of lives each year and infectious disease is far less deadly because of their effectiveness.¹

But all of this is changing. Bacteria, viruses, parasites and fungi are rapidly developing resistance to existing classes of medicines and few novel antimicrobials are coming to market. Such resistance is both natural and inevitable, but it is also clear that inappropriate antimicrobial use, falsified/substandard drugs and poor infection control have accelerated the pace of evolutionary processes.¹

Today, diminishing antimicrobial effectiveness represents one of the greatest threats to humankind while universal access to antimicrobials represents one of the greatest opportunities.²⁻⁴ As a threat, the world faces the prospect of a post-antimicrobial era where infection once again does battle with our bodies on a scale and severity not seen in over 80 years. The most recent modeling work predicts annual drug-resistant infection deaths will climb from today's 700,000 to 10 million by 2050, at a total cumulative cost of \$100 trillion USD.⁵⁻⁶ As an opportunity, universal access to antimicrobials would save millions of lives each year and improve many millions more. For example, 244,000 neonate deaths can easily be averted annually with basic injectable antibiotics for newborn sepsis.⁴ Antimicrobial access can improve health among the most marginalized, vulnerable and poorest people.

It is clear that robust global action is needed to mitigate this threat and maximize this opportunity. Yet successions of recommended policies to improve access to, conservation of and

innovation for antimicrobials have not been implemented despite evidence of importance, benefit and cost-effectiveness.¹ The frustrating pace of progress is not the result of insufficient awareness or political priority, but rather deep-seated failures in both global governance and global markets. Specifically, countries face collective action problems whereby all would benefit from cooperation and coordination on antimicrobial access, conservation and innovation, but none want to incur their part of the associated costs.⁷⁻⁸ Global markets, meanwhile, undersupply antimicrobials for those who cannot afford them, oversupply them in wealthier contexts where individual benefits are not weighed against total costs, and underfinance research and development (R&D) for new antimicrobials given risks and constrained rewards.⁹

This chapter examines how to achieve global collective action for correcting these governance and market failures and implementing recommended policies for improving access, conservation and innovation for antimicrobials. The starting point is a mapping of the problems underlying inadequate global action and the existing actors relevant for this policy area. Gaps are identified, guiding institutional design principles are distilled, and ten options for achieving progress are evaluated. Opportunities for embedding accountability into international agreements are explored, which are listed as a menu of accountability mechanisms addressing transparency, oversight, complaint, and enforcement. The overall goal is to bring the science of global strategy to bear on addressing this pressing global challenge – because everyone’s health depends on it.

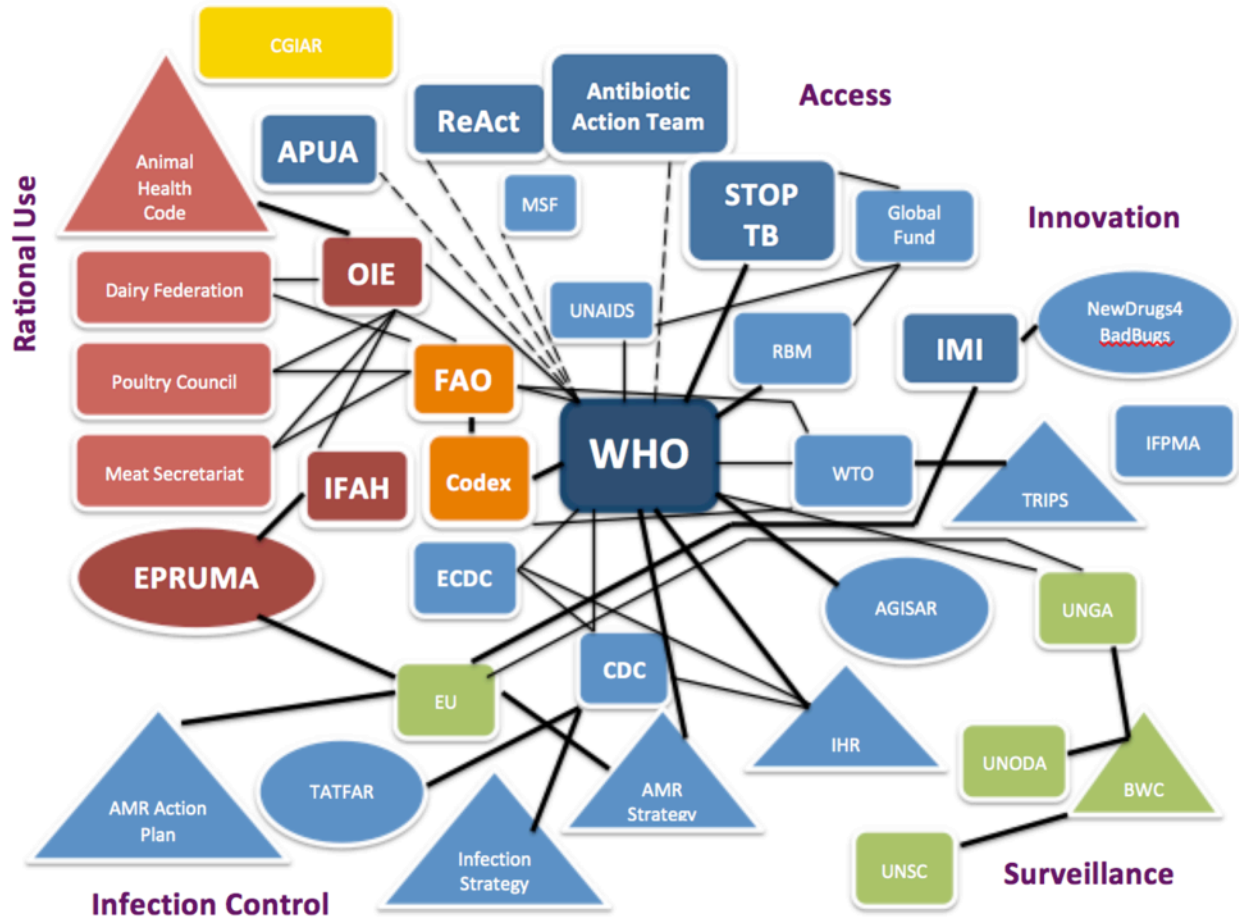
Political Economy Challenges Preventing Global Collective Action on Antimicrobials

The fact that countries of the world have been unable to achieve global collective action on antimicrobials is not surprising. Within countries, the financial costs of maintaining antimicrobial effectiveness are immediate and concentrated among a few powerful actors like wealthy individuals, pharmaceutical companies, livestock producers and drug dispensaries. The benefits, meanwhile, are

relatively far-off and diffuse across society. This creates a domestic collective action problem where special interests are overrepresented in political and regulatory processes.¹⁰ Circumstances like these make even the most beneficial global collective action difficult because of two-level games whereby states' international behaviors reflect the domestic interests of powerful domestic constituents.¹¹ Regarding antimicrobials, these constituents face potentially significant short-term losses while the rest of the population has 'only' long-term gains to forego.

But in addition to sub-optimal preferencing caused by domestic politics, there are additional political economy problems at the international level underlying inactivity by states. These problems include global commons dilemmas, negative externalities, unrealized positive externalities, coordination issues and free-rider problems.⁷⁻⁸ The difficulty in solving them is compounded by how antimicrobials concern several domains – human health, animal health, agriculture, food, migration, trade, environment and security – and implicate the work of many actors, including United Nations (UN) entities, other multilateral organizations, civil society, public-private partnerships and industry (see Panel 2.1). Understanding the political economy problems facing each antimicrobial policy goal along with the constellation of actors that can address them is essential, because any new effort to promote antimicrobial access, conservation and innovation will not be implemented on a blank slate but rather in the context of this highly evolved policy context.¹²⁻¹³

Panel 2.1: Constellation of Actors in the Global Antimicrobial Regime



The figure illustrates the constellation of actors in the global antimicrobial regime, roughly categorized by antimicrobial policy goals. Conservation is divided into sub-components infection control, rational use and surveillance for visualization purposes. Rectangles, circles and triangles represent institutions, initiatives, and instruments, respectively. Blue shapes are focused on human health, red on animal health, orange on food, yellow on agriculture, plants and the environment, and green on security. The darker colours and larger fonts symbolize more significant institutions, instruments and initiatives in the antimicrobial regime. Differences in line thickness represent the varying strengths of relationships.

Responsible Use (Conservation)

Preserving antimicrobial effectiveness through responsible use is a global commons dilemma for two interlinked reasons: states' perceived short-term self-interest is contrary to the long-term common good, and interdependence from resistant-microbes spreading across borders disincentivizes unilateral action without corresponding moves by others.¹⁴ For example, states prohibiting antimicrobial growth-promoters in animals are undermined by other states' failure to do the same by contributing to

resistance and comparatively increasing food production costs.¹⁵ This is perceived as diminishing competitiveness and profitability of the prohibiting state's food industry on international markets.

Theoretically, international institutions can eliminate these disincentives and coordinate conservation efforts. The World Health Organization (WHO), for example, has implored the responsible use of antimicrobials in various resolutions and strategies.¹⁶⁻¹⁷ WHO published a major report on antimicrobial surveillance in 2014¹⁸ and a global action plan for optimizing antimicrobial use in 2015.¹⁹⁻²² The joint WHO/Food & Agriculture Organization (FAO) Codex Alimentarius Commission has also supported responsible use measures, releasing a code of practice in cooperation with the World Organization for Animal Health (OIE).²³ The OIE has further promoted antimicrobial conservation through its *Terrestrial Animal Health Code*, which includes guidelines on the prudent use of antimicrobials.²⁴ The European Commission (EC) and USA restricted non-therapeutic antibiotic use in food animals in 2006 and 2013 respectively,²⁵⁻²⁶ and together convene a Transatlantic Taskforce on Antimicrobial Resistance (TATFAR) to promote coordinated action.^{27,29}

Yet irresponsible use of antimicrobials persists in both clinical medicine and livestock production. One explanation lies in domestic political concerns, but another points to weak international institutions. Existing institutions have not created credible commitments among states to implement specific standards such that they do not eliminate disincentives for state action. Another explanation lies in concerns of strong countervailing interest groups (e.g., livestock lobby) and about obstructing access to antimicrobials among those who need them.

Infection Control (Conservation)

The positive externalities of infection control extend its benefits far beyond the paying individual, health facility or state, resulting in a market failure with underutilization of infection control practices given states weigh only their own benefits against implementation costs. Even when direct

benefits would clearly outweigh costs, domestic capacity constraints make it difficult for some states to establish infection control programs.

In theory, an international commitment to infection control could eliminate this market failure. Global standards and capacity-building could assist states in preventing the spread of infection at the domestic level. Along these lines, WHO has continued to emphasize the importance of appropriate infection control practices and has offered technical guidance on achieving minimum standards.^{16,19,22,30} The CDC and ECDC have also released infection control strategies for resistant-microbes.³¹⁻³² Yet insufficient incentives to incorporate the positive externalities of prevention strategies have left them underutilized and underfinanced.

Surveillance (Conservation)

Surveillance presents both coordination and free-rider problems in that states approach data collection on antimicrobial access and effectiveness inconsistently and are incentivized to wait for data from other states rather than undertake the cost of collecting any themselves.⁸ A globally integrated surveillance system would benefit all but be difficult to achieve given how reporting systems are often driven by cost reimbursement and entrenched healthcare management processes. Change may not be worth the cost without universal participation and shared financing. Even if it is worthwhile for a single country like the United States to just pay the full cost of global surveillance, domestic political preferences against foreign aid may prevent unilateral financing. Such action would also undermine long-term sustainability that domestic financing offers.

To address these problems, WHO has launched several guidelines, resolutions and strategic documents promoting antimicrobial surveillance and an advisory group to support their implementation.^{16,19-20,33} WHO's *International Health Regulations* (IHR) also legally requires all 194 Member States to monitor and report outbreaks of certain diseases, many of which are prone to

resistance. Numerous pathogen- and region-specific surveillance networks are supported by WHO (e.g., CAESAR),³⁴ EU (e.g., EARS-Net)³⁵ and pharmaceutical companies (e.g., SMART).³⁶ OIE's *Terrestrial Animal Health Code* sets global standards for antimicrobial surveillance programs.²⁴ Yet weak institutions and interest groups supporting surveillance have meant it has remained dangerously patchy. For example, 123 countries requested extensions for the IHR's June 2012 deadline to attain minimal capacities.³⁷⁻⁴⁰

Access

Where access is problematic, states are naturally reluctant to restrict antimicrobial availability, particularly when conservation benefits are undermined by others' inaction. Limiting access also undermines market incentives for innovation. Even though untreated infections can easily spillover across borders – aligning the antimicrobial needs of poorer states with the health security interests of wealthier states – global access schemes will be insufficiently supported by countries ideologically against foreign aid.

International regimes can theoretically facilitate cooperative efforts to minimize spillover effects and promote universal access. Indeed, improving access to antimicrobials has been a central focus of many resolutions, reports and activities of WHO, civil society organizations and others.⁴¹⁻⁴² International human rights law enshrines access to essential medicines – including essential antimicrobials – as part of the human right to the highest attainable standard of health.⁴³ Programs of the Global Fund to Fight AIDS, Tuberculosis & Malaria, Roll Back Malaria Partnership, Stop TB Partnership and UNAIDS support this goal.⁴⁴⁻⁴⁷

Nevertheless, inadequate access to existing antimicrobials persists in many states and there are insufficiently credible commitments by states to alleviate these concerns. Instead, piecemeal approaches dominate in the form of disease-specific interventions and a partially applicable framework

of the *International Health Regulations* (IHR) governing public health emergencies of international concern.^{21,48-49}

Innovation

Like many areas of R&D, investment in developing new antimicrobial medicines, vaccines, diagnostics and control strategies is undermined by its public-good character and the ability to free-ride on discoveries. But it is the common-pool nature of antimicrobials that makes innovation in this area especially challenging. This is because each antimicrobial use diminishes the medicine's theoretical pool of effectiveness, including for the states and companies that paid for its development and/or holds the patent rights on its sale.

Existing international architecture governing innovation is vast, but the World Trade Organization's *Agreement on Trade-Related Aspects of Intellectual Property Rights* (TRIPS) is the primary global mechanism through which R&D of antimicrobials is incentivized. It serves this function by obliging WTO Member States to uphold minimum intellectual property standards.⁵⁰ This includes patents, which give owners temporary monopoly rights that reduce competition. However, patents have proven insufficient for incentivizing antimicrobial R&D or maintaining a much-needed pipeline of new antimicrobials. More recently, major public financing efforts have been introduced,⁵¹⁻⁵² the impact of which have yet to be seen. Going forward, some have argued for an R&D treaty that would incentivize currently neglected R&D and create a more favourable environment for meeting innovation needs.⁵³⁻⁵⁴ In July 2014 UK Prime Minister David Cameron commissioned a review of these economic issues and policy options.⁵⁵

Assessment of the Global Antimicrobial Regime

This brief mapping of the political economy problems underlying inaction reveals the depth of challenges involved and the abundance of institutional architecture potentially available to address them (see Panel 2.2). There are numerous global strategies, political resolutions, regulatory standards, multilateral activities, industry initiatives and public-private partnerships focused on tackling antimicrobial access, conservation and innovation either generally or for specific diseases.⁵⁶ Further complicating matters is how actors often possess broad overlapping mandates that do not always align. For example, increasing the efficiency of food production through antimicrobial growth-promoters – advancing FAO’s objectives – could adversely affect human health, concerning for WHO. In addition, these institutions work through different policy forums which have different powers to influence state behaviour and are attended by different actors with different priorities (e.g., Ministers of Agriculture versus Ministers of Health). Cooperation and coordination under such circumstances is naturally challenging.

Panel 2.2: Key Institutions for the Global Antimicrobial Regime

Entity	Mandate, Functions and Powers	Access	Resp. Use	Infect. Cont.	Surveillance	Innovation
UN Entities						
World Health Organization (WHO) <i>[Human Health]</i>	▪ Sets standards, provides technical assistance, and disseminates research to achieve “the attainment by all peoples...the highest possible level of health” ⁵⁷	X	X	X	X	X
Roll Back Malaria Partnership <i>[Human Health]</i>	▪ Mobilizes networks of stakeholders for action and builds consensus to combat malaria ⁴⁵	X	X	-	X	X
STOP TB Partnership <i>[Human Health]</i>	▪ Mobilizes networks of stakeholders for action and builds consensus to combat tuberculosis ⁴⁶	X	X	-	X	X
Joint United Nations Programme on HIV/AIDS (UNAIDS) <i>[Human Health]</i>	▪ Provides global leadership, builds capacity, and advocates for greater political commitment for a global AIDS response ⁴⁷	X	X	-	X	-
United Nations Children’s Fund <i>[Human Health]</i>	▪ Seeks to promote the rights of children through a variety of activities, including education and health initiatives, and humanitarian action ⁵⁸	X	-	-	-	-
United Nations Office on Drugs and Crime (UNODC) <i>[Human Health]</i>	▪ Assists countries in their response against illicit drugs, crime and terrorism through capacity building and technical guidance ⁵⁹	-	-	-	-	-

Panel 2.2: Key Institutions for the Global Antimicrobial Regime (Continued)

Entity	Mandate, Functions and Powers	Access	Resp. Use	Infect. Cont.	Surveillance	Innovation
United Nations Development Programme (UNDP) <i>[Human Health; Agriculture, Plants and the Environment]</i>	<ul style="list-style-type: none"> As the UN's global development network, the organization "advocates[s] for change and connect[s] countries to knowledge, experience and resources to help people build a better life"⁶⁰ 	-	-	-	-	-
Food and Agriculture Organization of the United Nations (FAO) <i>[Food]</i>	<ul style="list-style-type: none"> Furnishes technical assistance, facilitates cooperation, and disseminates information to "raise levels of nutrition and standards of living" and "increase efficiency of the production and distribution of food and agricultural products"⁶¹ 	-	X	-	X	-
Joint FAO/WHO Codex Alimentarius Commission <i>[Food]</i>	<ul style="list-style-type: none"> Promotes coordination of food standards through harmonized guidelines and codes of practice to "protect the health of consumers and ensure fair practices in the food trade"⁶² 	-	X	-	-	-
United Nations Office for Disarmament Affairs (UNODA) <i>[Security]</i>	<ul style="list-style-type: none"> Disseminates information related to disarmament, facilitates dialogue and sets norms as measures of "strengthening of the disarmament regimes in respect to...biological weapons"⁶³ 	-	-	-	-	-
United Nations General Assembly (UNGA) <i>[All]</i>	<ul style="list-style-type: none"> Serves as the primary deliberative and policymaking organ of the United Nations⁶⁴ 	-	-	-	-	-
United Nations Security Council (UNSC) <i>[Security]</i>	<ul style="list-style-type: none"> United Nations organ with the "primary responsibility for the maintenance of international peace and security."⁶⁵ 	-	-	-	-	-
Other Multilateral Organizations						
Global Fund to Fight AIDS, Tuberculosis and Malaria <i>[Human Health]</i>	<ul style="list-style-type: none"> Funds programs related to prevention and treatment of AIDS, tuberculosis and malaria⁴⁴ 	X	X	-	-	-
International Conference on Harmonization of Technical Requirements for Registration of Pharmaceuticals for Human Use <i>[Human Health]</i>	<ul style="list-style-type: none"> Convenes the regulatory authorities and the pharmaceutical industry of Europe, Japan and the US to discuss drug regulation issues⁶⁶ 	X	-	-	-	X
World Bank <i>[Human Health]</i>	<ul style="list-style-type: none"> International financial institution that seeks to end extreme poverty and promote shared prosperity⁶⁷ 	-	-	-	-	-
World Organization for Animal Health (OIE) <i>[Animal Health]</i>	<ul style="list-style-type: none"> Seeks to improve animal health globally through disseminating information, providing technical guidance, and setting standards⁶⁸ 	-	X	-	X	-
International Cooperation on Harmonization of Technical Requirements for Registration of Veterinary Medicinal Products <i>[Animal Health]</i>	<ul style="list-style-type: none"> Convenes the regulatory authorities of and animal health industry representatives from Europe, Japan and the US to discuss veterinary product regulation issues⁶⁹ 	-	-	-	-	X
Pharmaceutical Inspection Convention and Pharmaceutical Inspection Co-operation Scheme (PIC/S)	<ul style="list-style-type: none"> Leads the development, implementation and maintenance of harmonized Good Manufacturing Practice (GMP) standards and quality systems of inspectorates in the field of medicinal products⁷⁰ 	-	X	-	-	-
World Trade Organization (WTO) <i>[Human Health; Agriculture, Plants and the Environment]</i>	<ul style="list-style-type: none"> Serves to facilitate more open trade by hosting negotiations, building trade capacity, monitoring trade practices, and resolving disputes concerning measures affecting trade⁷¹ 	X	-	-	-	X
Consultative Group on International Agricultural Research (CGIAR) <i>[Agriculture, Plants and the Environment]</i>	<ul style="list-style-type: none"> Global partnership that "unites organizations engaged in research for a food secure future", disseminates information, provides technical guidance, and sets standards⁷² 	-	-	-	-	-
G8 <i>[Security]</i>	<ul style="list-style-type: none"> Convenes world's largest national economies to discuss economic and political issues⁷³ 	-	-	-	-	-
Global Health Security Initiative <i>[Security]</i>	<ul style="list-style-type: none"> Partnership between nine states to strengthen health preparedness and response to global health threats⁷⁴ 	-	-	-	-	-

Panel 2.2: Key Institutions for the Global Antimicrobial Regime (Continued)

Entity	Mandate, Functions and Powers	Access	Resp. Use	Infect. Cont.	Surveillance	Innovation
Civil Society						
Alliance for the Prudent Use of Antibiotics (APUA) <i>[Human Health]</i>	Seeks to preserve the effectiveness of antimicrobial drugs through AMR advocacy efforts and research ⁷⁵	-	X	X	X	X
Action on Antibiotic Resistance (ReAct) <i>[Human Health]</i>	Engages in advocacy and research to promote concerted action on antibiotic resistance ⁷⁶	-	X	X	X	X
Antibiotic Acton Team <i>[Human Health]</i>	Calls upon stakeholders “to identify and implement solutions...to stimulate and regenerate interest in the discovery and development of antibiotic agents...” ⁷⁷	-	X	X	X	-
Health Action International <i>[Human Health]</i>	Promotes access to medicines and their rational use in both developing and developed countries ⁷⁸	X	X	-	-	-
Médecins Sans Frontières (MSF) <i>[Human Health]</i>	Humanitarian-aid organization that brings medical assistance to victims of conflict, natural disasters, epidemics and healthcare exclusion ⁷⁹	X	X	X	X	-
Public-Private Partnerships						
Innovative Medicines Initiative (IMI) <i>[Human Health]</i>	European Union and the European Federation of Pharmaceutical Industries and Associations partnership aiming to facilitate the development of novel medicines through increased collaboration and targeted investment ⁸⁰	-	-	-	-	X
European Platform for the Responsible Use of Medicines in Animals <i>[Animal Health]</i>	Promotes responsible use of medicines in animals through the development of guidelines on best practice ⁸¹	-	X	-	-	-
Industry Groups						
European Federation of Pharmaceutical Industries and Associations <i>[Human Health]</i>	Represents research-based pharmaceutical industry in Europe ⁸²	X	-	-	-	X
International Dairy Federation <i>[Animal Health]</i>	Represents dairy industry to international bodies, and disseminates technical guidance and best practices ⁸³	-	X	-	-	-
International Federation for Animal Health <i>[Animal Health]</i>	Represents global animal health industry ⁸⁴	-	X	-	-	-
International Federation of Pharmaceutical Manufacturers & Associations <i>[Human Health]</i>	Represents research-based pharmaceutical industry globally ⁸⁵	X	-	-	-	X
International Hospital Federation <i>[Human Health]</i>	Represents hospitals and other healthcare organizations globally ⁸⁶	-	-	X	-	-
International Meat Secretariat <i>[Animal Health]</i>	Represents meat industry to international bodies, and disseminates technical guidance and best practices ⁸⁷	-	X	-	-	-
International Poultry Council <i>[Animal Health]</i>	Represents poultry industry to international bodies, and disseminates technical guidance and best practices ⁸⁸	-	X	-	-	-
World Farmer’s Organization <i>[Animal Health]</i>	Represents of farming industry to international bodies, and disseminates technical guidance and best practices ⁸⁹	-	X	-	-	-
World Medical Association <i>[Human Health]</i>	Represents physicians globally and disseminates technical and ethical guidance and best practices ⁹⁰	-	-	-	-	-
International Pharmaceutical Federation <i>[Human Health]</i>	Represents pharmacists and pharmaceutical scientists globally and disseminates technical guidance and best practices ⁹¹	X	X	-	-	-
World Health Professions Alliance <i>[Human Health]</i>	Represents healthcare professionals worldwide, disseminates technical guidance and best practices ⁹²	-	-	-	-	-

Institutions with antimicrobial access and/or effectiveness as a core focus are in bold. The antimicrobial function categorizations are based on current activities, not potential activities.

Nonetheless, progress toward collective action on antimicrobials has been achieved in some domains in recent years, such as food safety. Following cooperation of FAO, WHO and OIE in the Codex commission, a recent tripartite note outlines how these agencies will jointly address challenges at the animal-human-ecosystems interface.⁹³ A tripartite antimicrobial strategy is currently in development.⁹⁴ The World Health Assembly approved a *Global Action Plan on Antimicrobial Resistance* in May 2015.⁹⁵

But whether the promise of this collaboration will be realized remains unclear. Debates between human and animal health researchers over antimicrobial resistance's drivers have hindered joint efforts⁹⁶ and the regime lacks clear leadership and remains fragmented.²⁹ Real-world achievements remain elusive. Of the 152 OIE Member States that responded to a 2012 survey, only 27% had systems for monitoring antimicrobial usage in animals, as prescribed by the *Terrestrial Animal Health Code*, with implementation lowest in Africa (5%) and the Americas (4%).⁹⁷ This follows a long history of unfulfilled commitments made through the World Health Assembly (e.g., WHA51.17, WHA54.11, WHA54.14 and WHA58.27) and depressing progress reports by WHO's secretariat, including one in 2007 noting that "few countries have a national task force or strategy for containment of resistance, a reference laboratory for surveillance, or enforcement of policies such as limiting the availability of antibiotics to prescription only".⁹⁸ A recent systematic review found that non-prescription human antimicrobial use in countries outside northern Europe and North America ranged from 19% to 100%.⁹⁹

The failure of existing actors to address either the governance gaps or market failures perpetuating global inaction on antimicrobial access and effectiveness is glaring. Four weaknesses seem most evident. The first is an absence of effective coordination across the constellation of actors addressing this important challenge (a *governance* problem). The second is a gap between the many actions that have been promised by states and the few that have been delivered (a *compliance* problem). The third is insufficient political will, momentum or ambition for stopping inappropriate use of antimicrobials in both humans and animals (a *leadership* problem). The fourth is grossly insufficient

resources for implementing recommended antimicrobial policies, especially for the poorest countries which may individually be better off allocating their limited resources towards basic primary healthcare, vaccines and sanitation, even if the transnational externalities of inaction overall make antimicrobials a better global investment (a *financing* problem).

In the absence of consent-based global action, powerful actors may resort to unilateral measures to coerce collective action, such as direct financing, conditionality, import/export bans and sanctions. These approaches could theoretically work but carry many disadvantages that may make them less desirable (see Panel 2.3).

Panel 2.3: Unilateral Options for Coercing State Action

Action	How It Could Work	Disadvantages
Direct financing	Actors could fully or partially finance implementation of specific AMR policies or offer rewards for achieving certain AMR milestones	<ul style="list-style-type: none"> • Possibly unaffordable option for any one actor alone. • May deepen paternalistic patron-client relationships and disrupt national priority-setting processes.
Conditionality	Donors could condition development aid and other assistance on recipient states implementing specific AMR policies or achieving certain AMR milestones.	<ul style="list-style-type: none"> • Risks creating a ‘one size fits all’ approach that does not appropriately address each state’s circumstances and needs. • Risks a broader backlash as in the case of structural adjustment programs and tied development aid.
Import/export bans	States could prohibit the import or export of products associated with AMR like medicines and livestock from/to countries without specific AMR policies such as restrictions on antimicrobial use for promoting animal growth.	<ul style="list-style-type: none"> • Effect would be limited to countries with trading relations (e.g., only 34 countries can export meat to the US) • Could violate WTO agreements if intended to coerce action in the territory of trading partners rather than protect against a risk to domestic consumers.¹⁰⁰
Sanctions	Actors could punish states that lack specific AMR policies or have not achieved certain AMR milestones by withdrawing funding, cutting off relations, restricting financial flows, imposing trade barriers, and public shaming.	<ul style="list-style-type: none"> • Punitive action could result in significant harm to health, economic and social well-being, especially for the most vulnerable. • Risks undermining multilateralism, principles of sovereign equality and international cooperation on other issues. • Could violate WTO agreements.

The collective action problems undermining global coordination and cooperation raise the question of what highly motivated actors could do unilaterally to coerce action by states that are currently less motivated to address AMR.

Institutional Design Principles for Strengthening the Global Antimicrobial Regime

To correct these governance gaps and market failures, the global antimicrobial regime can be changed by adding to or reforming three sets of institutional mechanisms: 1) *decision-making mechanisms* for setting norms, soliciting advice, making decisions, appealing decisions, and resolving disputes; 2) *operational mechanisms* for administering activities, raising funds, managing funds, spending funds and financial auditing; and 3) *accountability mechanisms* for making commitments, encouraging compliance, promoting transparency, ensuring oversight and learning from experience.¹⁰¹

The optimal package of institutional mechanisms to be added or reformed is one that yields a regime that addresses current weaknesses by offering effective governance, universal compliance, competent leadership and sufficient financing. Fortunately, in redesigning institutional architecture that advances these aims, we can learn much from past experience and scholarship of international law, international relations and political science.¹⁰²⁻¹¹⁴

First, global institutions are well-positioned to serve some functions and not others because actors commit to and comply with international rules for particular reasons. For example, realist scholars argue international relations primarily reflect states' own rational self-interests and pursuit of wealth, power and status.¹⁰² Institutionalists believe states cooperate and coordinate to maximize utility under conditions of interdependence.¹⁰³ Liberal theorists suggest domestic ideas, interests and institutions affect states' international relations by shaping state preferences.¹⁰⁴⁻¹⁰⁵ Constructivists argue state behavior is shaped by ideas, including those picked-up from international engagement.¹⁰⁶ While these theories sometimes conflict, together they suggest global institutions can do better for antimicrobial access and effectiveness if they either advance states' rational self-interests, address cooperation and coordination problems, empower domestic actors, or change ideas about the world. The impact of any function global institutions serve also depends critically on states having sufficient

capacity to change,¹⁰⁷ possessing the ability to internalize international norms into domestic processes,¹⁰⁸ and perceiving the function to be a legitimate exercise of delegated authority.¹⁰⁹

Second, global institutions addressing antimicrobial access, conservation and innovation should have clear mandates to ensure they maximize benefits, minimize costs and balance trade-offs. International activities are not harmless. There are direct costs like staff salaries, meetings, travel, communications, governance structures and management, and indirect opportunity costs and potential paternalism costs in placing international norms above local priorities.¹¹⁵⁻¹¹⁶ This requires being cognizant of these costs and risks of harm, maximizing existing institutional architecture, and working synergistically with others to minimize destructive competition and inefficient duplication.

Third, the forum through which global institutions are created or reformed matters enormously. Different forums have different members, mandates and powers that place structural limits on their activities and competence. The choice of forum for international action also empowers some epistemic communities and interest groups over others because different communities and groups work through different international forums.¹¹² For example, since the FCTC was negotiated through WHO, the influence of health authorities was amplified and the tobacco industry was marginalized. The UN General Assembly, alternatively, has facilitated higher-level whole-of-government engagement with HIV/AIDS, non-communicable diseases and universal health coverage that seems particularly useful for inter-sectoral challenges.¹¹⁷⁻¹¹⁹ Although even the most theoretically well-suited forums may sometimes need to be bypassed if they are clogged, inefficient or otherwise ineffective.^{113,120}

Fourth, global institutions must be specifically tailored for the nature of the problems they are created or reformed to solve. Many global institutions, like international treaties or multilateral organizations, are state-centric which means they primarily involve national governments and depend on them to regulate non-state actors within their territories. More meaningful involvement for civil society, industry and healthcare organizations may strengthen functions that depend on them. Although

antimicrobial policies' reliance on coercive regulation – such as restricting access to antimicrobials – means states realistically must take centre stage, if not fully dominate.¹²¹

Fifth, there are inescapably pragmatic ties between the functions, forms and forums of global collective action. For example, there seems to be an inverse relationship between the strength of international commitment mechanisms and the activities, norms or standards they are supposed to procure.¹¹¹ This is because agreements are negotiated as a whole,¹¹⁰ explaining why states regularly adopt treaties – the strongest international commitment mechanism available – then void them of ambitious content, which they instead reserve for non-binding commitment mechanisms like political declarations and unilateral statements.¹¹¹ As another example, agreements on trade, human rights, disarmament, prisoners of war and money laundering generally rely upon different enforcement mechanisms based on the type of problems addressed and the commitments states are willing to undertake (see Panel 2.4). There is no general hierarchy among global institutions for the impact or influence they yield. To strengthen the global antimicrobial regime, tailored matchmaking between functions sought, the form that follows and the forum of implementation is the only effective approach.

Panel 2.4: Examples of Accountability Mechanisms in Existing International Treaties

Trade provides an example of a problem addressed through a reciprocal exchange of benefits between WTO Member States. The political economy of trade policy creates incentives for states to protect domestic firms by erecting barriers to trade. This problem is addressed through trade agreements under which parties have made commitments not to impose particular barriers to trade. In the WTO context, these commitments are enforced through a system of dispute settlement that permits one member to bring a claim against another. This system of enforcement relies on reciprocity in the sense that there is a mutual exchange of concessions between members on a mutually reciprocating basis.

Human rights, in contrast, do not create comparable reciprocal interests between state parties in the observance of treaty commitments. There is no mutual exchange of benefits on a reciprocal basis between parties and no comparable interest in one another's compliance. As such, accountability mechanisms include reporting, monitoring and individual complaint processes.

Disarmament and **fair treatment of prisoners of war** are both goals in which all states have an interest in the performance of commitments by a single state acting alone, such that performance by one party is dependent on performance by all parties. This explains the importance of independent inspection and verification in disarmament and humanitarian treaties.

Anti-money laundering efforts by the Financial Action Task Force exemplify a problem addressed through non-binding international recommendations that have considerable coercive power given how they have justified 'blacklisting' financial institutions in certain countries. This has incentivized countries to raise standards in order to continue transacting with financial institutions abroad.

Sixth, global institutions should be designed for political robustness to withstand the *realpolitik* of inequalities in decision-making and diplomatic machinations in opaque global forums, hidden corridors of power and private corporate boardrooms.¹²² This means taking a realist and realistic view on what different actors can and will do both domestically and internationally, whether by choice or limited by domestic regulations, resources and/or political constraints. This also means supporting *institutions* that help bring edicts into effect, *incentives* for those with power to act upon them, and *interest mobilizers* to advocate for their implementation.¹¹⁴

Ten Options for Achieving Global Collective Action

There are many global strategy options for building institutions, crafting incentives and mobilizing interests that could promote antimicrobial access, conservation and innovation, ranging from setting implementation milestones,¹ to providing new financial models,¹²³⁻¹²⁶ to creating new

structures,¹²⁷ to adopting legally-binding treaties.^{8,128-129} This chapter presents ten stylized options for achieving global collective action that were purposively packaged to represent the range of what is possible. Each is assessed according to the political economy problems addressed and the antimicrobial policy imperatives served (see Panel 2.5).

Panel 2.5: Ten Options for Achieving Global Collective Action on Antimicrobial:

	Packaged Options	Implementation			Problems Addressed				Imperatives Served				
		Decision-making Mechanisms	Operational Mechanisms	Accountability Mechanisms	Governance	Compliance	Leadership	Financing	Access	Resp. Use	Infect. Cont.	Surveillance	Innovation
Institutions	1. Monitored milestones , including setting goals, timelines, indicators, regular reporting, and UN-, industry- or civil society-led transnational advocacy network monitoring (like MDGs and proposed SDGs)	<ul style="list-style-type: none"> World Health Assembly (WHA) or UN General Assembly 	<ul style="list-style-type: none"> UN agencies, civil society networks and/or industry groups 	<ul style="list-style-type: none"> Independent review and evaluation Shadow reports Naming and shaming 	-	X	-	-	X	X	X	X	-
	2. Code of practice , including minimum expectations for responsible use efforts, surveillance and R&D investment among willing actors (like Monterrey Consensus)	<ul style="list-style-type: none"> Political agreement among willing states, such as G8 or Oslo-7 FPGH countries 	<ul style="list-style-type: none"> Informal governmental networks 	<ul style="list-style-type: none"> Naming and shaming 	-	X	-	-	-	X	-	X	X
	3. Inter-Agency Task Force , coordinating FAO, OIE, UNAIDS, UNDP, UNICEF, UNFPA, UNODA, WFP, WHO, WIPO, World Bank, WTO and civil society groups (like UN task forces on NCDs, disaster reduction and violence against women)	<ul style="list-style-type: none"> Steering committee of agency reps 	<ul style="list-style-type: none"> Secretariat of lead UN agency 	<ul style="list-style-type: none"> Annual reports 	X	-	X	-	X	X	X	-	-
	4. Intergovernmental Panel , involving scientific working groups and regular reports (like Intergovernmental Panel on Climate Change)	<ul style="list-style-type: none"> Government assembly Working groups 	<ul style="list-style-type: none"> Technical support units and academic institutions 	<ul style="list-style-type: none"> Annual reports 	-	-	X	-	-	X	-	X	-
Incentives	5. Funding agreement , including coordinating joint assistance from development agencies and joint calls for proposals from research funders (like Global Alliance for Chronic Diseases)	<ul style="list-style-type: none"> Contractual agreement between major donors or research funders 	<ul style="list-style-type: none"> Board of major funders and a secretariat 	<ul style="list-style-type: none"> Annual reports Financial audits Domestic litigation 	-	-	-	X	X	-	X	X	X
	6. Global pooled fund , either to finance antimicrobial policies, reward achieving milestones, procure antimicrobials, or incentivize R&D (like Global Fund to Fight AIDS, Tuberculosis and Malaria)	<ul style="list-style-type: none"> Board of key stakeholders Advisory committees 	<ul style="list-style-type: none"> Secretariat and World Bank as fund trustee Financing from states, 	<ul style="list-style-type: none"> Annual reports Financial audits Independent review and 	X	X	-	X	X	X	X	X	X

Panel 2.5: Ten Options for Achieving Global Collective Action on Antimicrobials (Continued)

	Packaged Options	Implementation			Problems Addressed		Imperatives Served						
		Decision-making Mechanisms	Operational Mechanisms	Accountability Mechanisms	Governance	Compliance	Leadership	Financing	Access	Resp. Use	Infect. Cont.	Surveillance	Innovation
			charities and industry	evaluation									
	7. Conditioning benefits or support , such as imposing input-, activity-, output- or outcome-based criteria for receiving aid, gaining trade advantages or participating in international initiatives (like UN membership dues)	<ul style="list-style-type: none"> Governing body of multilateral organization Review panel 	<ul style="list-style-type: none"> Secretariat of multilateral organization 	<ul style="list-style-type: none"> Independent review and evaluation Automatic loss of benefits 	-	X	-	-	X	X	X	X	-
Interest Mobilizers	8. Special Representatives , to rally interest groups, coordinate advocacy, attract attention and encourage action (like UN Special Rapporteurs or UN Secretary-General's Envoys)	<ul style="list-style-type: none"> WHA or UN General Assembly appoints reps 	<ul style="list-style-type: none"> Office of the reps 	<ul style="list-style-type: none"> Political pressure Naming and shaming 	-	X	X	-	X	X	X	-	-
	9. High-Level Panel , involving eminent persons raising political prioritization of antimicrobials (like MDG Advocacy Group or Post-2015 High-Level Panel)	<ul style="list-style-type: none"> WHA or UN General Assembly appoints panel 	<ul style="list-style-type: none"> Offices of the panel's chairs or conveners 	<ul style="list-style-type: none"> Political pressure 	-	X	X	-	X	X	X	-	-
	10. Multi-stakeholder partnership , involving an alliance of many actors, working groups and advocacy (like Every Woman Every Child movement)	<ul style="list-style-type: none"> Coordinating committee Surveillance committee 	<ul style="list-style-type: none"> Offices of partnership members 	<ul style="list-style-type: none"> Annual reports Independent review and evaluation 	X	X	-	-	X	X	X	-	X

Options 1-4 primarily involve building institutions, ranging in formality. The first is for a global governing body to create milestones and indicators that would then be annually monitored.¹ Like the Millennium Development Goals (MDGs), milestones can serve as a commitment device and help promote action if actors know they will be regularly assessed and shamed for any lapses. Indicators were a key feature of WHO's Global Action Plan for the Prevention and Control of Non-communicable Diseases (2013-2020),¹³⁰ reflecting their increasing popularity in global governance.¹³¹ The second option is a code of practice that outlines minimum expectations for willing signatories. Like the *Monterrey Consensus* on development assistance targets (requiring 0.7% GDP) and the *WHO Code of Practice on the International Recruitment of Health Personnel* (banning active poaching), norms can promote compliance through informal governmental networks and psychological preferences for avoiding

“antisocial” behaviour. The third option is a UN Inter-Agency Task Force that coordinates the activities of the many UN entities working in this policy area and provides clear direction and leadership for stakeholders. The fourth is an intergovernmental antimicrobial panel, like the UN Intergovernmental Panel on Climate Change, that marshals available evidence to inform national policies and encourages their implementation.^{127,132}

Options 5-7 primarily involve crafting incentives, ranging in voluntariness. The first is a funding agreement – a contract – between actors like development agencies and actors who can promote antimicrobial access and/or effectiveness.¹³³ The second is a global pooled fund that allocates contributions from various donors to finance antimicrobial policies, reward achieving milestones, or incentivize R&D. The third is for multilateral organizations to impose input-, activity-, output- or outcome-based conditions on any benefits or support they offer, such as requiring governments to share surveillance data or provide their citizens with access to antimicrobials before receiving additional aid, gaining trade advantages or participating in international initiatives.¹³⁴⁻¹³⁵

Options 8-10 primarily involve mobilizing interests, ranging in scale. The first is appointment of a special representative, like the UN Human Rights Council’s special rapporteurs or the UN Secretary-General’s envoys, who would use the prestige of his/her office to rally interest groups, coordinate advocacy, attract attention and encourage action. The second is appointment of a high-level panel of eminent persons that would use their access to corridors of power to apply political pressure.¹³⁶ The third is launching a multi-stakeholder partnership, like the UN Secretary-General’s *Every Woman Every Child* movement, which involves an alliance of many actors, working groups and advocacy across forums.

While each option has its merits, none is individually sufficient to tackle all political economy challenges facing the global antimicrobial regime, bridge all gaps, or implement all needed policies.

Instead, multiple options will need to be adopted – with global decision-makers able to mix-and-match, hopefully in a way that builds on comparative advantages.

As a starting point, intuitively, the optimal package of options probably includes at least one from each of the three categories: institutions, incentives and interest mobilizers.¹¹⁴ Within institutions, monitored milestones and an inter-agency task force seem most promising, especially given failure of previous codes of practice,¹³⁷ including those involving antimicrobials,^{97,138} and already existing mechanisms to achieve scientific consensus in medicine and public health making a big intergovernmental panel seem unnecessary.¹³² Within incentives, a global pooled fund seems to dominate the other options, given funding agreements address so few of the political economy challenges faced and conditioning benefits or support could be cruel. Within interest mobilizers, appointment of a special representative seems the most practical option, especially given it would likely achieve similar outcomes to a far costlier high-level panel and avoid infeasibility concerns around a multi-stakeholder partnership.

An International Antimicrobial Treaty

In addition to options for building institutions, crafting incentives and mobilizing interests, there are also “meta-options” for how states package chosen solutions. An international antimicrobial treaty represents the most prominent example of such a meta-option. It’s also a meta-option that is starting to receive some support, with some pointing to this challenge as the best candidate for an international treaty out of the many global health challenges for which treaties have been proposed.¹¹¹

Support for an international antimicrobial treaty is justified on the basis that antimicrobial resistance is one of the greatest global risks spreading unabated across state boundaries, a multilateral challenge involving the exploitation of an essential common-pool resource, and a global public good challenge for ensuring universal access to existing antimicrobials (which benefits people beyond the consumer) and progress in R&D towards new antimicrobials (which also benefits all). It has a reasonable

chance of achieving benefits by incentivizing those with power to act, and alternative commitment mechanisms have thus far proven ineffective.¹¹¹ Additionally, like the legs of a tripod, each antimicrobial imperative – access, conservation and innovation – requires the *simultaneous* and *strongest* level of support from the other two. There is perhaps no better way to achieve such interdependent coordination than a treaty.¹²⁹

Forums for Implementation

If global decision-makers take action, they must decide whether to revise existing parts of the global antimicrobial regime or to create new institutional architecture. From a policy perspective, it's always cleaner to create standalone initiatives either under sponsorship of an existing organization or through a new forum. WHO is the most obvious existing organization, especially given its unusually expansive powers for making new international treaties under Articles 19 and 21 of its Constitution.¹³⁹ Yet WHO's current financing crisis and governance challenges indicate that an alternative forum may be needed.^{120,140} Viable (but not necessarily optimal) alternatives include near-universal bodies like the Food & Agriculture Organization, UN General Assembly, UN Security Council, and World Organization for Animal Health, or smaller clubs like the G7/G8, G20, G77, and Oslo-7 FPGH countries. Other platforms, like the UN Office for Disarmament Affairs and *Biological Weapons Convention* (1972) – which bans the development of biological weapons – could also be relevant for specific functions like antimicrobial surveillance as they have become increasingly important forums for addressing infectious disease threats.¹⁴¹

But from a political economy perspective, standalone initiatives may not be possible; there may be insufficient coalescence of institutions, incentives and interests around a workable package of policy prescriptions to make meaningful progress a reality. Actors may need to piggyback on momentum from existing institutions (e.g., *International Health Regulations*), incentives of other policy areas (e.g., free

trade agreements) and interest mobilizers pushing for action (e.g., human rights activists or military-industrial actors). Incorporating policies into existing platforms may help overcome the otherwise high threshold for starting something new while simultaneously facilitating cross-forum bargaining that may be needed. But this can also powerfully influence the final policies adopted depending on how decisions are made, who is involved, which actors dominate, where priorities lie, and what informal bargains have already been struck over the years among repeat negotiators. Rules made through sector-based forums will naturally favour the germane sector. Achieving collective action for antimicrobial access and effectiveness depends on successfully matching functions, forms and forums that maximizes what is operationally feasible, politically possible and worth achieving.

Accountability is Essential for Implementation and Impact

From a pragmatic perspective, when envisioning changes to the global antimicrobial regime or new institutional architecture, these are most likely to come in the form of an international agreement – whether an international treaty, funding contract, or political declaration.¹⁰¹ If the goal is to address AMR, then the value of such an agreement will depend on its ability to actually influence the world – to shape norms, constrain behavior, facilitate cooperation, and mobilize action. The review of 90 empirical studies in the first chapter of this dissertation suggested that many international agreements fail to achieve their aspirations.¹¹⁴ The review indicated that what matters most is the content of the commitments and how these are supported by mechanisms to encourage implementation. When developing proposals for new international agreements on AMR, implementation mechanisms should therefore be equal to if not greater than the attention paid to its form, functions and forums.

The key to implementation is *accountability*.^{101,114,142} To avoid purely symbolic agreements and to achieve real-world impact, accountability must be at the core of agreements and their development. This is as true for an agreement on AMR as it is for any other international agreement.

Definitions of “accountability” vary widely. In the present context, accountability best refers to a relationship involving answerability and enforceability.¹⁴³ According to one leading definition in this vein, accountability “implies that some actors have the right to hold other actors to a set of standards, to judge whether they have fulfilled their responsibilities in light of these standards, and to impose sanctions if they determine that these responsibilities have not been met.”¹⁴⁴ Another much-cited definition describes accountability as “a relationship between an actor and a forum, in which the actor has an obligation to explain and to justify his or her conduct, the forum can pose questions and pass judgment, and the actor may face consequences.”¹⁴⁵

An accountability relationship can be characterized along three dimensions and by answering three basic questions. *Among whom* is accountability owed? *For what* are the actors accountable? And *how* are accountability relationships built and secured?

Parties to Accountability Relationships (“Among Whom?”)

Accountability can be difficult to understand, partly because in most settings there are multiple relevant accountability relationships. These form an interconnected network among different actors. State parties to an international agreement are accountable to each other, but also to their domestic constituencies and often to one or more supra- or transnational entities. Four types of entities are particularly important in this context (see Appendix 2). One is collective bodies of the state parties to the agreement, such as a governing council, conference, or assembly. Another type is independent oversight bodies whose mandate is specifically linked to the agreement in question. Examples include designated committees, panels, courts, and secretariats. A third type of entity is general fora whose broad mandate covers matters pertaining to the agreement. These entities may include the UN General Assembly, World Health Assembly, and, for its members, the G7, G20, and G77.¹⁴⁶ Fourth, there are

entities such as non-governmental organizations (NGOs) and civil society organizations (CSOs) that represent different constituencies, interests, and perspectives.

Object of Accountability Relationships (“For What?”)

The objects for which actors in accountability relationships are answerable vary across relationships. These can include taking certain actions, instituting certain processes, or achieving certain outcomes. For example, state parties to an international AMR agreement may be expected to enact policies that promote access to appropriate antimicrobials, adopt regulations banning inappropriate use of antimicrobials in livestock, or provide funding for research and development relevant to AMR. With regard to process, state parties may be expected to ensure that all districts, hospitals, and pharmacies have adequate reporting systems for the sale and use of antimicrobials. For outcomes, states may be expected to achieve a particular level of affordability for antimicrobials (e.g., course of treatment not to exceed one day’s wage of lowest-paid government worker), usage in animals (e.g., less than a certain amount per livestock raised), or investment in antimicrobial innovation (e.g., more than a certain percentage of public health expenditures).¹⁴⁷

Less frequently discussed, but no less important, is accountability for fair process. As part of an international agreement, state parties may be held accountable for ensuring processes for public participation and engagement at the national level, as well as for facilitating inclusive processes at the international level. State parties could also be expected to systematically measure inequalities – including inequalities in access to antimicrobials – and to systematically assess whether these are addressed in a fair and effective way.

Mechanisms for Building and Securing Accountability Relationships (“How?”)

Accountability relationships depend on formal or informal mechanisms for their establishment and for being sustained over time. Four types of accountability mechanisms are particularly important in the context of international agreements: 1) transparency; 2) oversight; 3) complaint; and 4) enforcement (see Panel 2.1).

Panel 2.6: Mechanisms for Promoting Accountability

<p>1) Transparency mechanisms</p> <ul style="list-style-type: none">a. Information aggregationb. Publicityc. Regular reportingd. Access-to-information requests	<p>3) Complaint mechanisms</p> <ul style="list-style-type: none">a. State complaintsb. Secretariat complaintsc. Non-state-actor complaintsd. Appeals of decisions
<p>2) Oversight mechanisms</p> <ul style="list-style-type: none">a. Standards-settingb. Data collectionc. Implementation reviewd. Impact assessment	<p>4) Enforcement mechanisms</p> <ul style="list-style-type: none">a. Public disapprovalb. Loss of privilegesc. Economic punishmentd. Military intervention

1) Transparency Mechanisms

Transparency mechanisms make information about actors available to observers.¹⁴⁸ In the context of an international agreement, the key actors are state parties, and the key observers are other state parties, plus supra- and transnational entities and the general public. For an international agreement on AMR, relevant information pertains to the epidemiology of infectious diseases, data on resistance, indicators of access to antimicrobials, sales and use of antimicrobials, financial flows, and government action to improve access, conservation, and innovation. To be effective, transparency mechanisms must make it possible for observers to easily understand and verify the information provided.

Many existing international agreements incorporate transparency mechanisms, including mechanisms that promote and make possible a) information aggregation, b) publicity, c) regular reporting, and/or d) access-to-information requests. One example is the *Minamata Convention on*

Mercury. It requires each state party to report on the measures it has taken to implement the Convention and on the effectiveness of those measures.

The benefits from more transparency are potentially transformative. Transparency is considered a prerequisite for accountability and is expected to improve legitimacy, compliance, and learning – thereby enhancing the real-world impact of agreements. Although these expectations have not yet been matched by empirical evidence, as impact evaluations of transparency mechanisms in international agreements appear to be non-existent.¹¹⁴

2) Oversight Mechanisms

Oversight mechanisms involve active monitoring and evaluation of actors, actions, inputs, processes, outputs, or outcomes.^{101,149} These mechanisms build on transparency, but go further by involving active collection and processing of information and comparison of findings against some normative or technical standard. In the context of AMR, potential oversight bodies include designated committees, panels, courts, and secretariats, and the other supra- or transnational entities described above can also have an oversight role. Oversight mechanisms can monitor and assess the extent to which state parties comply with the agreement, as well as the situation with regard to access, conservation, and innovation of antimicrobials at global and national levels. Even basic monitoring of antimicrobials sales and use would be a major step forward, as indicated by how even the United States does not yet systematically collect such data.¹⁵⁰ Oversight mechanisms can also track state parties' compliance with decisions made through complaint mechanisms.

Many different oversight mechanisms are embedded in existing agreements, and these mechanisms involve to various degrees a) standard-setting, b) data collection, c) implementation review, and/or d) impact assessment. For example, the Kyoto Protocol to the *UN Framework Convention on Climate Change* requires that its 43 “Annex 1” state parties with industrialized or transitioning

economies report a national inventory of greenhouse gas emissions and sinks, and convey information on their implementation of the Protocol. Each report is assessed by an international expert review team, which forwards its own assessment of these reports to the Compliance Committee for consideration.

The potential benefits from oversight mechanisms are similar to those from transparency mechanisms. These benefits include improvements in legitimacy, compliance, and learning. However, as for transparency mechanisms, little empirical evidence is available to directly evaluate this widely held belief in their benefits.¹¹⁴

3) Complaint Mechanisms

Complaint mechanisms process and adjudicate grievances about actions, inputs, processes, outputs, or outcomes attributable to an actor.^{101,151} In the context of international agreements, the impugned actors are typically state parties. Complainants are usually other state parties, sometimes oversight bodies created by the agreements, and less often individuals, NGOs/CSOs, or corporations. Non-fulfillment of the agreement's obligations would be the most common complaint. These mechanisms can be institutionalized as separate bodies or be incorporated as part of existing entities, such as an existing international court, tribunal or organization.

Complaint mechanisms are usefully categorized according to whether they are available to a) states, b) secretariats, c) non-state actors without international legal personality (e.g., individuals, NGOs/CSOs, corporations), and/or for d) appeals of decisions. The IHR provides an example of a compliant mechanism that is open to states; an example that also illustrates how these mechanisms can be designed as multi-step processes. In the IHR's ideal process, state parties "shall seek in the first instance to settle the dispute through negotiation or any other peaceful means of their own choice, including good offices, mediation or conciliation." If not resolved, the state parties may agree to refer the dispute to WHO's Director-General for mediation. If the issue is still unresolved, binding arbitration

is theoretically possible if the dispute is among states that have voluntarily accepted arbitration “as compulsory with regard to all disputes concerning the interpretation or application of these Regulations” (although no state has voluntarily accepted binding arbitration to date). Ultimately, states can refer the matter to the International Court of Justice.

Other agreements allow non-state actors to access complaint mechanisms. One example is the *Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters* (“Aarhus Convention”). This Convention grants individuals “access to a review procedure before a court of law or another independent and impartial body established by law” when they believe their requests for information have not been adequately addressed by state parties. On the basis of this provision, a Compliance Committee has been established, and one of the ways a review can be triggered is by communications from individuals or NGOs/CSOs.

Complaint mechanisms can improve agreement effectiveness when they encourage or compel state parties to confront, explain, and resolve their non-compliance. There is some empirical evidence to support this widely held view.¹⁰¹

4) Enforcement Mechanisms

Enforcement mechanisms impose sanctions on non-compliant actors.¹⁵² These sanctions can be formal or informal, real or reputational. They include a) public disapproval, b) loss of privileges, c) economic punishment, and/or d) military intervention (although this last sub-category is not appropriate for addressing AMR). The non-provision of benefits that otherwise would have been provided is a form of sanction. Sanctions thus relate to both applying “sticks” and withdrawing “carrots.”

Transparency, oversight, and complaint mechanisms can facilitate some enforcement on their own. They can identify and publicize non-compliant behavior and thus facilitate “naming and shaming” of non-compliant actors. They are also important for more specific enforcement mechanisms, as they

can help determine whether sanctions are appropriate. In the context of international legal agreements, this decision will most often be made by a conference of parties, a separate supranational assembly (like the UN Security Council), or a dispute resolution body. Conversely, enforcement mechanisms can help strengthen transparency, oversight, and complaint mechanisms. Even where agreements include clear provisions for such mechanisms, realization of their full potential usually requires ancillary enforcement mechanisms. The weakness of the theoretically robust IHR complaint mechanism, for example, is that every step is voluntary without pre-acceptance of binding arbitration, and no party has accepted binding arbitration to date.¹⁰¹

A dearth of formal enforcement mechanisms is often seen as a hallmark of international agreements, including international law.¹⁵³ However, negotiators of an international agreement addressing AMR can learn from notable exceptions. One example is the *Marrakesh Agreement establishing the World Trade Organization* (WTO). Under this agreement, a state party can request authorization of countermeasures from WTO's Dispute Settlement Body if WTO rules are breached and if other steps have been unsuccessful. If granted, the winning state party is authorized to impose trade sanctions vis-à-vis the losing state party. The UN Charter provides several other examples, including how failure to pay UN membership fees results in loss of voting privileges in UN assemblies.

Enforcement mechanisms promote effective implementation by incentivizing compliance, disincentivizing non-compliance, and strengthening other accountability mechanisms. Many studies have found sanctions to be effective in promoting implementation.¹¹⁴

Optimizing the Design of Accountability Mechanisms

It is clear that there are many options available for strengthening accountability and ensuring that international agreements have a fighting chance of achieving their progenitors' aspirations. In reviewing the central aspects of accountability relationships and outlining ways to build and secure

these relationships in the context of international agreements, a menu of accountability mechanisms emerges from which negotiators of international agreements can mix-and-match to facilitate transparency, oversight, complaint, and enforcement.

No international agreement should incorporate every accountability mechanism, but most – if not all – agreements should incorporate at least one mechanism from each category. States that are serious about addressing global challenges through international legal agreements should particularly insist on including effective transparency, oversight, complaint, and enforcement mechanisms. This is plausibly the best way of ensuring that negotiated legal texts have the effects they are intended to procure.

Accountability is often championed as an unequivocal good, but more is not always better. A shift in accountability can alter power dynamics in undesirable ways, especially in undemocratic settings.¹²² In all settings, strengthening one accountability relationship can weaken another. The balance between different accountability relationships is also important. It has been argued, for example, that the Global Fund to Fight AIDS, Tuberculosis & Malaria fails to hold donors accountable for actually delivering their promised financial contributions in the way it holds recipients accountable for achieving health results.¹⁵⁴

Appendix 2 shows considerable variation in the specific mechanisms utilized by existing international legal agreements, which are themselves only one type of international agreement. The optimal mechanism in each category and the optimal combination of mechanisms for an agreement are likely to vary across settings. For future agreements, it is important to evaluate each set as a whole, since individual mechanisms interact in multiple ways and can be mutually synergistic or antagonistic. These sets should also be carefully assessed against widely shared values, including those pertaining to effectiveness, fairness, and legitimacy.¹⁵⁵

Most existing international agreements lack effective mechanisms for transparency, oversight, complaint, and enforcement. Enforcement mechanisms are in particular short supply. This reflects the general incapacity for enforcement at the global level – compared with the national level that has powerful courts, police forces, and armies – and the public consternation that even international legal agreements “aren’t really binding” or “don’t matter.”¹⁰¹ However, this does not mean that much more cannot be done internationally. Experience from certain regimes like the international trade sector shows there is the potential for stronger international agreements and more effective institutions.

Governmental capacity is another challenge for accountability and for compliance with international agreements – even in the presence of strong institutional mechanisms. While dissemination of data and documents that governments have readily available may sound quite simple, in reality, most of the mechanisms described require significant bureaucratic capacity to deliver. For example, some oversight mechanisms require sophisticated data collection systems and technical expertise for conducting data analyses. This capacity varies tremendously across countries. In response, international agreements can differentiate accountability requirements according to capacity or require that high-capacity countries assist countries with lower capacity. Again, weak institutions and limited governmental capacity do not mean that much more cannot be done.

Formal accountability mechanisms are neither necessary nor sufficient for building and securing accountability relationships. Actors can also hold each other accountable through informal mechanisms. For example, the United States unilaterally reviews countries’ compliance with the *WTO’s Agreement on Trade-Related Aspects of Intellectual Property Rights* (TRIPS) and sometimes imposes sanctions on countries it judges to be non-compliant.¹⁵⁶ Formal accountability mechanisms also do not automatically translate into real-world changes, although institutionalizing them may be the best way to strengthen accountability in the short term and to promote a culture of accountability in the longer term.

The issues raised here are all important areas for future inquiry, especially given how empirical evidence is scant across the board. This research agenda should be pursued alongside efforts to intelligently craft new international agreements so that theory and practice can learn from each other.

Conclusion

Bringing the science of global strategy to bear on addressing antimicrobial access, conservation and innovation raises many questions but also provides some answers. The governance and market failures underlying inaction are laid bare, as are the existing institutions and gaps in their functioning. Institutional design principles point to ten options for achieving progress – four that seem particularly promising – and the possible utility of an international treaty for packaging them together.

Accountability mechanisms for transparency, oversight, complaint, and enforcement are identified, as well as a menu of options and some key considerations for choosing among them.

Despite overwhelming challenges and a history of inaction, the good news is that progress should be possible if only we find the right mix of options matched with the right forum that aligns institutions, incentives and interests to make global collective action politically possible. Achieving such alignment will only happen if the agreement these options are intended to implement assures access to antimicrobials, conservation of their effectiveness, and innovation for new antimicrobials and related practices and technologies. These interdependent goals – so often presented in opposition – are mutually-reinforcing: untreated infections spread resistance and constrict the size of markets for antimicrobials; resistance diminishes the value of access to existing drugs and puts a time-limit on their sale; and innovation without conservation is cost-ineffective and without access it is inequitable.¹²⁹

Besides, global politics will also probably not allow one imperative to progress unless accompanied by advances towards the other two.

Some additional efforts will be needed to lay the groundwork for achieving this grand bargain, but what is really needed is a commitment to action and implementation of the many different assessments, reviews and recommendations that have already been made, especially WHO's global action plan on antimicrobial resistance.⁹⁵ Global policymakers must now combine the science of strategy with their art of the possible. Preserving and continuing advances in global health depend on it.

References

1. Laxminarayan R, Duse A, Wattal C, Zaidi AKM, Wertheim HFL, Sumpradit N, et al. (2013) Antibiotic resistance—the need for global solutions. *The Lancet Infectious Diseases* 13(12): 1057-98.
2. Davies SC (2013) *Annual Report of the Chief Medical Officer, Volume Two, 2011, Infections and the Rise of Antimicrobial Resistance*. London, UK: Department of Health.
3. World Economic Forum (2013) *Global Risks 2013*. Geneva: World Economic Forum 2013. Report No.: 8th ed [PDF document]. [cited 2015 Aug 11]; Available from: http://www3.weforum.org/docs/WEF_GlobalRisks_Report_2013.pdf.
4. Jonathan HGE, Stoltenberg RHJ (2012) *UN Commission on Life-Saving Commodities for Women and Children*. [cited 2014 Jul 17]; Available from: http://unfpa.org/webdav/site/global/shared/images/publications/2012/Final%20UN%20Commission%20Report_14sept2012.doc.
5. Davies SC, Fowler T, Watson J, Livermore DM, Walker D (2013) Annual Report of the Chief Medical Officer: infection and the rise of antimicrobial resistance. *Lancet* 381(9878): 1606-9.
6. Review on Antimicrobial Resistance (2014) *Tackling Drug-Resistant Infections Globally* [Internet]. London: Wellcome Trust. [cited 2015 Aug 11]; Available from: <http://amr-review.org>.
7. Fidler DP (1998) Legal issues associated with antimicrobial drug resistance. *Emerging Infectious Diseases* 4(2): 169-77.
8. Smith RD, Coast J (2002) Antimicrobial resistance: a global response. *Bulletin of World Health Organization* 80(2): 126-33.
9. Outtersson K (2014) *New Business Models for Sustainable Antibiotics*. [PDF document]. London, UK: Chatham House. [cited 2014 Apr 22]; Available from: <http://www.chathamhouse.org/sites/files/chathamhouse/public/Research/Global%20Health/0214SustainableAntibiotics.pdf>.
10. Olson M (1971) *The Logic of Collective Action: Public Goods and the Theory of Groups*. Cambridge, MA: Harvard University Press.
11. Putnam RD (1988) Diplomacy and domestic politics: the logic of two-level games. *International Organization* 42(3): 427-60.
12. Alter KJ, Meunier S (2009) The politics of international regime complexity. *Perspective on Politics* 7(01): 13-24.
13. Drezner DW (2009) The power and peril of international regime complexity. *Perspective on Politics* 7(1): 65-70.
14. Okeke I (2009) The tragedy of antimicrobial resistance: achieving a recognition of necessity. *Current Science* 97(11): 1564-72.

15. U.S. General Accounting Office (2004) *Antibiotic Resistance: Federal Agencies Need to Better Focus Efforts to Address Risk to Humans from Antibiotic Use in Animals*. [PDF document]. Washington, D.C: GAO. [cited 2015 Aug 11]; Available from: www.gao.gov/new.items/d04490.pdf.
16. World Health Assembly (1998) *Resolution 51.17: Emerging and Other Communicable Diseases: Antimicrobial Resistance* [PDF document]. Geneva: World Health Organization. [cited 2015 Aug 11]; Available from: <http://apps.who.int/medicinedocs/documents/s16334e/s16334e.pdf>.
17. World Health Organization (2001) *WHO Global Strategy for Containment of Antimicrobial Resistance*. [cited 2015 Aug 11]; Available from: <http://apps.who.int/iris/handle/10665/66860>.
18. World Health Organization (2014) *Antimicrobial Resistance: Global Report on Surveillance* [Internet]. Geneva: World Health Organization. [cited 2015 Aug 11]; Available from: <http://www.who.int/drugresistance/documents/surveillancereport/en/>.
19. World Health Assembly (2014) *WHA67 Agenda Item 16.5: Antimicrobial Resistance* [PDF document]. Geneva: World Health Organization. [cited 2015 Aug 11]; Available from: http://apps.who.int/gb/ebwha/pdf_files/WHA67/A67_R25-en.pdf.
20. World Health Assembly (2011) *Resolutions, Small Pox Eradication: Destruction Of Variola Virus Stocks* [PDF document]. Geneva: World Health Organization. [cited 2015 Aug 11]; Available from: http://apps.who.int/gb/ebwha/pdf_files/EB134/B134_34-en.pdf.
21. World Health Assembly (2005) *Resolution - WHA 58.27: Improving The Containment Of Antimicrobial Resistance* [PDF document]. Geneva: World Health Organization. [cited 2015 Aug 11]; Available from: http://who.int/gb/ebwha/pdf_files/WHA60/A60_28-en.pdf?ua=1.
22. World Health Organization (2014) *WHO Advisory Group on Integrated Surveillance of Antimicrobial Resistance (AGISAR)* [Internet]. [cited 2015 Aug 11]; Available from: http://www.who.int/foodborne_disease/resistance/agisar/en/.
23. Codex Alimentarius Commission (2011) *Codex Alimentarius Commission - Guidelines For Risk Analysis Of Foodborne Antimicrobial Resistance* [PDF document]. Geneva: Food and Agriculture Organization. [cited 2015 Aug 11]; Available from: <http://www.security-science.com/pdf/risk-management-guide-for-information-technology-systems.pdf>.
24. OIE. Terrestrial code: OIE - World Organisation for Animal Health (2013) *World Organization for Animal Health* [Internet]. [cited 2015 Aug 11]; Available from: <http://www.oie.int/international-standard-setting/terrestrial-code/>.
25. European Commission (2005) *Press release - Ban on antibiotics as growth promoters in animal feed enters into effect* [Internet]. [cited 2015 Aug 11]; Available from: http://europa.eu/rapid/press-release_IP-05-1687_en.htm.
26. Food and Drug Administration (2013) *Guidance for Industry: The Judicious Use of Medically Important Antimicrobial Drugs in Food-Producing Animals*. Washington, DC: US Department of Health and Human Services.

27. European Commission (2011) *Action Plan Against The Rising Threats From Antimicrobial Resistance* [PDF document]. [cited 2015 Aug 11]; Available from: http://ec.europa.eu/dgs/health_consumer/docs/communication_amr_2011_748_en.pdf.
28. Transatlantic Taskforce on Antimicrobial Resistance (2014) *Progress Report: Recommendations for Future Collaboration between the US and EU*. Stockholm: European Centre for Disease Prevention and Control; p. 85.
29. Transatlantic Taskforce on Antimicrobial Resistance (2011) *Recommendations for Future Collaboration between the US and EU*. Stockholm: European Centre for Disease Prevention and Control; p. 44.
30. Nicolle LE (2001) *Infection Control Programmes to Contain Antimicrobial Resistance* [PDF document]. Geneva: World Health Organization. [cited 2015 Aug 11]; Available from: http://cdrwww.who.int/entity/csr/resources/publications/drugresist/infection_control.pdf.
31. US Centers for Disease Control and Prevention (2013) Diseases and Organisms in Healthcare Settings | HAI | CDC [Internet]. [cited 2015 Aug 11]; Available from: <http://www.cdc.gov/HAI/organisms/organisms.html>.
32. European Centre for Disease Prevention and Control (2014) Antimicrobial resistance and healthcare-associated infections [Internet]. [cited 2015 Aug 11]; Available from: http://ecdc.europa.eu/en/publications/technical_reports/arhai/Pages/arhai.aspx.
33. WHO (1990) Epidemiology, prevention and control of legionellosis: memorandum from a WHO meeting. *Bulletin of the World Health Organization* 68(2): 155–164.
34. WHO EURO (2015) *Central Asian and Eastern European Surveillance on Antimicrobial Resistance (CAESAR)* [Internet]. [cited 2015 Aug 11]; Available from: <http://www.euro.who.int/en/health-topics/disease-prevention/antimicrobial-resistance/antimicrobial-resistance/central-asian-and-eastern-european-surveillance-on-antimicrobial-resistance-caesar>.
35. European Centre for Disease Prevention and Control (ECDC) (2015) European Antimicrobial Resistance Surveillance Network (EARS-Net) [Internet]. [cited 2015 Aug 11]; Available from: <http://www.ecdc.europa.eu/en/activities/surveillance/EARS-Net/Pages/index.aspx>.
36. Morrissey I, Hackel M, Badal R, Bouchillon S, Hawser S, Biedenbach D (2013) A review of ten years of the study for monitoring antimicrobial resistance trends (SMART) from 2002 to 2011. *Pharmaceuticals* 6(11): 1335–46.
37. Ijaz K, Kasowski E, Arthur RR, Angulo FJ, Dowell SF (2012) International Health Regulations—what gets measured gets done. *Emerging Infectious Diseases* 18(7): 1054–7.
38. Edge JS, Hoffman SJ (2015) Strengthening national health systems' capacity to respond to future global pandemics. In: Davies S, Youde JR, editors. *The Politics of Surveillance and Responses to Disease Outbreaks*. Surrey, U.K.: Ashgate Publishing; p.157–79.

39. World Health Organization (2005) *International Health Regulations*. Geneva: World Health Organization [PDF document]. [cited 2015 Feb 11]; Available from: http://whqlibdoc.who.int/publications/2008/9789241580410_eng.pdf?ua=1.
40. World Health Organization (2013) *Implementation of the International Health Regulations: Report by the Director-General* [PDF document]. Geneva: World Health Organization [PDF document]. [cited 2015 Aug 11]; Available from: http://apps.who.int/gb/ebwha/pdf_files/WHA66/A66_16-en.pdf.
41. World Health Organization (2009) WHO | Access to medicines [Internet]. [cited 2015 Aug 11]; Available from: <http://www.who.int/mediacentre/news/statements/2009/access-medicines-20090313/en/>.
42. Médecins Sans Frontières (MSF) (2014) About Us | msfaccess.org [Internet]. [cited 2015 Aug 11]; Available from: <http://www.msfaccess.org/the-access-campaign>.
43. UN Committee on Economic, Social and Cultural Rights (CESCR) (2000) Refworld | General Comment No. 14: The Right to the Highest Attainable Standard of Health (Art. 12 of the Covenant) [Internet]. Refworld. [cited 2015 Aug 11]; Available from: <http://www.refworld.org/docid/4538838d0.html>.
44. The Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM) (2011) *The Global Fund Strategy 2012-2016: Investing For Impact* [Internet]. Geneva: GFATM. [cited 2015 Aug 11]; Available from: http://www.theglobalfund.org/documents/core/strategies/Core_GlobalFund_Strategy_en/.
45. Roll Back Malaria Partnership (2008) Global malaria action plan for a malaria-free world [PDF document]. Geneva: World Health Organization. [cited 2015 08 11]; Available from: <http://www.rollbackmalaria.org/gmap/gmap.pdf>.
46. Stop TB Partnership (2010) *The Global Plan To Stop TB 2011-2015* [PDF document]. Geneva: World Health Organization. [cited 2015 Aug 11]; Available from: http://www.stoptb.org/assets/documents/global/plan/TB_GlobalPlanToStopTB2011-2015.pdf.
47. Joint United Nations Programme on HIV/AIDS (2010) Getting to zero: 2011-2015 strategy. Geneva, Switzerland: UNAIDS. p. 63
48. Kamradt-Scott A (2011) A public health emergency of international concern? Response to a proposal to apply the International Health Regulations to antimicrobial resistance. *PLoS Medicine* 8(4): e1001021.
49. Wernli D, Hausteiner T, Conly J, Carmeli Y, Kickbusch I, Harbarth S (2011) A call for action: the application of the international health regulations to the global threat of antimicrobial resistance. *PLoS Medicine* 8(4): e1001022.
50. World Trade Organization (WTO) (1994) WTO | Agreement on trade-related aspects of intellectual property rights [Internet]. WTO. [cited 2015 Aug 11]; Available from: http://www.wto.org/english/tratop_e/trips_e/t_agm0_e.htm.

51. Innovative Medicines Initiative (2012) IMI Launches 223.7 million programme for combating antibiotic resistance [PDF document]. Brussels. [cited 2015 Aug 11]; Available from: <http://www.imi.europa.eu/sites/default/files/uploads/documents/Press%20Releases/IMIpressRelease6thCallFINAL.pdf>.
52. Biomedical Advanced Research and Development Authority (BARDA) (2015) Medical countermeasures with broad spectrum activities (BSAs) [Internet]. [cited 2015 Aug 11]; Available from: <https://www.medicalcountermeasures.gov/barda/cbrn/broad-spectrum-antimicrobials.aspx>.
53. WHO Consultative Expert Working Group on Research and Development (2012) WHO | Research and development to meet health needs in developing countries: Strengthening global financing and coordination [Internet]. WHO. [cited 2015 Aug 11]; Available from: http://www.who.int/phi/cewg_report/en/.
54. Røttingen J-A, Chamas C (2012) A New Deal for Global Health R&D? The recommendations of the Consultative Expert Working Group on research and development (CEWG). *PLoS Medicine* 9(5): e1001219.
55. Government of the United Kingdom (2014) Press release: Prime Minister warns of global threat of antibiotic resistance [Internet]. [cited 2015 Aug 11]; Available from: <https://www.gov.uk/government/publications/chief-medical-officer-annual-report-volume-2>.
56. Hoffman SJ, Cole CB, Pearcey M (2015) *Mapping Global Health Architecture to Inform the Future* [PDF document]. London: Chatham House (Royal Institute of International Affairs). [cited 2015 Aug 11]; Available from: http://www.chathamhouse.org/sites/files/chathamhouse/field/field_document/20150120GlobalHealthArchitectureHoffmanColePearceyUpdate.pdf.
57. World Health Organization, others (1948) *Constitution of the World Health Organization* [Internet]. [cited 2015 Aug 11]; Available from: <http://apps.who.int/iris/handle/10665/43637>.
58. United Nations Children's Fund (UNICEF) (2015) Who we are [Internet]. United Nations. [cited 2015 Aug 11]; Available from: http://www.unicef.org/about/who/index_introduction.html.
59. United Nations Office on Drugs and Crime (UNODC) (2014) About UNODC [Internet]. [cited 2015 Aug 11]; Available from: <http://www.unodc.org/unodc/en/about-unodc/index.html?ref=menutop>.
60. United Nations Development Programme (UNDP) (2013) Overview | UNDP [Internet]. United Nations. [cited 2015 Aug 11]; Available from: http://www.undp.org/content/undp/en/home/operations/about_us.html.
61. FAO (1945) Constitution of the Food and Agriculture Organization. [PDF document]. Geneva: Food and Agriculture Organization (FAO). [cited 2015 Aug 11]; Available from: <http://www.fao.org/docrep/meeting/022/k8024e.pdf>.

62. Codex Alimentarius Commission (2014) About Codex [Internet]. Food and Agriculture Organization. [cited 2015 Aug 11]; Available from: <http://www.codexalimentarius.org/about-codex/en/>.
63. United Nations Office for Disarmament Affairs (UNODA) (2014) UNODA - About Us [Internet]. United Nations. [cited 2015 Aug 11]; Available from: http://www.un.org/disarmament/HomePage/about_us/aboutus.shtml.
64. United Nations (2014) General Assembly of the United Nations [Internet]. United Nations. [cited 2015 Aug 11]; Available from: <http://www.un.org/en/ga/>.
65. United Nations (2014) About the United Nations Security Council [Internet]. [cited 2015 Aug 11]; Available from: <http://www.un.org/en/sc/about/>.
66. International Conference on Harmonization (2015) ICH Official web site: ICH [Internet]. International Conference on Harmonization. [cited 2015 Aug 11]; Available from: <http://www.ich.org/>.
67. World Bank (2014) What We Do [Internet]. World Bank. [cited 2015 Aug 11]; Available from: <http://www.worldbank.org/en/about/what-we-do>.
68. World Organization for Animal Health (2014) Our missions [Internet]. World Organization for Animal Health. [cited 2015 Aug 11]; Available from: <http://www.oie.int/about-us/our-missions/>.
69. International Cooperation on Harmonization (2015) VICH [Internet]. International Federation for Animal Health. [cited 2015 Aug 11]; Available from: <http://www.vichsec.org/>.
70. PIC/S Secretariat. PIC/S: Pharmaceutical Inspection Co-operation Scheme [Internet]. [cited 2015 Aug 11]; Available from: <http://www.picscheme.org>.
71. World Trade Organization (WTO) (2014) WTO | What is the WTO? - What we do [Internet]. WTO. [cited 2015 Aug 11]; Available from: http://www.wto.org/english/thewto_e/whatis_e/what_we_do_e.htm.
72. Consultative Group on International Agricultural Research (CGIAR). Who We Are [Internet]. The World Bank. [cited 2015 Aug 11]; Available from: <http://www.cgiar.org/who-we-are/>.
73. G8 Research Group (2014) What is the G8? [Internet]. [cited 2015 Aug 11]; Available from: http://www.g8.utoronto.ca/what_is_g8.html.
74. Global Health Security Initiative (2014) GHSI - Global Health Security Initiative [Internet]. Global Health Security Initiative. [cited 2015 Aug 11]; Available from: <http://www.ghsi.ca/english/index.asp>.
75. Alliance for the Prudent Use of Antibiotics TU (2013) What we do [Internet]. Boston. [cited 2015 Aug 11]; Available from: http://www.tufts.edu/med/apua/about_us/what_we_do.shtml.
76. ReAct Group. ReAct - What We Do [Internet]. Uppsala University. [cited 2015 Aug 2015]; Available from: <http://www.reactgroup.org/what-we-do.html>.

77. Antibiotic Action (2011) Antibiotic Action - The Arms Race [Internet]. British Society for Antimicrobial Chemotherapy. [cited 2015 Aug 11]; Available from: <http://antibiotic-action.com/>.
78. Stichting Health Action International Foundation (2007) Amendment of the Constitution [PDF document]. [cited 2015 Aug 11]; Available from: <http://www.haiweb.org/24122007/hai-constitution-english.pdf>.
79. Médecins Sans Frontières (2014) About MSF [Internet]. Médecins Sans Frontières (MSF) International. [cited 2015 Aug 11]; Available from: <http://www.msf.org/about-msf>.
80. Innovative Medicines Initiative (2010) Mission | IMI [Internet]. Innovative Medicines Initiative. [cited 2015 Aug 11]; Available from: <http://www.imi.europa.eu/content/mission>.
81. European Platform for the Responsible Use of Medicines in Animals (2010) Responsible Use of Veterinary Medicines - EPRUMA [Internet]. European Platform for the Responsible Use of Medicines in Animals. [cited 2015 Aug 11]; Available from: <http://www.epruma.eu/about/about-epruma.html>.
82. European Federation of Pharmaceutical Industries and Associations (2014) EFPIA - About us [Internet]. European Federation of Pharmaceutical Industries and Associations. [cited 2015 Aug 11]; Available from: <http://www.efpia.eu/about-us>.
83. International Dairy Federation (2014) FIL-IDF - About IDF [Internet]. International Dairy Federation. [cited 2015 Aug 11]; Available from: <http://www.fil-idf.org/Public/TextFlowPage.php?ID=23084>.
84. International Federation for Animal Health (2011) Animal Health Care - International Animal Health Regulation | IFAH - International Federation for Animal Health [Internet]. [cited 2015 Aug 11]; Available from: <http://www.ifahsec.org/our-industry/about-us/>.
85. International Federation of Pharmaceutical Manufacturers & Associations (2014) Welcome: IFPMA [Internet]. International Federation of Pharmaceutical Manufacturers & Associations. [cited 2015 Aug 11]; Available from: <http://www.ifpma.org/about-ifpma/welcome.html>.
86. International Hospital Federation (2014) About IHF [Internet]. International Hospital Federation. [cited 2015 Aug 11]; Available from: <http://www.ihf-fih.org/en/About-IHF>.
87. International Meat Secretariat (2012) IMS | About the IMS [Internet]. [cited 2015 Aug 11]; Available from: <http://www.meat-ims.org/about-the-ims>.
88. International Poultry Council. Objectives [Internet]. International Poultry Council. [cited 2015 Aug 11]; Available from: <http://www.internationalpoultrycouncil.org/about/aboutObj.cfm>.
89. World Farmer's Organization (2014) World Farmers' Organisation [Internet]. World Farmer's Organization. [cited 2015 Aug 11]; Available from: <http://www.wfo-oma.com/wfo.html>.
90. World Medical Association (2014) About the WMA [Internet]. Ferney-Voltaire: World Medical Association. [cited 2015 Aug 11]; Available from: <http://www.wma.net/en/contact/index.html>.

91. International Pharmaceutical Federation (2014) About FIP - FIP - International Pharmaceutical Federation [Internet]. The International Pharmaceutical Federation – FIP. [cited 2015 Aug 11]; Available from: http://www.fip.org/menu_about.
92. World Health Professions Alliance (2014) What is the WHPA? [Internet]. World Health Professions Alliance. [cited 2015 Aug 11]; Available from: <http://www.whpa.org/whpa.htm>.
93. FAO, OIE & WHO (2010) *The FAO-OIE-WHO Collaboration: Sharing Responsibilities And Coordinating Global Activities To Address Health Risks At The Animal-Human-Ecosystems Interface* [PDF document]. Geneva: Food and Agriculture Organization, World Organization for Animal Health, & World Health Organization. [cited 2015 Aug 11]; Available from: http://www.oie.int/fileadmin/Home/eng/Current_Scientific_Issues/docs/pdf/FINAL_CONCEPT_NOTE_Hanoi.pdf.
94. Otto P (2013) FAO-OIE-WHO tripartite positions and actions on antimicrobial resistance. Rome: Food and Agriculture Organization [PDF document]. [cited 2015 Aug 11]; Available from: <http://www.rr-africa.oie.int/docspdf/en/2013/VP/12.OTTO.pdf>.
95. World Health Organization (2014) *Draft Global Action Plan on Antimicrobial Resistance* [PDF document]. Geneva: World Health Organization. [cited 2015 Jan 24]; Available from: http://apps.who.int/gb/ebwha/pdf_files/EB136/B136_20-en.pdf.
96. World Health Organization. (2013) *Strategic and Technical Advisory Group on Antimicrobial Resistance: Report of the First Meeting* [PDF document]. Geneva: World Health Organization. [cited 2015 Aug 11]; Available from: http://www.who.int/drugresistance/stag/amr_stag_meetingreport0913.pdf.
97. Diaz F (2013) Collection of quantitative data on the use of antimicrobial agents [PDF document]. Maputo: World Organization for Animal Health. [cited 2015 Aug 11]; Available from: <http://www.rr-africa.oie.int/docspdf/en/2013/VP/13.DIAZ.pdf>.
98. World Health Organization (2007) *Progress Reports On Technical And Health Matters* [PDF document]. Geneva: World Health Organization [cited 2015 Aug 11]; Available from: http://apps.who.int/gb/ebwha/pdf_files/WHA60/A60_28-en.pdf.
99. Morgan DJ, Okeke IN, Laxminarayan R, Perencevich EN, Weisenberg S (2011) Non-prescription antimicrobial use worldwide: a systematic review. *The Lancet Infectious Diseases* 11(9): 692–701.
100. World Trade Organization Appellate Body (1998) United States – Import prohibition of certain shrimp and shrimp products: Report of the Appellate Body. [PDF document]. Geneva: WTO [cited 2015 Aug 11]; Available from: http://www.wto.org/english/tratop_e/dispu_e/58abr.pdf.
101. Hoffman SJ, Røttingen J-A (2012) Assessing implementation mechanisms for an international agreement on research and development for health products. *Bulletin of the World Health Organization* 90(11): 854–63.
102. Baldwin DA, editor (1993) *Neorealism and Neoliberalism: The Contemporary Debate*. Columbia University Press.

103. Keohane RO (1993) *Institutionalist Theory and the Realist Challenge after the Cold War*. Center for International Affairs, Harvard University. 54 p.
104. Moravcsik A (1997) Taking preferences seriously: a liberal theory of international politics. *International Organizations* 51(4): 513–53.
105. Simmons BA (2009) *Mobilizing for Human Rights: International Law in Domestic Politics*. Cambridge; New York: Cambridge University Press; p. 451
106. Finnemore M (1996) *National Interests in International Society*. Cornell University Press; p.180
107. Chayes A, Chayes AH (1996) *The New Sovereignty: Compliance with International Regulatory Agreements*. Harvard University Press; p.432
108. Koh HH (1997) Why do nations obey international law? *Yale Law Journal* 106: 2599-659.
109. Franck TM (1990) *The Power of Legitimacy Among Nations*. Oxford University Press; p.318
110. Raustiala K (2005) Form and substance in international agreements. *American Journal of International Law* 99: 581-614.
111. Hoffman SJ, Røttingen J-A, Frenk J (2015) Assessing proposals for new global health treaties: an analytic framework. *American Journal of Public Health* 105(8): 1523-1530. doi:10.2105/AJPH.2015.302726.
112. Slaughter AM (2005) *A New World Order*. Princeton: Princeton University Press.
113. Prado MM (2011) *Institutional Bypass: An Alternative for Development Reform* [Internet]. Rochester, NY: Social Science Research Network [cited 2015 Aug 11]; Report No.: ID 1815442. Available from: <http://papers.ssrn.com/abstract=1815442>.
114. Hoffman SJ, Røttingen J-A. Assessing the expected impact of global health treaties: evidence from 90 quantitative evaluations. *American Journal of Public Health* 105(1): 26-40. doi:10.2105/AJPH.2014.302085.
115. Hoffman SJ, Røttingen J-A. A framework convention on obesity control? *The Lancet* 378(9809): 2068.
116. Hoffman SJ, Røttingen J-A (2011) Be sparing with international laws. *Nature*. 2012 Mar 14;483(7389): 275-275.
117. United Nations (2001) Declaration of commitment on HIV/AIDS: United Nations General Assembly special session on HIV/AIDS. [PDF document]. New York: United. [cited 2015 Aug 11]; p. 47. Available from: http://data.unaids.org/publications/irc-pub03/aidsdeclaration_en.pdf.
118. United Nations (2011) *Political declaration of the High-level Meeting of the General Assembly on the Prevention and Control of Non-communicable Diseases* [Internet]. New York: United Nations. [cited 2014 Jul 10]; p. 13. Available from: http://www.un.org/ga/search/view_doc.asp?symbol=A/66/L.1.

119. United Nations (2012) *Global Health and Foreign Policy 67.123* [Internet]. United Nations; p. 6. [cited 2015 Aug 11]; Report No.: 67.123. Available from: http://www.un.org/ga/search/view_doc.asp?symbol=A/67/L.36.
120. Hoffman SJ, Røttingen J-A (2014) Split WHO in two: strengthening political decision-making and securing independent scientific advice. *Public Health* 128(2): 188–94.
121. Hoffman SJ (2010) The evolution, etiology and eventualities of the global health security regime. *Health Policy and Planning* 25(6): 510–22.
122. Hoffman SJ (2012) Mitigating inequalities of influence among states in global decision making: mitigating inequalities in global decision making. *Global Policy* 3(4): 421–32.
123. Kesselheim AS, Outterson K (2011) Improving antibiotic markets for long term sustainability. *Yale Journal of Health Policy, Law & Ethics* 11: 10–42.
124. Brogan DM, Mossialos E (2013) Incentives for new antibiotics: the Options Market for Antibiotics (OMA) model. *Globalization and Health* 9(1): 58.
125. Dahle UR, Petersen FC (2013) Incentives for developing new antibiotics or antimicrobial strategies. *BMJ* 346(1): f2136.
126. Hollis A, Ahmed Z (2013) Preserving antibiotics, rationally. *New England Journal of Medicine* 369(26): 2474–6.
127. Woolhouse M, Farrar J (2014) An intergovernmental panel on antimicrobial resistance. *Nature* 509(7502): 555–7.
128. Chatham House (2013) *Antimicrobial Resistance: Incentivizing Change towards a Global Solution* [Internet]. Chatham House. [cited 2015 Aug 11]; Available from: <http://www.chathamhouse.org/node/6809>.
129. Hoffman SJ, Outterson K, Røttingen J-A, Cars O, Clift C, Rizvi Z, et al. (2015) An international legal framework to address antimicrobial resistance. *Bulletin of the World Health Organization*. 93(2).
130. World Health Organization (2013) Global action plan for the prevention and control of noncommunicable diseases 2013-2020. [cited 2015 Aug 11]; Available from: <http://apps.who.int/iris/handle/10665/94384>.
131. Davis KE, editor (2012) *Governance by Indicators: Global Power Through Classification and Rankings*. Oxford: Oxford University Press. 491 p.
132. Sandberg K, Hoffman SJ, Pearcey M (2015) *Lessons for Global Health from Global Environmental Governance* [PDF document]. London: Chatham House (Royal Institute of International Affairs). [cited 2015 Aug 11]; Available from: http://www.chathamhouse.org/sites/files/chathamhouse/field/field_document/20150119GlobalHealthEnvironmentSandbergHoffmanPearcey.pdf.

133. Behdinan A, Cole C, Li G (2014) Working paper: Establishing global collective action for response to antimicrobial resistance. Hamilton, Ontario, Canada: McMaster University p. 40.
134. Mahendren M, Pope C, Tam V (2014) Working paper: Global Collective Action on Antimicrobial Resistance. Hamilton, Ontario, Canada: McMaster University p. 41.
135. Chen A, Wang C, Young C (2014) Working paper: Achieving Global Collective Action Towards Sustaining the Effectiveness and Achieving Equitable Access of Antimicrobials Globally. Hamilton, Ontario, Canada: McMaster University p. 33.
136. Hirji S, Kim M, Pearson J (2014) Working paper: Addressing Global Collective Action for Antimicrobial Resistance. Hamilton, Ontario, Canada: McMaster University p. 23.
137. Edge JS, Hoffman SJ (2013) Empirical impact evaluation of the WHO Global Code of Practice on the International Recruitment of Health Personnel in Australia, Canada, UK and USA. *Globalization and Health* 9(1): 60.
138. Bruno AV, Mackay C (2012) Antimicrobial resistance and the activities of the Codex Alimentarius Commission. *Revue Scientifique et Technique - International Office of Epizootics* 31(1): 317–23.
139. World Health Organization (2006) World Health Organization Constitution [PDF document]. [cited 2015 Aug 11]; Available from: http://apps.who.int/gb/DGNP/pdf_files/constitution-en.pdf.
140. Clift C (2014) *What's the World Health Organization for*. Chatham House [PDF document]. [cited 2015 Aug 11]; Available from: http://observgo.quebec.ca/observgo/fichiers/88303_20140521WHOHealthGovernanceClift.pdf.
141. United Nations Office for Disarmament Affairs (UNODA). *Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on their Destruction* [Internet]. n.d. [cited 2015 Aug 11]; Available from: <http://disarmament.un.org/treaties/t/bwc/text>.
142. Hoffman S (2014) Making the International Health Regulations matter: promoting universal compliance through effective dispute resolution. In: Rushton S, Youde J, editors. *Routledge Handbook on Global Health Security*. Routledge. Oxford: Routledge.
143. Schedler A (1999) Conceptualizing accountability. In: Schedler A, Plattner M, Diamond L, editors. *The Self-Restraining State: Power and Accountability in New Democracies* [Internet]. Lynne Rienner Publishers [cited 2015 Aug 11]; p. 13–28. Available from: http://works.bepress.com/andreas_schedler/22.
144. Grant RW, Keohane RO (2005) Accountability and abuses of power in world politics. *American Political Science Review* 99(1): 29–43.
145. Bovens M (2007) Analysing and assessing accountability: a conceptual framework. *European Law Journal* 13(4): 447–68.
146. Rizvi Z, Hoffman SJ (2015) Effective global action on antibiotic resistance requires careful consideration of convening forums. *Journal of Law, Medicine and Ethics* 43(3): 74–8.

147. Behdinan A, Hoffman SJ, Pearcey M (2015) Some global policies for antibiotic resistance depend on legally binding and enforceable commitments. *Journal of Law, Medicine and Ethics* 43(2).
148. Mitchell RB (1994) Regime design matters: intentional oil pollution and treaty compliance. *International Organizations* 48(3): 425.
149. Victor DG, Greene O, Lanchberry J, di Primio JC, Korula A (1994) *Review Mechanisms in the Effective Implementation of International Environmental Agreements* [Internet]. International Institute for Applied Systems Analysis [cited 2015 Aug 7]; Report No.: wp94114. Available from: <https://ideas.repec.org/p/wop/iasawp/wp94114.html>
150. Centers for Disease Control and Prevention (2013) *Antibiotic Resistance Threats in the United States, 2013* [Internet]. [cited 2015 Aug 11]; Available from: <http://www.cdc.gov/drugresistance/threat-report-2013/>.
151. Menkel-Meadow CJ (2010) Dispute resolution. In: Cane P, Kritzer HM, editors. *The Oxford Handbook of Empirical Legal Research* [Internet]. 1st ed. Oxford University Press; [cited 2015 Aug 11]; Available from: <http://www.oxfordhandbooks.com/view/10.1093/oxfordhb/9780199542475.001.0001/oxfordhb-9780199542475>.
152. Yang T (2006) International treaty enforcement as a public good: institutional deterrent sanctions in international environmental agreements. *Michigan Journal of International Law* 27: 1131-1184.
153. Hoffman SJ, Røttingen J-A, Frenk J (2105) Assessing proposals for new global health treaties: an analytic framework. *American Journal of Public Health* 105(8): 1523-30.
154. Barnes A, Brown GW (2011) The Global Fund to Fight AIDS, Tuberculosis and Malaria: expertise, accountability and the depoliticisation of global health governance. In: Rushton S, Williams, OD, editors. *Partnerships and Foundations in Global Health Governance* [Internet]. [cited 2015 Aug 7]; Available from: http://www.palgrave.com%2Fpage%2Fdetail%2F%3Fsf1%3Did_product%26st1%3D382747.
155. Esty D (2008) Rethinking Global Environmental Governance to Deal with Climate Change: The Multiple Logics of Global Collective Action. *Faculty Scholarship Series* [Internet]. [cited 2015 Aug 11]; Available from: http://digitalcommons.law.yale.edu/fss_papers/427.
156. Flynn S (2014) Special 301 and Global Administrative Law. In: Dreyfuss RC, Dreyfuss R, Rodríguez-Garavito C, editors. *Balancing Wealth and Health: The Battle Over Intellectual Property and Access to Medicines in Latin America*. Oxford: Oxford University Press.

Chapter 3

Automatically Quantifying the Scientific Quality and Sensationalism of News on Pandemics[‡]

Abstract

News media coverage of health issues is far from optimal, especially during crises like pandemic outbreaks. This study presents a new method for automatically quantifying the relevance, scientific quality and sensationalism of individual news articles and validates it on a corpus of 163,433 news records mentioning the recent SARS and H1N1 pandemics. This method involved optimizing retrieval of relevant news records, using specially tailored tools for scoring these qualities on a randomly sampled training set of 500 news records, processing the training set into a document-term matrix, utilizing a maximum entropy model for inductive machine learning to identify relationships that distinguish differently scored news records, computationally applying these relationships to classify other news records, and validating the model using a test set that compares computer and human judgments. Estimates of overall scientific quality and sensationalism based on the 500 human-scored news records were 3.17 (“potentially important but not critical shortcomings”) and 1.81 (“not too much sensationalizing”) out of 5, respectively, and updated by the computer model to 3.32 and 1.73 out of 5 after including information from 10,000 records. This confirms that news media coverage of pandemic outbreaks is far from perfect, especially its scientific quality if not also its sensationalism, but that coverage slightly improved between the SARS and H1N1 pandemics. The accuracy of computer scoring of individual news records for relevance, quality and sensationalism was 86%, 65% and 73%, respectively. This demonstrates that automated methods can evaluate news records faster, cheaper and possibly better than humans, and that the specific procedure implemented in this study can at the very least identify subsets of news records that are far more likely to have particular scientific and discursive qualities.

[‡] Co-authored with Toria Justicz.

Introduction

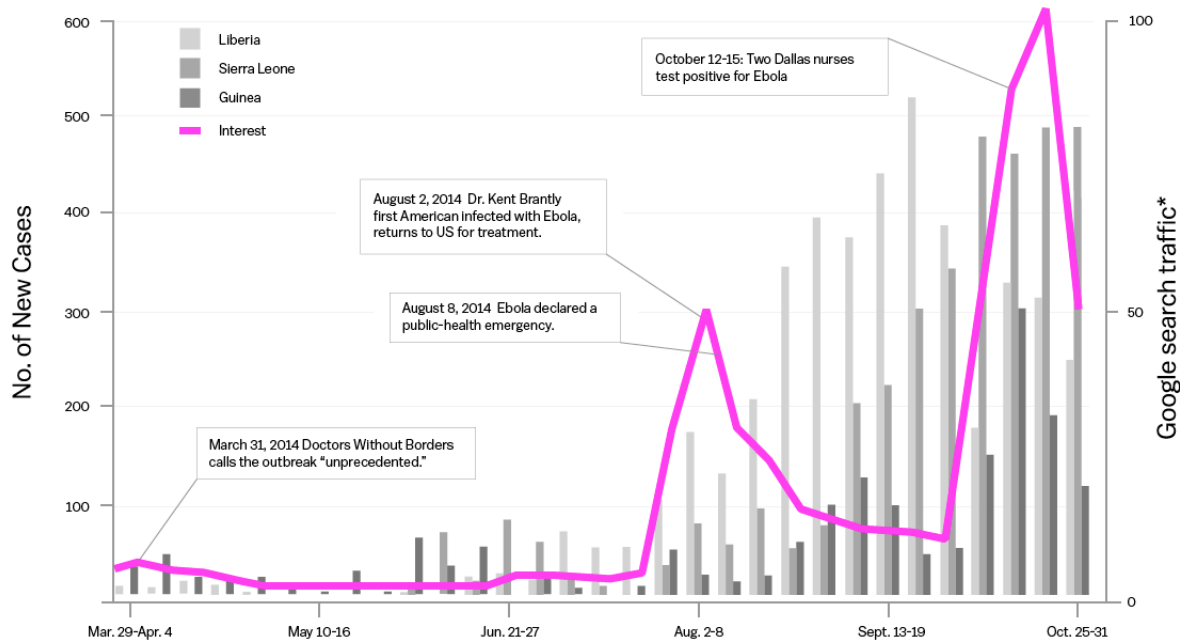
Scientists tell us that a devastating global pandemic in the next few years is simply “inevitable”.¹⁻² A future influenza pandemic, for example, is expected to cause 150 million deaths,³ 1.5 billion cases of illness,⁴ and up to \$3 trillion in economic damages.⁵ The global impact of Severe Acute Respiratory Syndrome (SARS) in 2003, A/H1N1 influenza (H1N1) in 2009, and Ebola in 2014 revealed just how devastating the transnational spread of disease can be; halting all travel to affected areas, causing severe economic hardship and prompting international isolation.⁶ Given this frightening outlook, governments and health system stakeholders around the world have invested considerably in pandemic preparation and response strategies to protect the health of their citizens.

Yet while massive research efforts are undertaken each year to develop new vaccines and antiviral medicines, relatively few efforts have focused on understanding, evaluating and strengthening news media coverage of pandemic outbreaks – even when the vital role and current weaknesses of the news media have been recognized time and time again across stakeholder groups.⁷

The news media is one of the most powerful societal influences and most important sources of health information available to the general public. It significantly influences people’s health-related behaviors,⁸ clinical practices, and policymaking processes. But there is good reason to believe current coverage of health issues is far from optimal, especially during dramatic crises like pandemics; this is because news media coverage of health issues is often far from optimal. Health information is frequently misused and abused, resulting in large gaps among what researchers know about health emergencies, how journalists convey this information, and, ultimately, the reports on which health professionals, policymakers and the public act. For example, initial genomic studies of the SARS and H1N1 viruses were reported sensationally and in isolation without being put in the context of the larger body of research to which they contributed. Worst-case scenarios were also often laid out theatrically without caveating possible risks with any sense of the likelihood (or unlikelihood) in which they may or

may not be realized. The 2014 Ebola outbreak was consistently front-page news around the world for weeks – drawing unprecedented public interest (see Panel 3.1) – despite only a single Ebola death outside of West Africa.⁹ And when high-quality, specific information was available, the journalistic imperative of balanced coverage too often resulted in trustworthy evidence from credible scientists reported alongside ill-informed opinions from the most popular celebrities and conflicted lobbyists.¹⁰

Panel 3.1: Google Searches for “Ebola” vs. New Ebola Cases



Sources: Google Trends / CDC

*Reflecting how many searches have been done for a particular term, relative to the total number of searches done on Google over time. Data is normalized and presented on a scale from 0-100.



To researchers, this “research-to-reporting gap” and the broader “research-to-action gap” that it perpetuates is an unending frustration. But to those people who rely on the media as a primary source of health information – the clinicians who provide healthcare treatment, the decision-makers who set health policy, and the public who make personal health decisions every day – this gap means the best available information is not reaching them. It means they are routinely left to act upon sub-optimal information and unnecessary fear, and therefore cannot make truly informed decisions about how to

respond to pandemics. This can result in inappropriate treatments, ineffective policies, and potentially harmful behaviours.

Further, for public health professionals, poor media coverage diminishes their capacity to quickly access, assess, adapt and apply emerging information as it is generated, disseminate their own public health guidance, and coordinate responses with health system stakeholders. Stark divergences in countries' responses to past pandemics and widespread non-adherence to World Health Organization (WHO) recommendations suggest that governments around the world make life-and-death decisions during pandemics based on different information.¹¹ Media coverage is probably at least partially responsible. Further discrepancies among scientific, political and journalistic statements also suggest there may be deadly time lags between when information is first known by scientists and when it is accessed and acted upon by politicians, journalists and the general public. New research is often said to take 17 years to be translated into practice;¹² in pandemics, even a mere 17 *hour* delay could result in devastating consequences.

Finally, and more broadly, poor reporting by the media during pandemics perpetuates the perceived decline in public discourse on policy issues and levels of trust in science. Inaccurate information and sensationalized stories in the media diminishes citizens' ability to hold their elected officials, government decision-makers and health professionals to account, thereby affecting good governance, limiting oversight and impacting broader principles of responsibility.¹³

This study offers the first assessment of news media coverage about pandemic outbreaks that is both systematic and comprehensive. The focus is on quantitatively evaluating the scientific quality and sensationalism of news records published during the SARS and H1N1 pandemic alert periods. Scientific quality is about accurate reporting that reflects truth and avoids bias.¹⁴ Sensationalism is a discourse strategy of presenting news as more extraordinary, interesting or relevant than is objectively warranted.¹⁵ Analysis of such vast quantities of qualitative data is aided by advances in automatic and

computer-assisted methods of extracting, organizing and consuming knowledge from unstructured text.¹⁶ These machine-learning methods allow classifications of text documents according to user-chosen categories by applying human classifications of a small subset of documents to the rest of the documents.¹⁷ The ultimate goal of this study is to advance methods for “techno-regulation” of the news media, which represents the deliberate use of technology to regulate an industry that is mostly impervious to traditional law-based regulatory mechanisms due to constitutional freedoms of speech and the press.¹⁸ Hopefully the development of methods for assessing news media coverage can also facilitate evaluations of interventions to improve it.

Methods

The scientific quality and sensationalism of news media coverage mentioning pandemic outbreaks were evaluated by optimizing the retrieval of relevant news records, developing tools for quantitatively measuring these qualities on a random sample of news records, utilizing a maximum entropy model for automatic unstructured text classification, and validating the classification model by measuring its accuracy. See Appendix 3a for a detailed explanation of these steps, which are only summarized below.

1) Retrieving News Records

News records were retrieved from the LexisNexis database using a search protocol that was developed in consultation with a social science librarian and continually optimized over three stages of pilot tests to maximize sensitivity (i.e., true positives) and specificity (i.e., true negatives). LexisNexis provides access to over 15,000 sources, including over 3,000 newspapers, 2,000 magazines, and many newswires, blogs and television broadcasting transcripts from around the world.¹⁹ The following search was implemented to retrieve English-language records published on SARS from March 15, 2003 to May

18, 2004: "SARS" or "severe acute respiratory syndrome" or "coronavirus" or "sars-cov". The following search retrieved records on H1N1 from April 23, 2009 to September 10, 2010: "h1n1" or "a(h1n1)" or "s-
oiv" or "swine origin influenza" or ("flu" or "influenza") and ("pig" or "swine" or "hog").

2) Measuring Scientific Quality and Sensationalism

The scientific quality of individual news records were quantitatively measured using an adapted version of the *Index of Scientific Quality* outlined in Oxman et al.²⁰ This index was used because it was the only empirically validated tool for measuring scientific quality that was found after extensive literature searches, it was devised with input from 38 research methodologists and additional journalism scholars, and it was specifically developed for evaluating health news reports. The index facilitates calculation of a score for news records by integrating human ratings on five-point Likert-type scales measured along seven dimensions: 1) applicability; 2) opinions vs. facts; 3) validity; 4) magnitude; 5) precision; 6) consistency; and 7) consequences. A score of "1" or "2" indicates the news record contains "critical or extensive shortcomings", a score of "3" indicates "potentially important but not critical shortcomings", and a score of "5" indicates "minimal shortcomings".²⁰ Other approaches to measuring scientific quality tend to rely on proxies, such as author affiliation,²¹ sources of information²² and referencing practices.²³

For this study, the *Index of Scientific Quality* was slightly modified to improve clarity based on pre-testing with three research assistants (RAs) and consultation with a professional copy-editor. These revisions included dropping the "magnitude" dimension and merging "consistency" and "consequences" into a single rating due to overlap and highly correlated responses in pre-testing. Illustrative examples were added to boost inter-rater reliability.

Sensationalism was measured using a new tool developed from a pragma-linguistic framework of five "sensationalist illocutions" – exposing, speculating, generalizing, warning and extolling – that

Molek-Kozakowska¹⁵ identified as indicative of sensationalist reporting through surveys and focus groups. This framework was used because it facilitated direct measurement of sensationalism by conceptually identifying its facets and dividing it into discrete components. Other approaches were either: too specifically tailored for evaluating news about particular events like suicides²⁴⁻²⁵ and anthrax attacks;²⁶ depended on elements not found in text-based databases like background music²⁷ and camera positions;²⁸ incorporated consideration of the topic cover;²⁹ used simple dictionary methods like counting intensifying adjectives³⁰; or relied on proxy indicators like newspaper page number,²⁵ article length²⁴ and off-record attribution.²⁶ One previous study examined the 1918 influenza pandemic but its approach assessed news media coverage broadly rather than measured the sensationalism of individual news records.³¹

Questions, examples and corresponding five-point Likert-type scales were crafted to assess the five components of sensationalism identified in Molek-Kozakowska.¹⁵ A score of “1” indicates the news record was “not at all sensationalizing”, a “2” indicates there was “not too much sensationalizing”, a “3” indicates the record was “somewhat sensationalizing”, a “4” corresponds to “fairly sensationalizing”, and a “5” means it was “very sensationalizing”. This means that a “5” is the worst score possible, unlike with scientific quality – a virtue, rather than a vice – where a “5” is the best score possible. Only minor word changes were made after pre-testing. See Appendix 3b for the final tool used to measure the scientific quality and sensationalism of individual news records.

Three RAs independently assessed a simple random sample of 500 retrieved LexisNexis news records, first for relevance based on whether they were actually focused on the SARS or H1N1 pandemics, and then, if so, to score them using the tools developed for measuring scientific quality and sensationalism. This sample size was chosen based on previous work that suggests the advantages of more human coding begins to experience diminishing returns at this point.¹⁶ Disagreements on

relevance were resolved by consensus. Three-rater Fleiss' kappa and intraclass correlation coefficients (ICCs) were calculated to assess inter-rater reliability.

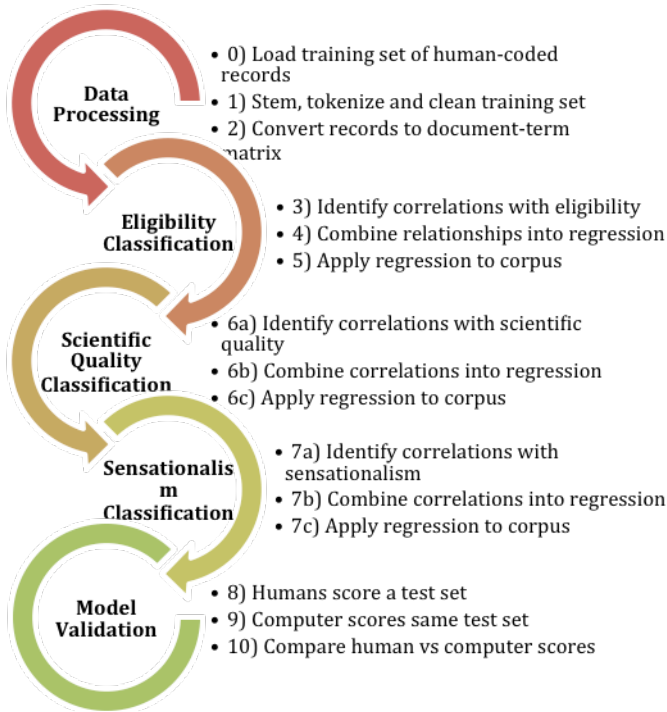
3) Maximum Entropy Modeling for Classifying Relevance, Scientific Quality and Sensationalism

These 500 news records served as a “training set” for development of a maximum entropy model that probabilistically classifies text documents,³²⁻³⁴ first for relevance and then for scientific quality and sensationalism. Maximum entropy modeling is equivalent to multinomial logistic regression – both using maximum likelihood estimation – albeit the two methods are derived differently. Specifically, logistic regression maximizes the log-likelihood of model parameters knowing the exponential form of posterior probability functions, which is equivalent to the dual problem of maximum entropy modeling's unconstrained optimization.³⁵⁻³⁷

This modeling involved a computationally intensive inductive machine-learning procedure that 1) processed the training set to remove punctuation, capitalization, non-English words, white spaces, symbols and non-ASCII letters, 2) converted it into a document-term matrix for quantitative analysis, 3) identified relationships distinguishing the 500 news records by how the RAs assessed relevance, 4) combined these relationships as constraints into a multinomial logistic regression that best predicts records' relevance, 5) applied this regression to a corpus of 10,000[§] randomly selected news records mentioning pandemics for determining relevance by the least biased maximum likelihood estimate on the available information, 6) repeated steps 3-5 using RA scores for a second analysis to evaluate each relevant article for scientific quality, and 7) repeated steps 3-5 using RA scores for a second analysis to evaluate sensationalism. See Panel 3.2 for a flowchart of this modeling.

[§] The maximum entropy model was applied to 10,000 news records instead of all 163,433 records given the model's exponentially increasing demands on computing resources as the corpus of records expands. A run of this model on all 163,433 records using default computing resources available through the Harvard-MIT Data Center's Interactive Computing Cluster did not finish within seven days. Applying the model to 10,000 news records took approximately 12 hours.

Panel 3.2: Flowchart of Maximum Entropy Modeling and Validation



More simply, a statistical model was trained to predict whether news records mentioning pandemic-related terms were actually about pandemics (i.e., first application) and whether they deserved a “1”, “2”, “3”, “4” or “5” score for scientific quality and for sensationalism (i.e., second application). The first application is important to boost specificity after it was sacrificed in the optimized search for greater sensitivity.

Maximum entropy modeling was chosen from among the many machine-learning approaches that can be used for text analysis because it does not assume independence of terms; in future applications, this would allow the use of bigrams and phrases in modeling without the possibility of overlapping or double counting words that often appear together such as “World Health Organization”.³⁴

Data processing, statistical analyses and text classification were conducted using the MaxEnt package (v1.3.3.1) for R statistical software (v2.15.1). See Appendix 3c for R code implementing these procedures.

4) Validating the Model

To assess the model's internal validity, a test set of 200 news records was randomly drawn from the corpus of retrieved news records (excluding those in the training set) and classified independently by two RAs and the maximum entropy model, first for relevance and then for scientific quality and sensationalism. The mean RA score for each relevant record in the test set was assumed to be "correct" and used as a benchmark against which the model's second-application classifications were judged. Two-rater Cohen's kappa, ICCs and two-way paired t-tests were calculated to assess the model's reliability. Accuracy was calculated based on the percentage of news records that the model classified the same as the two RAs.

Results

The optimized search protocols conducted 17-19 October 2013 on LexisNexis identified 89,846 news records mentioning SARS and 73,587 records mentioning H1N1, for a total of 163,433 records. RAs deemed 195 of the 500 training set records to be relevant. This means the LexisNexis searches yielded an estimated 63,739 news records that were actually focused on SARS or H1N1 for an estimated specificity of 39.0%.

The 195 relevant records in the training set had a mean overall scientific quality score of 3.17 and a mean overall sensationalism score of 1.81 with an overall Fleiss' kappa of 0.74 and ICC of 0.98, indicating substantial inter-rater reliability among RAs.³⁸⁻³⁹ Scores for specific dimensions of scientific quality ranged from 2.62 for validity ("not assessed or very misleading") to 4.66 for applicability ("minimal ambiguity"). Scores for sensationalism ranged from 1.20 for extolling to 1.73 for speculating (both indicating "minimal" presence of these illocutions).

Maximum entropy modeling of the 10,000 randomly selected news records provides revised aggregated estimates of scientific quality (total mean of overall score = 3.32, ranging from 2.54 for

validity to 4.83 for applicability) and sensationalism (total mean of overall score = 1.73, ranging from 1.09 for extolling to 1.88 for warning). This means the average news record had “critical or extensive shortcomings” in scientific quality with “not too much sensationalizing”.

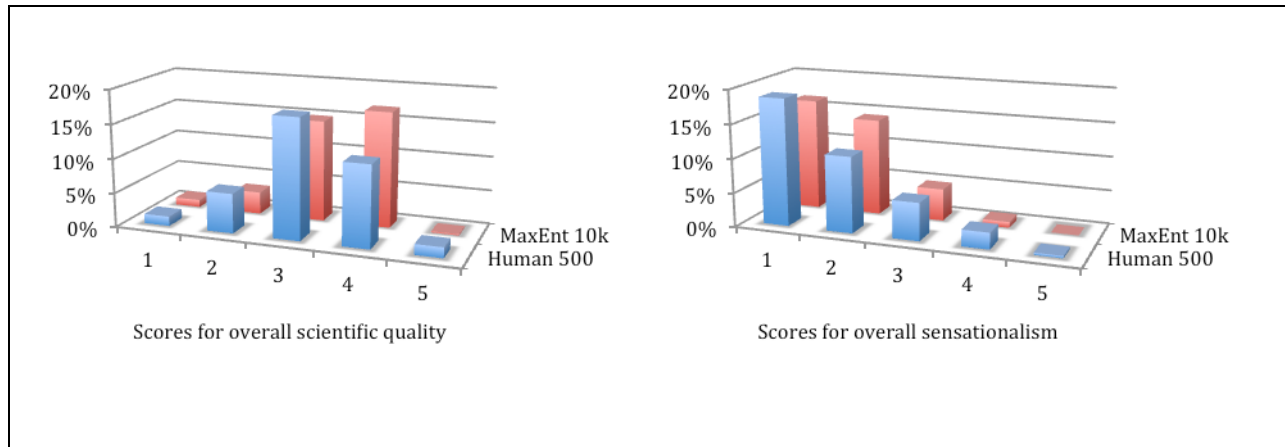
These records can also now be stratified at the individual record level for sub-group comparisons such as between records published about different pandemics; in this example, news coverage of the H1N1 pandemic was found to be statistically significantly better than the earlier SARS outbreak (two-sample t-test 95%CI for overall scientific quality score = [0.0982, 0.2083], $p < 0.0001$; for overall sensationalism score = [-0.3707, -0.2549], $p < 0.0001$). See Panel 3.3 and 3.4 for a summary of these results.

Panel 3.3: Summary of the Training and Maximum Entropy Modeling Exercises

		Training set (500 records)			MaxEnt model (10,000 records)				
		<i>Human mean</i>	<i>Fleiss' kappa</i>	<i>ICC statistic</i>	<i>Total mean</i>	<i>SARS mean</i>	<i>H1N1 mean</i>	<i>2-sample t-test 95%CI</i>	<i>t-test's p-value</i>
	relevance	195/500	1.00	1.00	3625/10k	1101/5192	2524/4808	[0.2949, 0.3309]	<0.0001*
Scientific quality	applicability	4.66	0.82	0.99	4.83	4.81	4.84	[0.0064, 0.0633]	0.0165*
	opinion vs fact	3.32	0.66	0.97	3.31	3.15	3.38	[0.1478, 0.3125]	<0.0001*
	validity	2.62	0.58	0.95	2.54	2.48	2.57	[0.0382, 0.1267]	0.0003*
	precision	3.28	0.63	0.98	3.44	3.62	3.36	[-0.3126, -0.1982]	<0.0001*
	context	3.25	0.64	0.98	3.40	3.55	3.34	[-0.2683, -0.1548]	<0.0001*
	overall	3.17	0.84	0.99	3.32	3.22	3.32	[0.0982, 0.2083]	<0.0001*
Sensationalism	exposing	1.66	0.79	0.96	1.30	1.46	1.23	[-0.2903, -0.1694]	<0.0001*
	speculating	1.73	0.66	0.95	1.70	1.83	1.64	[-0.2556, -0.1279]	<0.0001*
	generalizing	1.54	0.79	0.95	1.33	1.40	1.29	[-0.1636, -0.0584]	<0.0001*
	warning	1.73	0.68	0.96	1.88	2.13	1.78	[-0.4199, -0.2758]	<0.0001*
	extolling	1.20	0.83	0.94	1.09	1.15	1.06	[-0.1211, -0.0590]	<0.0001*
	overall	1.81	0.68	0.97	1.73	1.94	1.63	[-0.3707, -0.2549]	<0.0001*
	Overall	2.50	0.74	0.98	2.49	2.56	2.45	[-0.1318, -0.0765]	<0.0001*

Note: ICC = intraclass correlation coefficient; 10k = 10,000; SARS = Severe Acute Respiratory Syndrome (2003-2004); H1N1 = Influenza A subtype H1N1 (2009-2010); 95%CI = 95% confidence interval for estimated difference between SARS and H1N1 means.

Panel 3.4: Histograms of Scores from Training Set (500 Records) and Maximum Entropy Model (10,000 Records)



The histograms exclude those cases that were deemed irrelevant to either the SARS or H1N1 pandemics in the first screening.

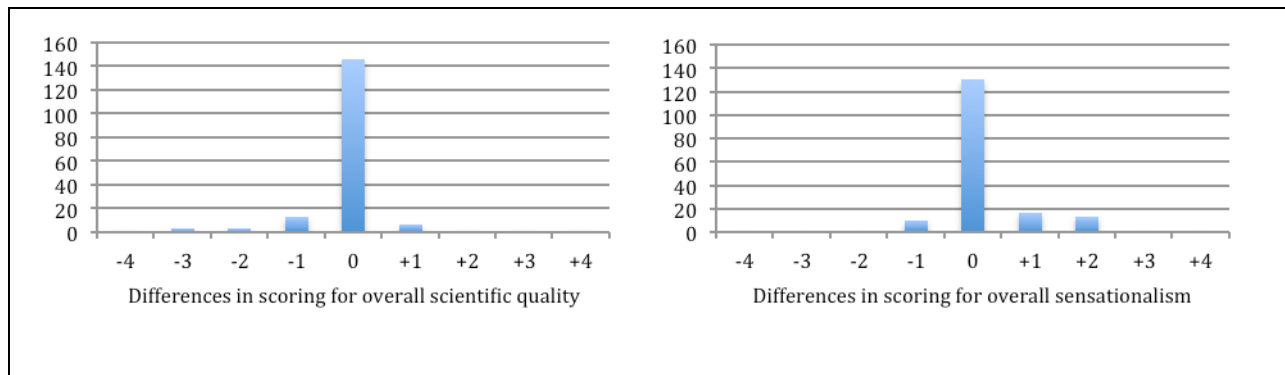
The model performed well in the validation exercise. In the first application, the model determined relevance with 86% accuracy – which means the model and RAs nearly always agreed on whether news records in the test set were about pandemics or not. In the second application, overall scientific quality was scored accurately 65% of the time (or 78% if allowing ± 1 deviations on the five-point scale). The model's overall sensationalism scoring was 73% accurate (or 82% if allowing ± 1 deviations). These statistics indicate substantial agreement between the human and MaxEnt scoring for scientific quality and sensationalism.³⁹ Notwithstanding errors, population-wide estimates from the model should be unbiased given the histogram of misclassifications appear to be equally biased upwards and downwards. See Panel 3.5 and 3.6 for a summary of these results.

Panel 3.5: Summary of the Validation Exercises

		Validation test set (200 records)					
		Human mean	Computer mean	Cohen's kappa	ICC statistic	Accuracy ±0	Accuracy ±1
	relevance	65/200	74/200	0.68	0.81	86%	NA
Scientific quality	applicability	2.89	4.73	0.56	0.75	61%	70%
	opinion vs fact	3.54	3.20	0.72	0.84	74%	82%
	validity	1.40	2.62	0.48	0.69	60%	73%
	precision	2.40	3.54	0.60	0.77	65%	74%
	context	2.75	3.15	0.66	0.80	68%	77%
	overall	2.55	3.16	0.66	0.81	65%	78%
Sensationalism	exposing	1.88	1.45	0.54	0.70	72%	79%
	speculating	2.11	1.84	0.43	0.60	67%	76%
	generalizing	1.40	1.43	0.45	0.62	74%	81%
	warning	2.37	1.66	0.53	0.70	68%	76%
	extolling	1.09	1.09	0.58	0.74	81%	84%
	overall	2.06	1.66	0.47	0.64	73%	82%
	Overall	2.20	2.46	0.60	0.76	69%	78%

All Cohen's kappa and ICC statistics in the validation exercise had p-values well below 0.00001 indicating the high values of these statistics should not be due to chance. The scientific quality and sensationalism accuracy percentages carried forward the inaccuracies of the relevance screening which means they represent overall accuracy percentages measuring error in both applications. ICC = intraclass correlation coefficient; NA = Not applicable.

Panel 3.6: Histograms of Differences in MaxEnt Scores to Human Scores in the Validation Test Set (200 Records)



Counts exclude the 29 cases (14%) where the human scorers and MaxEnt model disagreed on the article's relevance to either the SARS or H1N1 pandemics in the first screening.

Discussion

Principal Findings

A new method for quantitatively evaluating the relevance, scientific quality and sensationalism of individual news records was developed and successfully modeled, applied and validated on a huge

corpus of 163,433 news records mentioning two pandemic outbreaks. Analyses confirmed that news media coverage of pandemics is far from perfect, especially its scientific quality if not also its sensationalism. Slight improvements were observed between the SARS and H1N1 pandemics. Possible explanations for this improvement include the media learning from experience with the first pandemic and/or better crisis communications from public health authorities throughout the second pandemic. It could also be a reaction to the 2005 revision of the *International Health Regulations*.

Strengths and Limitations

This study has several strengths compared to previous work in news media analysis on which it builds. First, it drew from over *15,000 sources* of news records. Second, it used *pilot tests* to optimize searches for maximal sensitivity. Third, it drew on *existing tools* – an empirically validated index and rich pragma-linguistic framework – when developing new metrics for quantitatively measuring news records' scientific quality and sensationalism. Fourth, the study assessed records from a *massive corpus* of 163,433 news records (instead of just a small sample feasible for human scoring) utilizing recent advances in machine learning methods and computing power. This means that population-wide estimates incorporate more information from more sources and that detailed sub-group analyses are theoretically possible given most-likely scores are available at the individual-record-level. Fifth, the study incorporated a *relevance screening* into the modeling procedures to boost specificity. Sixth, there were *multiple RAs* scoring the training and test set records to reduce human errors and biases. Seventh, the study *validated* the approach and measured its reliability and accuracy. Overall, the study showed that automated methods can quantify characteristics of news records *faster* (i.e., within seconds), *cheaper* (i.e., fewer human resources) and possibly *better* than humans (i.e., avoiding silly mistakes and rater drift), and that the specific procedure implemented here can at the very least identify subsets of news records that are far more likely to have particular scientific and discursive qualities.

This study also has several limitations. First, it has all the *usual pitfalls* of automated text classification, including its many assumptions and simplifications.¹⁷ Second, its maximum entropy model *leaves information* on the table by relying on a multinomial regression that treats the scientific quality and sensationalism scores as nominal rather than ordinal data. Third, it required a *substantial initial investment* of human resources to score the training and test sets. Fourth, the final model was *not perfectly accurate* with classification errors compounded across two applications. Fifth, the performance of this particular machine-learning approach was *not compared* to others.

Future Research Directions

The sub-optimal news media coverage of pandemics that was confirmed in this study emphasizes the need to further research this problem and identify prospects for amelioration. Also needed are advances in the imperfect methods and metrics for making these assessments.

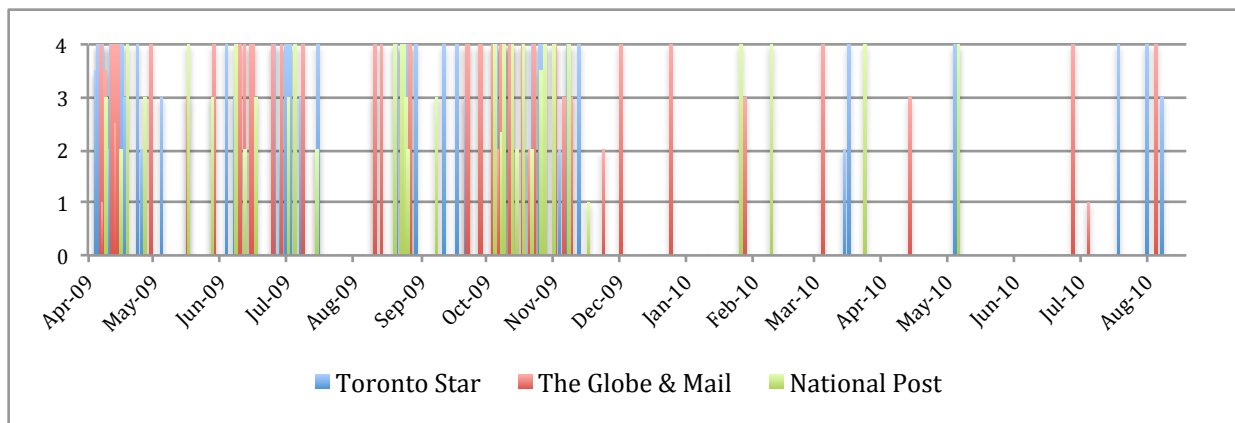
Specifically, the ability to automatically score individual news records for their scientific quality and sensationalism should be applied to track changes, make comparisons, identify outliers, find correlations and evaluate interventions. This could include, for example, constructing day-by-day time series of these characteristics that could be stratified to compare countries, rank news media organizations, or even judge individual journalists (see Panel 3.7 and 3.8). Publishing rankings comparing news media organizations or journalists could encourage them to compete on quality and enhance their reporting practices. These data could also help find factors broadly associated with better news coverage (e.g., record length, readership, political affiliation) or predictive of rapid changes in scientific quality and sensationalism (e.g., new event, major announcement, public scolding of news media). Record-level data can also be used for rigorous impact evaluations such as quasi-experimental interrupted time-series analyses of interventions aimed at improving news media coverage. The feasibility of real-time analysis of news media coverage on emerging pandemics should also be explored.

Panel 3.7: Ranking News Media Organizations by the Scientific Quality of their Pandemic Coverage

<i>Rank</i>	<i>Organization</i>	<i>Country</i>	<i>Number of articles</i>	<i>Overall scientific quality</i>	<i>Overall sensationalism</i>
1.	The Scotsman	UK	55	3.64	1.89
2.	Midland Independent Newspapers	UK	65	3.52	1.58
3.	AllAfrica	Multiple	112	3.44	1.75
4.	The Liverpool Daily Post & Echo	UK	51	3.41	1.43
5.	New Straits Times Press	Malaysia	112	3.37	1.63
6.	The New York Times	USA	100	3.35	1.71
7.	The Globe and Mail	Canada	110	3.34	1.98
8.	The Times	UK	116	3.32	1.91
9.	Guardian	UK	59	3.31	2.17
10.	Express Newspapers	UK	91	3.30	1.64
11.	Singapore Press	Singapore	58	3.29	1.76
12.	The Australian	Australia	390	3.29	1.63
13.	BBC	UK	418	3.29	1.30
14.	The Washington Post	USA	87	3.28	1.89
15.	South China Morning Post	China	208	3.27	1.95
16.	National Post	Canada	111	3.26	1.80
17.	The Sun/The News of the World	UK	108	3.24	1.69
18.	Toronto Star	Canada	155	3.23	1.98
19.	The Irish Times	Ireland	55	3.22	1.87
20.	The Daily Mirror	UK	102	3.09	1.70

This panel includes all news record sources for which there were more than 50 relevant news records.

Panel 3.8: Average Daily Scores of News Records' Overall Scientific Quality during the H1N1 Pandemic Period among the Three Canadian Newspapers with More Than 50 Relevant Records



Another opportunity for future research is to improve automated methods of quantitatively measuring the scientific quality and sensationalism of news records as well as other characteristics of other qualitative texts. All automated text classification methods use necessarily wrong models of text designed to help draw inferences from data; this means that diverse methods should be explored for assessing news records and their merit evaluated according to how well they perform specific tasks, especially since more realistic or sophisticated models do not always offer better performance.¹⁷ Methodological advances that improve models' accuracy and applicability to out-of-sample records would allow researchers to make more helpful inferences with fewer resources.

Conclusion

News media coverage of emerging pandemics is not as good as it should be. Developing new methods for automatically quantifying characteristics of news media coverage is an important step towards improving it. These methods represent an exciting frontier in public health research and news media analysis because they can help detect performance gaps, identify problems, develop solutions, evaluate interventions and hold news organizations accountable for their health reporting.

References

1. World Health Organization (2004) World is ill-prepared for “inevitable” flu pandemic. *Bulletin of the World Health Organization* 82: 317-318.
2. World Bank (2006) *Global Development Finance: The Development Potential of Surging Capital Flows*. Washington DC: World Bank.
3. United Nations (2005) Press Release: Press conference by UN System Senior Coordinator for Avian, Human Influenza. 29 September. [cited 2015 Aug 11]; Available from: http://www.un.org/News/briefings/docs/2005/050929_Nabarro.doc.htm.
4. World Health Organization (2015) *Ebola Situation Report – 17 June 2015*. Geneva: World Health Organization. [cited 2015 Aug 11]; Available from: <http://apps.who.int/ebola/current-situation/ebola-situation-report-17-june-2015>.
5. Gale J. Flu pandemic may cost world economy up to \$3 trillion. Bloomberg [Internet]. 2008 Oct 17. [cited 2015 Aug 11]; Available from: www.bloomberg.com/apps/news?pid=20601202&sid=ashmCPWATNwU&refer=healthcare.
6. Hoffman SJ (2010) The evolution, etiology and eventualities of the global health security regime. *Health Policy and Planning* 25(6): 510-522.
7. Naylor D, Basrur S, Bergeron MG, Brunham RC, Butler-Jones D, Dafoe G, et al. (2003) *Learning from SARS: Renewal of Public Health in Canada: A Report of the National Advisory Committee on SARS and Public Health*. Ottawa: Health Canada. [cited 2015 Aug 11]; Available from: <http://www.phac-aspc.gc.ca/publicat/sars-sras/pdf/sars-e.pdf>.
8. Grilli R, Ramsay C, Minozzi S (2002) Mass media interventions: effects on health services utilisation. *Cochrane Database of Systematic Reviews* (1): 1-35.
9. World Health Organization (2007) *World Health Report 2007: A Safer Future: Global Public Health Security in the 21st Century*. Geneva: World Health Organization.
10. Laing A (2011) The H1N1 crisis: roles played by government communicators, the public and the media. *Journal of Professional Communication* 1(1): 123-149.
11. Reissman DB, Watson PJ, Klomp RW, Tanielian TL, Prior SD (2006) Pandemic influenza preparedness: adaptive responses to an evolving challenge. *Journal of Homeland Security and Emergency Management* 3(2): 13.
12. Institute of Medicine (2001) *Crossing the Quality Chasm: A New Health System for the 21st Century*. Washington DC: National Academy Press.
13. Otten AL (1992) The influence of the mass media on health policy. *Health Affairs* 11(4): 111.
14. Oxman AD, Guyatt GH (1991) Validation of an index of the quality of review articles. *Journal of Clinical Epidemiology* 44(11): 1271-1278.

15. Molek-Kozakowska K (2013) Towards a pragma-linguistic framework for the study of sensationalism in news headlines. *Discourse & Communication* 7(2): 173-197. doi:10.1177/1750481312471668.
16. Hopkins D, King G (2010) A method of automated nonparametric content analysis for social science. *American Journal of Political Science* 54(1): 229-247.
17. Grimmer J, Stewart BM (2013) Text as data: the promise and pitfalls of automatic content analysis methods for political texts. *Political Analysis* 21: 267-297. doi:10.1093/pan/mps028.
18. Brownsword R (2005) Code, control, and choice: why East is East and West is West. *Legal Studies* 25(1): 1-21.
19. LexisNexis (2014) LexisNexis Academic. [cited 2015 Aug 11]; Available from: <http://www.lexisnexis.com/en-us/products/lexisnexis-academic.page>.
20. Oxman AD, Guyatt GH, Cook DJ, Jaeschke R, Heddle N, Keller J (1993) An index of scientific quality for health reports in the lay press. *Journal of Clinical Epidemiology* 46(9): 987-1001.
21. Soot LC, Moneta GL, & Edwards JM (1999) Vascular surgery and the Internet: a poor source of patient-oriented information. *Journal of Vascular Surgery* 30(1): 84-91.
22. Charnock D, Shepperd S, Needham G, & Gann R (1999) DISCERN: an instrument for judging the quality of written consumer health information on treatment choices. *Journal of Epidemiology and Community Health* 53(2): 105-111.
23. Eysenbach G, Powell J, Kuss O, Sa ER (2002) Empirical studies assessing the quality of health information for consumers on the world wide web: a systematic review. *JAMA* 287(20): 2691-2700.
24. Niederkrotenthaler T, Voracek M, Herberth A, Till B, Strauss M, Etzersdorfer E, et al. (2010) Role of media reports in completed and prevented suicide: Werther v. Papageno effects. *British Journal of Psychiatry* 197(3): 234-243.
25. Pirkis JE, Burges, PM, Francis C, Blood RW, Jolley DJ (2006) The relationship between media reporting of suicide and actual suicide in Australia. *Social Science & Medicine* 62(11): 2874-2886.
26. Swain KA (2007) Outrage factors and explanations in news coverage of the anthrax attacks. *Journalism & Mass Communication Quarterly* 84(2): 335-352.
27. Grabe ME, Zhou S, Barnett B (2001) Explicating sensationalism in television news: content and the bells and whistles of form. *Journal of Broadcasting & Electronic Media* 45(4): 635-655.
28. Vettehen PH, Nuijten K, Peeters A (2008) Explaining effects of sensationalism on liking of television news stories the role of emotional arousal. *Communication Research* 35(3): 319-338.
29. Tannenbaum PH & Lynch MD (1960) Sensationalism: the concept and its measurement. *Journalism & Mass Communication Quarterly* 37(3): 381-392.
30. Burgers C, de Graaf A (2013) Language intensity as a sensationalistic news feature: the influence of style on sensationalism perceptions and effects. *Communications* 38(2): 167-188.

31. Spratt M (2001) Science, journalism, and the construction of news: how print media framed the 1918 influenza pandemic. *American Journalism* 18(3): 61-79.
32. Jaynes ET (1957) Information theory and statistical mechanics. *Physical Review Series II* 106: 620-630.
33. Berger AL, Pietra VJD, Pietra SAD (1996) A maximum entropy approach to natural language processing. *Computational Linguistics* 22(1): 39-71.
34. Anjaria M, Guddeti RMR (2014) A novel sentiment analysis of social networks using supervised learning. *Social Network Analysis and Mining* 4(1): 1-15.
35. Malouf R (2002) A comparison of algorithms for maximum entropy parameter estimation. COLING-02: The 6th Conference on Natural Language Learning 2002 (CoNLL-2002). [cited 2015 Aug 11]; Available from: <http://aclweb.org/anthology/W/W02/W02-2018.pdf>.
36. Mount J (2011) The equivalence of logistic regression and maximum entropy models. [cited 2015 Aug 11]; Available from: <http://www.win-vector.com/dfiles/LogisticRegressionMaxEnt.pdf>.
37. Qian M (2013) The Equivalence of Logistic Regression and Maximum Entropy Modeling. [cited 2015 Aug 11]; Available from: <http://web.engr.illinois.edu/~mqian2/upload/research/notes/The%20Equivalence%20of%20Logistic%20Regression%20and%20Maximum%20Entropy%20Modeling.pdf>.
38. Fleiss, JL (1971) Measuring nominal scale agreement among many raters. *Psychological Bulletin* 76: 378-382.
39. Landis JR, Koch GG (1977) The measurement of observer agreement for categorical data. *Biometrics* 33: 159-174.

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Appendix 1: Summaries of 90 Quantitative Evaluations of International Treaties

Panel A1.1: Summaries of 31 Quantitative Evaluations of International Human Rights Law

Studies	Questions	Methods	Findings	Authors' Conclusions
<p>1. Keith LC (1999) The United Nations International Covenant on Civil and Political Rights: Does It Make a Difference in Human Rights Behavior? <i>Journal of Peace Research</i> 36: 95-118. [PS]</p>	<ul style="list-style-type: none"> Does ratifying the UN International Covenant on Civil and Political Rights (ICCPR) change a state's human rights practices? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of several human rights indicators on 178 countries from 1976-1993. 	<ul style="list-style-type: none"> Ratifying the ICCPR was not associated with a state's human rights practices. 	<ul style="list-style-type: none"> Committing to the ICCPR does not have a significant impact on a state's human rights behavior.
<p>2. Hathaway OA (2002) Do Human Rights Treaties Make a Difference? <i>Yale Law Journal</i> 111: 1935-2042. [Law]</p>	<ul style="list-style-type: none"> Do human rights practices differ between states that ratified certain human rights treaties and those that did not? Is treaty ratification responsible for the differences? 	<ul style="list-style-type: none"> Times-series cross-sectional analysis of several human rights indicators on 166 countries from 1960-1999. 	<ul style="list-style-type: none"> States that have ratified treaties on average had better human rights practices (e.g., genocide, torture, fair trial, civil liberties, women's political equality). A similar proportion of states with low human rights ratings have ratified treaties compared to states with high ratings. Treaty ratification was not associated with improved human rights practices, and was often associated with worse practices. 	<ul style="list-style-type: none"> States that ratify treaties generally have better human rights practices than those that do not, but not necessarily as a result of treaty ratification. States that ratify treaties are not more likely and often less likely to comply with a treaty's obligations compared to states that do not, indicating that treaty ratification alone is not effective in improving human rights practices.

Panel A1.1: Summaries of 31 Quantitative Evaluations of International Human Rights Law (Continued)

Studies	Questions	Methods	Findings	Authors' Conclusions
3. Hafner-Burton EM, Tsutsui K (2005) Human Rights in a Globalizing World: The Paradox of Empty Promises. <i>American Journal of Sociology</i> 110: 1373-1411. [PS]	<ul style="list-style-type: none"> Does treaty ratification and having a strong civil society affect a state's human rights behavior? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of several human rights indicators on 153 countries from 1976-1999. 	<ul style="list-style-type: none"> Ratifying human rights treaties was associated with worse human rights practices. High citizen involvement in international non-governmental organizations (INGOs) was associated with better human rights practices. 	<ul style="list-style-type: none"> Committing to human rights treaties does not improve a state's human rights practices. Global civil society activities in a country can improve that state's human rights practices.
4. Neumayer E (2005) Do International Human Rights Treaties Improve Respect for Human Rights? <i>Journal of Conflict Resolution</i> 49: 925-953. [Development]	<ul style="list-style-type: none"> Do international human rights treaties improve a state's human rights practices? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of civil rights data on 172 countries from 1972-2001, and personal integrity rights data on 189 countries from 1980-2001. 	<ul style="list-style-type: none"> Treaty ratification was associated with improved human rights practices in states with democratic governments and high citizen participation in INGOs. 	<ul style="list-style-type: none"> States with democratic governments and an engaged civil society are more likely to experience improvements in human rights by ratifying relevant treaties.

Panel A1.1: Summaries of 31 Quantitative Evaluations of International Human Rights Law (Continued)

Studies	Questions	Methods	Findings	Authors' Conclusions
5. Abouharb R, Cingranelli D (2007) <i>Human Rights and Structural Adjustment</i> . Cambridge: Cambridge University Press. 292 p. [PS]	<ul style="list-style-type: none"> Does entering World Bank and International Monetary Fund structural adjustment agreements (SAAs) affect a state's human rights protections? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of several human rights indicators on 131 developing countries between 1981-2003. 	<ul style="list-style-type: none"> Entering SAAs was associated with lower government respect for economic and social, physical integrity and worker rights. Entering SAAs was associated with higher probability of rebellion, prevalence of riots and rebellion, and government respect for procedural democratic rights. 	<ul style="list-style-type: none"> Compliance with structural adjustment conditions lessens the targeted governments' respect for human rights practices, explaining why SAAs are not producing strong economic outcomes. Structural adjustment can positively impact human rights practices by promoting democracy, but this effect may not be meaningful.
6. Cardenas S (2007) <i>Conflict and Compliance: State Responses to International Human Rights Pressure</i> . Philadelphia: University of Pennsylvania Press. 188 p. [PS]	<ul style="list-style-type: none"> Do international human rights pressures influence a state's ratification of and compliance with human rights treaties? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of states' human rights practices and treaty ratification data on 172 countries from 1992-1996. 	<ul style="list-style-type: none"> International human rights pressures were not associated with human rights practices, but were associated with increased ratification in countries without a national security threat, where norm violations threaten elites' economic interests, and where pro-human rights groups have public support. 	<ul style="list-style-type: none"> International human rights pressures directly promote commitment to human rights treaties for certain countries, which could indirectly improve human rights practices.
7. Hafner-Burton EM, Tsutsui K (2007) <i>Justice Lost! The Failure of International Human Rights Law to Matter Where Needed Most</i> . <i>Journal of Peace Research</i> 44: 407-425. [PS]	<ul style="list-style-type: none"> Do international human rights laws have any effect on the states that need to improve the most? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of repression data on 182 countries from 1976-2003. 	<ul style="list-style-type: none"> Repressive states that ratified the CAT or ICCPR did not change their practices after one year, nor did they implement reforms in the 15 years after commitment even if they were democratic or had strong civil society. 	<ul style="list-style-type: none"> International human rights laws are ineffective in improving the behaviors of states that require the most change – repressive countries whose governments participate in or allow violations.

Panel A1.1: Summaries of 31 Quantitative Evaluations of International Human Rights Law (Continued)

Studies	Questions	Methods	Findings	Authors' Conclusions
8. Gilligan MJ, Nesbitt NH (2009) Do Norms Reduce Torture? <i>Journal of Legal Studies</i> 38: 445-470. [PS]	<ul style="list-style-type: none"> Do international anti-torture norms reduce a state's levels of torture? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis using torture prevalence data from 1985-2003. 	<ul style="list-style-type: none"> Ratification of the UN Convention Against Torture (CAT) was not associated with lower torture levels; in certain analyses, it was associated with more torture. 	<ul style="list-style-type: none"> International anti-torture norms do not reduce a state's torture practices.
9. Palmer A, Tomkinson J, Phung C, Ford N, Joffres M, Fernandes KA, Zeng L, Lima V, Montaner JSG, Guyatt GH, Mills EJ (2009) Does Ratification of Human-Rights Treaties Have Effects on Population Health? <i>The Lancet</i> 373: 1987-1992. [Public Health]	<ul style="list-style-type: none"> Does ratification of human rights treaties affect population health and social well-being? 	<ul style="list-style-type: none"> Cross-sectional analysis using health and social indicators on 170 countries from 2008 (for level of indicators) and from treaty ratification to 2008 (for change in indicator level). 	<ul style="list-style-type: none"> Increased ratification of human rights treaties was not associated with any indicators of health and social status. Treaty ratification did not change the values of states' health and social indicators. 	<ul style="list-style-type: none"> Ratification of international human rights treaties does not improve health and social outcomes for a state's population.
10. Powell EJ, Staton JK (2009) Domestic Judicial Institutions and Human Rights Treaty Violation. <i>International Studies Quarterly</i> 53: 149-174. [PS]	<ul style="list-style-type: none"> Does a state's judicial effectiveness affect the joint probability of ratifying the CAT and violating its statutes? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of CAT ratification and torture data on 195 countries from 1987-2000. 	<ul style="list-style-type: none"> Increased judicial effectiveness was associated with a lower joint probability of ratifying and torturing. Decreased judicial effectiveness was associated with a higher probability of torturing but not strongly associated with the probability of ratifying. 	<ul style="list-style-type: none"> States with strong domestic legal enforcement are less likely to ratify the CAT but more likely to comply if adopted. States with weak enforcement are more likely to ratify but less likely to comply if adopted.

Panel A1.1: Summaries of 31 Quantitative Evaluations of International Human Rights Law (Continued)

Studies	Questions	Methods	Findings	Authors' Conclusions
11. Simmons BA (2009) <i>Civil Rights in International Law: Compliance with Aspects of the "International Bill of Rights"</i> . <i>Indiana Journal of Global Legal Studies</i> 16: 437-481. [PS]	<ul style="list-style-type: none"> Do international laws of civil rights affect states' domestic practices? Under what conditions do such laws have an effect? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of civil liberties data on 143 countries from 1972-2002, religious freedom data on 195 countries from 1981-2004, and trial fairness data on 140 countries from 1982-2002. 	<ul style="list-style-type: none"> Ratifying the ICCPR was weakly associated with improved civil liberties after five years, reduced government restrictions on religious freedoms (strongest in transitional countries), and improved fair trial practices (only in transitional countries). 	<ul style="list-style-type: none"> The ICCPR has had a positive effect on civil rights practices, particularly in states transitioning between autocracy and democracy, in which citizens are able and motivated to mobilize and government practices can be readily monitored.
12. Simmons BA (2009) <i>Mobilizing for Human Rights: International Law in Domestic Politics</i> . Cambridge: Cambridge University Press. 472 p. [PS]	<ul style="list-style-type: none"> Do the six key international human rights treaties (e.g., ICCPR, ICESCR, CERD, CEDAW, CAT and CRC) affect a state's political behavior? Under which conditions do they have an effect? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of several human rights indicators on 173 countries from 1966-2005. 	<ul style="list-style-type: none"> Adoption of international human rights treaties was associated with better human rights outcomes (e.g., ICCPR improved religious freedom and fair trial practices), but only for certain governments that make such commitments. 	<ul style="list-style-type: none"> International human rights treaties have the largest positive impact on states in transition between democracy and autocracy. In transitional states, domestic actors have the means and the motive to mobilize for treaty implementation.

Panel A1.1: Summaries of 31 Quantitative Evaluations of International Human Rights Law (Continued)

Studies	Questions	Methods	Findings	Authors' Conclusions
13. Simmons BA (2009) Should States Ratify Protocol? Process and Consequences of the Optional Protocol of the ICESCR. <i>Norwegian Journal of Human Rights</i> 27: 64-81. [PS]	<ul style="list-style-type: none"> • What effects did the ICCPR's Optional Protocol (which allows for individual complaints of treaty violations) have on states' human rights behavior? • What can we predict about the ICESCR's Optional Protocol from this experience? 	<ul style="list-style-type: none"> • Time-series cross-sectional analysis of civil liberties data on 128 countries. • Cox proportionate hazard model of ratification data on the optional protocols of four treaties for 149 countries. 	<ul style="list-style-type: none"> • Ratifying ICCPR's Optional Protocol was weakly associated with an improvement in civil liberties. • High regional ratification of the optional protocols of ICCPR, CERD and CAT were strong predictors of ratification. 	<ul style="list-style-type: none"> • The Optional Protocol of the ICCPR achieved modest positive impact on civil liberties. • Ratifying the ICESCR's Optional Protocol may achieve similar effects and encourage other countries to follow.
14. Basch F, Filippini L, Laya A, Nino M, Rossi F, Schreiber B (2010) The Effectiveness of the Inter-American System of Human Rights Protection: A Quantitative Approach to it Functioning and Compliance with its Decisions. <i>Sur - International Journal on Human Rights</i> 7: 9-35. [Law]	<ul style="list-style-type: none"> • Do states follow the decisions of the Inter-American System of Human Rights Protection (IASHPR), which is composed of the Inter-American Commission on Human Rights and the Inter-American Court of Human Rights (IACHR)? 	<ul style="list-style-type: none"> • Descriptive statistics of data on compliance with 462 remedies adopted by the IAHSPP from 2001-2006 in 19 countries. 	<ul style="list-style-type: none"> • Non-compliance was observed for 50% of the IAHSPP's remedies, partial compliance for 14%, and total compliance for 36%. • Remedies involving monetary reparations and/or agreed upon in friendly settlements had the highest rates of total compliance. • On average, states took 2 years and 7 months to comply with Commission recommendations, and 1 year and 8 months to comply with IACHR rulings. 	<ul style="list-style-type: none"> • States commonly show non-compliance with measures required by the IAHSPP, and total compliance occurs only after a long time period. • Friendly settlements are more effective than report recommendations and court rulings.

Panel A1.1: Summaries of 31 Quantitative Evaluations of International Human Rights Law (Continued)

Studies	Questions	Methods	Findings	Authors' Conclusions
15. Greenhill B (2010) <i>The Company You Keep: International Socialization and the Diffusion of Human Rights Norms. International Studies Quarterly</i> 54: 127-145. [PS]	<ul style="list-style-type: none"> Does membership in intergovernmental organizations (IGOs) influence a state's human rights behavior? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of data on personal and physical integrity in 137 countries from 1982-2000. 	<ul style="list-style-type: none"> States' human rights performance was associated with the human rights performance of states with membership in the same IGOs. 	<ul style="list-style-type: none"> IGOs can have a strong influence on a state's human rights behavior by providing a forum for human rights norms to be transmitted between member states.
16. Hawkins D, Jacoby W (2010) <i>Partial Compliance: A Comparison of the European and Inter-American Courts of Human Rights. Journal of International Law and International Relations</i> 6: 35-85. [PS]	<ul style="list-style-type: none"> To what extent do states comply with the rulings of the IACHR and the European Court of Human Rights (ECtHR)? 	<ul style="list-style-type: none"> Descriptive statistics of compliance data on 81 IACHR cases from 1989-2008 and 90 ECtHR cases from 2007-2009. 	<ul style="list-style-type: none"> Partial compliance was found in 83% of the IACHR cases and 94% of the ECtHR cases. For the IACHR, compliance was highest for orders to pay trial costs and expenses, moral damages and material damages, and to apologize, and lowest for orders to punish perpetrators, restore rights to violated individuals, and alter domestic laws. For many ECtHR cases, only partial compliance persisted for years despite monitoring. 	<ul style="list-style-type: none"> Partial compliance appears to be a common outcome of international rulings. States are more likely to respond to court orders when the associated costs are low. Partial compliance may be a relatively stable long-term outcome of international rulings rather than a transition towards full compliance.

Panel A1.1: Summaries of 31 Quantitative Evaluations of International Human Rights Law (Continued)

Studies	Questions	Methods	Findings	Authors' Conclusions
17. Hill Jr DW (2010) Estimating the Effects of Human Rights Treaties on State Behavior. <i>The Journal of Politics</i> 72: 1161-1174. [PS]	<ul style="list-style-type: none"> Do three core UN human rights treaties (i.e., ICCPR, CAT and CEDAW) affect states' human rights practices? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of data on personal integrity rights, women's rights and torture practices in 165 countries from 1976-2006 using coarsened exact matching for non-random selection into treaty ratification. 	<ul style="list-style-type: none"> Ratifying the ICCPR was associated with lower respect for personal integrity rights. Ratifying the CAT was associated with worse torture practices. Ratifying the CEDAW was associated with higher respect for women's political rights. 	<ul style="list-style-type: none"> The ICCPR and CAT have had negative effects on states' personal integrity rights and torture practices, respectively. The CEDAW has had positive effects on states' observance of women's political rights.
18. Kim H, Sikkink K (2010) Explaining the Deterrence Effect of Human Rights Prosecutions for Transitional Countries. <i>International Studies Quarterly</i> 54: 939-963. [PS]	<ul style="list-style-type: none"> Do domestic and international prosecutions of human rights violations and truth commissions affect future levels of human rights repression in transitional states? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of several human rights indicators on 100 transitional countries from 1980-2004. 	<ul style="list-style-type: none"> Prosecutions and truth commissions were associated with lower levels of repression, even for states undergoing civil conflict. Prosecutions in a state's neighbours are associated with less repression in that state. 	<ul style="list-style-type: none"> Prosecutions of international human rights and truth commissions can be an important tool in deterring human rights violations.

Panel A1.1: Summaries of 31 Quantitative Evaluations of International Human Rights Law (Continued)

Studies	Questions	Methods	Findings	Authors' Conclusions
19. Cole W (2011) <i>Individuals v. States: An Analysis of Human Rights Committee Rulings, 1979-2007</i> . [Working Paper]. Montana State University. [PS]	<ul style="list-style-type: none"> • What types of individual abuse claims filed under the ICCPR's Optional Protocol have been most successful? 	<ul style="list-style-type: none"> • Time-series cross-sectional analysis of Human Rights Committee (HRC) rulings on 54 countries from 1979-2007. 	<ul style="list-style-type: none"> • Due process and personal liberty claims were more likely to be ruled as violations. • Suffrage and family rights claims were more likely to be ruled as non-violations. • Discrimination claims were equally likely to be ruled as violations or non-violations. • States undergoing political liberalization were more likely to be ruled against and less likely to be exonerated. • High GDP states were more likely to be exonerated and less likely to be ruled against. 	<ul style="list-style-type: none"> • The HRC shows a bias favouring claimants for due process and personal liberty abuse claims. • The HRC shows a bias favouring state defendants for suffrage and family rights abuse claims. • Democratizing states are found in violation more and exonerated less, while the opposite was true for affluent countries.
20. Hollyer JR, Rosendorff PB (2011) <i>Why Do Authoritarian Regimes Sign the Convention Against Torture? Signaling, Domestic Politics and Non-Compliance</i> . <i>Quarterly Journal of Political Science</i> 6: 275-327. [PS]	<ul style="list-style-type: none"> • Does ratifying the CAT alter an autocracy's torture practices? 	<ul style="list-style-type: none"> • Time-series cross-sectional analysis of torture data on 129 authoritarian regimes from 1985-1996, and civil war fatality data from 1946-2005 for battles with at least 25 fatalities. 	<ul style="list-style-type: none"> • Ratifying the CAT was weakly associated with lower levels of torture by autocracies. • Ratifying the CAT was associated with lower risk of regime collapse, number of fatalities in civil wars and regime instability. • Autocracies that ratified the CAT had worse torture practices prior to adoption than those that did not. 	<ul style="list-style-type: none"> • Autocracies with high levels of past torture are more likely to ratify the CAT and to slightly reduce their torture practices after ratification. • Autocratic regimes that adopt the CAT have longer tenures in office and experience less domestic opposition.

Panel A1.1: Summaries of 31 Quantitative Evaluations of International Human Rights Law (Continued)

Studies	Questions	Methods	Findings	Authors' Conclusions
21. Linos K (2011) Diffusion through Democracy. <i>American Journal of Political Science</i> 55: 678-695. [Law]	<ul style="list-style-type: none"> Do international norms influence states' decisions on family policy? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of family policy data on 18 OECD countries from 1970-1994. 	<ul style="list-style-type: none"> Sales of foreign newspapers, ratification of relevant International Labour Organization conventions and large INGO presence were all associated with longer maternity leave. 	<ul style="list-style-type: none"> Governments are likely to imitate the decisions of foreign states covered prominently in the news. Global norms, spread through international organizations, influence a states' domestic policy decisions.
22. Staton JK, Romero A (2011) Clarity and Compliance in the Inter-American Human Rights System. Presented at the International Political Science Association, Sao Paulo. [PS]	<ul style="list-style-type: none"> How does the clarity of remedies adopted by the IACHR influence state behavior? 	<ul style="list-style-type: none"> Cross-sectional analysis of clarity and compliance data on 183 remedies adopted by the IACHR from 2006-2009. 	<ul style="list-style-type: none"> Clarity of remedies is associated with a higher likelihood of state compliance with human rights standards. 	<ul style="list-style-type: none"> The IACHR can promote compliance with human rights standards and its remedies in cases of non-compliance, but only if obligations are clearly expressed.
23. Kim M, Boyle EH (2012) Neoliberalism, Transnational Education Norms, and Education Spending in the Developing World, 1983-2004. <i>Law & Social Inquiry</i> 37: 367-394. [Law]	<ul style="list-style-type: none"> Do SAAs and global educational norms affect a developing state's funding for education? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of education spending data on 87 developing countries from 1983-2004. 	<ul style="list-style-type: none"> Entering SAAs was not associated with a state's education spending. Participation in child-focused INGOs by a country's citizens and organizations was associated with greater education spending. 	<ul style="list-style-type: none"> Ratification of SAAs has little impact on a state's support for education. Child rights INGOs have a significant role in determining a state's education spending.

Panel A1.1: Summaries of 31 Quantitative Evaluations of International Human Rights Law (Continued)

Studies	Questions	Methods	Findings	Authors' Conclusions
24. Cole W (2013) Strong Walk and Cheap Talk: The Effect of the International Covenant of Economic, Social and Cultural Rights on Policies and Practices. <i>Social and Economic Rights in Law and Practice</i> 92(1): 165-194. [Law]	<ul style="list-style-type: none"> How does the ICESCR affect labour rights in law and practice, and affect the constitutionalization of socio-economic rights? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of Mosley's collective labour rights index scores from 1985-2002 using a two-way fixed-effects regression model Time-series cross-sectional analysis of developing countries that have constitutionalized actionable rights between 1977-2006 	<ul style="list-style-type: none"> Labor rights law increases with economic growth and democracy but decreases with population size. ICESCR membership has a positive effect on labor rights practices but a negative effect on labor rights laws ICESCR membership increases constitutionalization of labor rights in aspirational terms but not in justiciable terms Countries' decisions to ratify the ICESCR do not originate from existence of preexisting labor laws. 	<ul style="list-style-type: none"> Membership in the ICESCR worsened labor rights laws but improved labour rights practices. Treaty membership prompts countries to enact constitutional provisions regarding socioeconomic rights but only in aspirational terms.
25. Conrad CR, Ritter EH (2013) Treaties, Tenure, and Torture: The Conflicting Domestic Effects of International Law. <i>Journal of Politics</i> 75: 397-409. [PS]	<ul style="list-style-type: none"> Do international human rights treaties improve a state's human rights behavior, given that they both promote social mobilization (incentivizing torture) and enhance judicial effectiveness (disincentivizing torture)? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of torture data on 161 countries from 1990-2004 using a Heckman model for non-random selection into CAT ratification. 	<ul style="list-style-type: none"> For politically secure leaders, ratifying the CAT was associated with a lower likelihood of systemic torture. For politically insecure leaders, ratifying the CAT was not associated with likelihood of systemic torture. 	<ul style="list-style-type: none"> Authorities balance the pressures of human rights treaties differently based on their job security. Secure leaders reduce torture practices due to the increased effectiveness of domestic courts. Insecure leaders continue torture practices due to the destabilizing effects of greater public mobilization.

Panel A1.1: Summaries of 31 Quantitative Evaluations of International Human Rights Law (Continued)

Studies	Questions	Methods	Findings	Authors' Conclusions
26. Conrad CR (2014) Divergent Incentives for Dictators: Domestic Institutions and (International Promises Not to) Torture. <i>Journal of Conflict Resolution</i> 58(1): 34-67. [PS]	<ul style="list-style-type: none"> How do conflicting incentives from two domestic institutions (political opposition parties and an effective judiciary) influence states' commitment to and behavior under the CAT? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of CAT ratification and torture data on 116 dictatorships from 1984-1996. 	<ul style="list-style-type: none"> In dictatorships without an effective domestic judiciary, power sharing increased the likelihood of CAT ratification and torture; these effects decreased as judicial effectiveness increased. In dictatorships with power sharing, CAT ratification was not associated with the likelihood of torture when judicial effectiveness was low, but became associated with a higher likelihood of torture as judicial effectiveness increased. 	<ul style="list-style-type: none"> Political opposition parties motivate dictators to ratify the CAT and torture, but these incentives have less effect on states with effective judiciaries. Dictatorships facing power sharing opposition and effective judiciaries will only ratify the CAT when the costs of not ratifying outweigh those of being held accountable for CAT violations.
27. Lupu Y (2013a) Best Evidence: The Role of Information in Domestic Judicial Enforcement of International Human Rights Agreements. [Working Paper] University of California – San Diego. [PS]	<ul style="list-style-type: none"> Does enforcement of international law by domestic courts affect states' human rights practices? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of personal integrity rights and civil rights data on 168 countries from 1981-2007 using propensity score matching for non-random selection into treaty ratification. 	<ul style="list-style-type: none"> Ratifying the ICCPR was associated with higher government respect for freedoms of speech, association, assembly and religion. Ratifying the ICCPR was not associated with government respect for personal integrity rights. 	<ul style="list-style-type: none"> International laws such as the ICCPR are more effective when domestic courts can enforce them. Domestic courts can more easily enforce civil rights than personal integrity rights due to lower costs of producing evidence that civil rights were violated and lower standards of proof.

Panel A1.1: Summaries of 31 Quantitative Evaluations of International Human Rights Law (Continued)

Studies	Questions	Methods	Findings	Authors' Conclusions
28. Lupu Y (2013b) The Informative Power of Treaty Commitment: Using the Spatial Model to Address Selection Effects. <i>American Journal of Political Science</i> 57(4): 912-925. [PS]	<ul style="list-style-type: none"> Do states' treaty preferences influence their treaty commitments? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of CEDAW, CAT and ICCPR commitments and compliance from 1981-2007 using ideal-point estimation, propensity-score matching and ordered-probit modeling. 	<ul style="list-style-type: none"> CEDAW improves respect for women's political, economic and social rights. Ratification of CAT and ICCPR are not associated with lower torture rates or increases in personal integrity rights, respectively, after controlling for selection effects. 	<ul style="list-style-type: none"> CEDAW improved respect for women's rights. CAT and ICCPR have not had significant effects on human rights.
29. Neumayer E (2013) Do Governments Mean Business When They Derogate? Human Rights Violations During Declared States of Emergency. <i>Review of International Organizations</i> 8: 1-31. [Development]	<ul style="list-style-type: none"> Do ICCPR signatory states increase their violations in declared states of emergency, during which time they are allowed to derogate from certain human rights? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of data on various human rights and violations in 130 countries from 1981-2008 using a Heckman model for non-random selection into derogation. 	<ul style="list-style-type: none"> During states of emergency, autocracies were associated with increased violations of all derogable and non-derogable rights, anocracies were associated with increased violations of select derogable and non-derogable rights, and democracies were not associated with violations of either kind. 	<ul style="list-style-type: none"> Regime type determines whether the ICCPR can stop states from violating non-derogable rights. During states of emergency, democracies do not increase violations, while autocracies and some anocracies increase violations of even non-derogable rights.

Panel A1.1: Summaries of 31 Quantitative Evaluations of International Human Rights Law (Continued)

Studies	Questions	Methods	Findings	Authors' Conclusions
30. Putnam TL, Shapiro JN (2013) International Law and Voter Preferences: The Case of Foreign Human Rights Violations. [Working Paper] Columbia University. [PS]	<ul style="list-style-type: none"> Do international human rights laws influence public support for punishment of human rights violations? 	<ul style="list-style-type: none"> Survey-based experiment of 2724 USA adults from September 12-22, 2007 testing public reaction to Myanmar's forced labor practices. 	<ul style="list-style-type: none"> Respondents who were told that Myanmar's actions violated international law had greater support for punishment compared to uninformed respondents. There was no difference in support between adults told that Myanmar violated customary law and those told that Myanmar violated specific treaty commitments. 	<ul style="list-style-type: none"> Awareness of how human rights abuses have violated international law shifts public support for punishment. Whether abuses violated customary legal rules or specific treaty obligations does not influence public support.
31. Helfer LR, Voeten E (2014) International Courts as Agents of Legal Change: Evidence from LGBT Rights in Europe. <i>International Organization</i> 68(1): 77-110. [Law]	<ul style="list-style-type: none"> Do ECtHR judgments have effects on all states under the court's jurisdiction, regardless of whether states participated in the litigation? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of lesbian, gay, bisexual and transgender (LGBT) policy data on 42 Council of Europe member states from 1958-2007. 	<ul style="list-style-type: none"> ECtHR rulings on LGBT issues were associated with a higher probability of domestic LGBT policy reform. The marginal benefit of ECtHR rulings was highest on states with low public support for LGBT rights and that do not have a religious, rural or nationalist government in power. 	<ul style="list-style-type: none"> ECtHR rulings for violations of LGBT rights lead to a higher likelihood of domestic policy change in all countries under the ECtHR's jurisdiction. ECtHR rulings have the greatest impact when public support of LGBT rights is low and political and institutional conditions support policy change.

CAT = United Nations Convention Against Torture | CEDAW = Convention on the Elimination of All Forms of Discrimination Against Women | CERD = Convention on the Elimination of Racial Discrimination | CRC = Convention on the Rights of the Child | ECtHR = European Court of Human Rights | HRA = Human Rights Agreement | IACHR = Inter-American Court of Human Rights | IASHPR = Inter-American System of Human Rights Protection | ICCPR = International Covenant on Civil and Political Rights | ICESCR = International Covenant on Economic, Social and Cultural Rights | IGO = Intergovernmental Organization | INGO = International Non-governmental Organization | LGBT = Lesbian, Gay, Bisexual and Transgender | OECD = Organisation for Economic Co-operation and Development | PS = Political Science | PTA = Preferential Trade Agreement | SAA = Structural Adjustment Agreement | UN = United Nations | ICESCR = International Covenant on Economic, Social and Cultural Rights

Panel A1.2: Summaries of 7 Quantitative Evaluations of International Criminal & Humanitarian Law

Studies	Questions	Methods	Findings	Authors' Conclusions
32. Meernik J (2005) <i>Justice and Peace? How the International Criminal Tribunal Affects Societal Peace in Bosnia.</i> <i>Journal of Peace Research</i> 42: 271-289. [PS]	<ul style="list-style-type: none"> Do judicial actions taken by the International Criminal Tribunal for the Former Yugoslavia (ICTY) affect societal peace in Bosnia? 	<ul style="list-style-type: none"> Prais-Winsten time-series analysis (testing for autocorrelation) of data on conflict and cooperation among Bosnian ethnic groups from 1996-2003. 	<ul style="list-style-type: none"> Prominent ICTY adjudicatory actions were not consistently associated with cooperation in Bosnia; only one action was associated with lower levels of conflict, while three actions were associated with higher levels. 	<ul style="list-style-type: none"> Judicial actions taken by ICTY were largely ineffective and often detrimental in improving relationships among Bosnian ethnic groups.
33. Hafner-Burton EM, Montgomery AH (2006) <i>Power Positions: International Organizations, Social Networks, and Conflict.</i> <i>Journal of Conflict Resolution</i> 50: 3-27. [PS]	<ul style="list-style-type: none"> Does membership in IGOs promote peace or conflict? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of militarized international dispute (MID) data on dyads of states linked by IGO membership between 1885-1992. 	<ul style="list-style-type: none"> Mutual membership in IGOs was weakly associated with a higher likelihood of MIDs. The likelihood of MIDs was increased in dyads where the two states differed in their centrality within the entire IGO network. 	<ul style="list-style-type: none"> IGOs create disparities in social power among member states, which influences how militarized conflicts occur between them.
34. Valentino B, Huth P, Croco S (2006) <i>Covenants without the Sword: International Law and the Protection of Civilians in Times of War.</i> <i>World Politics</i> 58: 339-377. [PS]	<ul style="list-style-type: none"> Do international laws that aim to protect civilians during war actually affect civilian wartime fatalities? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of fatality data for all interstate wars between 1900-2003. 	<ul style="list-style-type: none"> Commitment to international treaties was not associated with the number of civilian fatalities, even if states were democracies and both parties involved were committed. 	<ul style="list-style-type: none"> International laws of war are not effective in protecting civilians during war.

Panel A1.2: Summaries of 7 Quantitative Evaluations of International Criminal & Humanitarian Law (Continued)

Studies	Questions	Methods	Findings	Authors' Conclusions
35. Kelley J (2007) Who Keeps International Commitments and Why? The International Criminal Court and Bilateral Nonsurrender Agreements. <i>American Political Science Review</i> 101: 573-589. [PS]	<ul style="list-style-type: none"> Under what conditions do states follow their commitments to international law? 	<ul style="list-style-type: none"> Cross-sectional analysis of ratification data on 187 countries for a non-surrender agreement initiated by the USA. 	<ul style="list-style-type: none"> Members of the International Criminal Court (ICC) that were also either democratic, strong ICC backers or highly respectful of the rule of law were significantly more likely to reject a non-surrender agreement with the USA that would be incompatible with their ICC membership obligations. 	<ul style="list-style-type: none"> International treaties have a constraining effect on state behavior. States with high affinity for the ICC and respect for the rule of law are more strongly committed to international treaties.
36. Morrow JD (2007) When Do States Follow the Laws of War? <i>American Political Science Review</i> 101: 559-572. [PS]	<ul style="list-style-type: none"> Under what conditions do warring states comply with international humanitarian laws? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of treaty compliance data on 222 warring dyads from 48 interstate wars from 1899-1991. 	<ul style="list-style-type: none"> Joint ratification of international humanitarian laws by both warring states was associated with reciprocity between them. Ratification increased compliance with the laws of war among democratic states. 	<ul style="list-style-type: none"> States at war are more likely to comply with a treaty if both sides have ratified it. With joint ratification, if one side violates the treaty the other will respond similarly. Democracies that ratify a treaty are more likely to comply than non-democracies.
37. Nooruddin I, Payton AL (2010) Dynamics of Influence in International Politics: The ICCs, BIAs, and Economic Sanctions. <i>Journal of Peace Research</i> 47: 711-721. [PS]	<ul style="list-style-type: none"> Under what conditions do states follow their commitments to international law? 	<ul style="list-style-type: none"> Cox proportionate hazard model of ratification data on 166 countries from 2002-2007 for a bilateral immunity agreement (BIA) initiated by the USA. 	<ul style="list-style-type: none"> States that ratified the ICC, especially those with high domestic rule of law, had high GDP, had defense pacts with the USA, or were sanctioned by the USA took longer to sign the BIA. States with significant trade with the USA signed the BIA more quickly. 	<ul style="list-style-type: none"> A state's domestic politics and dependency relationships are determinants of compliance with international treaties.

Panel A1.2: Summaries of 7 Quantitative Evaluations of International Criminal & Humanitarian Law (Continued)

Studies	Questions	Methods	Findings	Authors' Conclusions
38. Simmons BA, Danner A (2010) <i>Credible Commitments and the International Criminal Court. International Organization</i> 64: 225-256. [PS]	<ul style="list-style-type: none"> Does joining the ICC promote peaceful behavior? What types of states join the ICC? 	<ul style="list-style-type: none"> Cox proportionate hazard model of conflict termination data on 52 episodes of civil war from 1998-2007. Cox proportionate hazard model of ICC ratification data on 189 countries from 1998-2007. 	<ul style="list-style-type: none"> Non-democracies with civil war were more likely to terminate violence and reach a peaceful agreement by joining the ICC. Democracies without civil war and non-democracies with civil war were 2.6 and 2.84 times more likely to join the ICC compared to non-democracies without civil war, respectively. 	<ul style="list-style-type: none"> States with inadequate domestic accountability mechanisms that join the ICC experience reduced violence and enter peace agreements. States that are the least and most vulnerable to be affected by an ICC prosecution join the ICC more readily compared to potentially vulnerable states.

ICC = International Criminal Court | ICTY = International Criminal Tribunal for the Former Yugoslavia | IGO = Intergovernmental Organization | MID = Militarized International Dispute | PS = Political Science

Panel A1.3: Summaries of 9 Quantitative Evaluations of International Trade Law

Studies	Questions	Methods	Findings	Authors' Conclusions
39. Bown CP (2004) On the Economic Success of GATT/WTO Dispute Settlement. <i>The Review of Economics and Statistics</i> 86: 811-823. [Trade]	<ul style="list-style-type: none"> • What factors influence whether defendant states commit to trade liberalization following dispute settlements? 	<ul style="list-style-type: none"> • Time-series cross-sectional analysis of General Agreement on Tariffs and Trade (GATT) and World Trade Organization (WTO) trade dispute data on 174 disputes from 1973-1998. 	<ul style="list-style-type: none"> • The plaintiff's ability to retaliate against the defendant (measured by the share of the defendant's total exports sent to the plaintiff) was associated with higher post-settlement imports from the plaintiff to the defendant in the disputed sector. 	<ul style="list-style-type: none"> • Defendant states are more likely to commit to trade liberalization if the plaintiff state (their trading partner) holds power over them.
40. Rose AK (2004) Do We Really Know that the WTO Increases Trade? <i>American Economic Review</i> 94: 98-114. [Trade]	<ul style="list-style-type: none"> • Does membership in the GATT/WTO affect a state's level of international trade? 	<ul style="list-style-type: none"> • Time-series cross-sectional analysis of International Monetary Fund (IMF) bilateral merchandise trade data on 178 countries from 1948-1999. 	<ul style="list-style-type: none"> • WTO/GATT membership was not associated with bilateral trade values. 	<ul style="list-style-type: none"> • Entering the WTO/GATT does not increase a state's bilateral trade flows.
41. Gowa J, Kim SY (2005) An Exclusive Country Club: The Effects of the GATT on Trade, 1950-94. <i>World Politics</i> 57: 453-478. [PS]	<ul style="list-style-type: none"> • Does the GATT affect the trade of its member states? 	<ul style="list-style-type: none"> • Time-series cross-sectional analysis of IMF bilateral import data on 145 countries from 1950-1994. 	<ul style="list-style-type: none"> • GATT membership was associated with greater trade between only five states: Britain, Canada, France, Germany and the United States. 	<ul style="list-style-type: none"> • The GATT had a positive impact on trade between only five of its member states, who represent principal trading partners of the UK and USA.

Panel A1.3: Summaries of 9 Quantitative Evaluations of International Trade Law (Continued)

Studies	Questions	Methods	Findings	Authors' Conclusions
42. Hafner-Burton EM (2005) Trading Human Rights: How Preferential Trade Agreements Influence Government Repression. <i>International Organization</i> 59: 593-629. [PS]	<ul style="list-style-type: none"> Do human rights agreements (HRAs) and preferential trade agreements (PTAs) involving human rights standards affect a state's human rights behavior? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of several human rights indicators on 176 countries from 1976-2001. 	<ul style="list-style-type: none"> Commitment to PTAs that establish enforceable human rights standards was associated with less human rights repression. Commitment to HRAs and those PTAs that do not establish enforceable human rights standards were not associated with measures of human rights repression. 	<ul style="list-style-type: none"> PTAs that influence members by coercion to protect certain human rights are more effective than HRAs, which influence by persuasion.
43. Subramanian A, Wei SJ (2007) The WTO promotes trade, strongly but unevenly. <i>Journal of International Economics</i> 72: 151-175. [Trade]	<ul style="list-style-type: none"> Does membership in the WTO/GATT affect a state's level of international trade? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of IMF bilateral import data on 172 countries from 1950-2000. 	<ul style="list-style-type: none"> WTO/GATT membership was associated with greater total imports for industrial states but not for developing states, and only in liberalized sectors. 	<ul style="list-style-type: none"> Membership in the WTO/GATT increases international trade for industrial states, especially with other WTO/GATT members.
44. Tomz M, Goldstein JL, Rivers D (2007) Do We Really Know that the WTO Increases Trade? Comment. <i>American Economic Review</i> 97: 2005-2018. [PS]	<ul style="list-style-type: none"> After reclassifying states from the Rose (2004) analysis, does membership in the GATT and WTO affect a state's level of international trade? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of IMF bilateral merchandise trade data on 178 countries from 1948-1999. 	<ul style="list-style-type: none"> WTO/GATT membership was associated with greater bilateral trade values when considering both member and non-member participants. 	<ul style="list-style-type: none"> Participation in the WTO/GATT, either as a formal member or as a non-member, increases a state's bilateral trade flows.

Panel A1.3: Summaries of 9 Quantitative Evaluations of International Trade Law (Continued)

Studies	Questions	Methods	Findings	Authors' Conclusions
<p>45. Kucik J, Reinhardt E (2008) <i>Does Flexibility Promote Cooperation? An Application to the Global Trade Regime.</i> <i>International Organization</i> 62: 477-505. [PS]</p>	<ul style="list-style-type: none"> Do flexibility provisions in international agreements influence cooperation? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of GATT/WTO membership and tariff data on 137 countries from 1981-2003 using Heckman model for selection bias. 	<ul style="list-style-type: none"> States possessing a domestic antidumping mechanism were more likely to join the WTO/GATT. Domestic antidumping mechanisms were associated with lower tariff bindings and lower applied tariffs after states joined the WTO/GATT. 	<ul style="list-style-type: none"> States that benefit from the WTO/GATT's antidumping flexibility are more likely to join the WTO/GATT, who in turn agree to tighter tariff bindings and apply lower tariffs.
<p>46. Mansfield ED, Reinhardt E (2008) <i>International Institutions and the Volatility of International Trade.</i> <i>International Organization</i> 62: 621-652. [PS]</p>	<ul style="list-style-type: none"> Do international trade agreements affect a state's trade volatility? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of bilateral trade data on 162 countries from 1951-2001. 	<ul style="list-style-type: none"> WTO membership and PTAs were associated with lower trade volatility and greater exports. 	<ul style="list-style-type: none"> International trade agreements reduce volatility in trade policy and trade flows, thereby increasing trade between states.

Panel A1.3: Summaries of 9 Quantitative Evaluations of International Trade Law (Continued)

Studies	Questions	Methods	Findings	Authors' Conclusions
47. Hafner-Burton EM, Montgomery AH (2012) War, Trade, and Distrust: Why Trade Agreements Don't Always Keep the Peace. <i>Conflict Management and Peace Science</i> 29: 257-278. [PS]	<ul style="list-style-type: none"> Do trade institutions, such as PTAs and the WTO, promote peace among member states? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of MID data on all dyads of states linked by PTAs between 1950-2000. 	<ul style="list-style-type: none"> Dyads linked by more trade institutions were associated with a lower likelihood of MIDs. Dyads where member states were equally interdependent and shared similar ties to other states were associated with a lower likelihood of MIDs. Dyads where member states differed in their interdependency and ties to other states were associated with a higher likelihood of MIDs. 	<ul style="list-style-type: none"> Trade institutions promote peace among member states with similar social positions in the international political economy. Trade institutions can create inequalities in social positions among member states, encouraging militarized conflict.

GATT = General Agreement on Tariffs and Trade | IMF = International Monetary Fund | MID = Militarized International Conflict | PS = Political Science | PTA = Preferential Trade Agreement | WTO = World Trade Organization

Panel A1.4: Summaries of 33 Quantitative Evaluations of International Financial Law

Studies	Questions	Methods	Findings	Authors' Conclusions
<p>48. UNCTAD (1998) Bilateral Investment Treaties in the Mid-1990s. [United Nations Publication, Sales No. E.98.II.D.8.] United Nations. <i>[Economics]</i></p>	<ul style="list-style-type: none"> Do bilateral investment treaties (BITs) increase foreign direct investment (FDI) in developing countries? 	<ul style="list-style-type: none"> Time-series analysis of data on FDI flows from 14 OECD countries to 72 host developing countries from 1971-1994. Cross-sectional analysis of FDI activity data on 133 developing countries in 1995. 	<ul style="list-style-type: none"> BIT adoption was associated with a slight increase in FDI, but results were not consistent across analyses. 	<ul style="list-style-type: none"> BITs may have a small positive effect on foreign investment.
<p>49. Simmons BA (2000) International Law and State Behavior: Commitment and Compliance in International Monetary Affairs. <i>American Political Science Review</i> 94: 819-835; Simmons BA (2000) Money and the Law: Why Comply with the Public International Law of Money? <i>Yale Journal of International Law</i> 25: 323-362; Simmons BA (2000) The Legalization of International Monetary Affairs. <i>International Organization</i> 54: 573-602. <i>[PS]</i></p>	<ul style="list-style-type: none"> Does the International Monetary Fund's (IMF) Articles of Agreement affect state behavior? What conditions influence commitment and compliance to international financial legal obligations? 	<ul style="list-style-type: none"> Cox proportionate hazard model of data on IMF Article VIII commitment in 133 countries from 1967-1997. Time-series cross-sectional analysis of data on payment restrictions in 133 countries from 1982-1995. 	<ul style="list-style-type: none"> The proportion of total and regional adherents was associated with a higher likelihood of ratification. Regional noncompliance was associated with a higher likelihood of imposing restrictions. Ratifying Article VIII was associated with a lower likelihood of account restrictions. Among Article VIII countries, those with high rule of law were more likely to be compliant. 	<ul style="list-style-type: none"> Commitment to international monetary law positively influences government behavior, particularly for high rule of law countries. Pressure from other states, particularly regional partners, influences ratification of and compliance with international law.

Panel A1.4: Summaries of 33 Quantitative Evaluations of International Financial Law (Continued)

Studies	Questions	Methods	Findings	Authors' Conclusions
50. Banga R (2003) Impact of Government Policies and Investment Agreements on FDI Inflows. [Working Paper No. 116] Indian Council for Research on International Economic Relations. <i>[Economics]</i>	<ul style="list-style-type: none"> Do BITs increase FDI in developing countries? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of FDI inflow data on 15 developing countries in South, East and Southeast Asia from 1980-2000. 	<ul style="list-style-type: none"> The cumulative number of BITs signed was associated with higher FDI inflows, but only treaties with developed countries had a significant impact. 	<ul style="list-style-type: none"> BITs with developed countries promote FDI in developing countries, but BITs among developing countries do not affect FDI.
51. Davies RB (2003) Tax Treaties, Renegotiations, and Foreign Direct Investment. <i>Economic Analysis and Policy</i> 33: 251-273. <i>[Economics]</i>	<ul style="list-style-type: none"> Do renegotiations on BTTs affect FDI? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of FDI activity data for the USA with 65 host countries from 1966-2000. 	<ul style="list-style-type: none"> Treaty renegotiations were not associated with USA affiliate sales and FDI stocks. 	<ul style="list-style-type: none"> Renegotiations on BTTs have no effect on foreign investment.
52. Hallward-Driemeier M (2003) Do Bilateral Investment Treaties Attract Foreign Direct Investment? Only a Bit – and They Could Bite. [Working Paper No. 3121] World Bank Policy Research. <i>[Economics]</i>	<ul style="list-style-type: none"> Do BITs increase FDI in developing countries? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of data on FDI flows from 20 OECD countries to 31 developing countries from 1980-2000. 	<ul style="list-style-type: none"> BIT adoption was not associated with subsequent changes in FDI inflows. 	<ul style="list-style-type: none"> BITs do not promote FDI in developing countries.
53. Egger P, Pfaffermayr M (2004) The Impact of Bilateral Investment Treaties on Foreign Direct Investment. <i>Journal of Comparative Economics</i> 32: 788-804. <i>[Economics]</i>	<ul style="list-style-type: none"> Do BITs increase FDI? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of data on outward FDI stocks from 19 OECD countries to 57 host countries from 1982-1997. 	<ul style="list-style-type: none"> BIT implementation was associated with higher outward FDI stocks. Signing a BIT, regardless of implementation, was associated with higher outward FDI stocks, but at a lower significance level. 	<ul style="list-style-type: none"> BITs that have been implemented promote foreign investment.

Panel A1.4: Summaries of 33 Quantitative Evaluations of International Financial Law (Continued)

Studies	Questions	Methods	Findings	Authors' Conclusions
54. di Giovanni J (2005) What Drives Capital Flows? The Case of Cross-Border M&A Activity and Financial Deepening. <i>Journal of International Economics</i> 65: 127-149. [<i>Economics</i>]	<ul style="list-style-type: none"> Do BTTs and bilateral service agreements influence international mergers and acquisitions (M&As)? 	<ul style="list-style-type: none"> Time-series cross sectional analysis of M&A data on 193 countries from 1990-1999. 	<ul style="list-style-type: none"> Adoption of BTTs and bilateral service agreements (e.g., those that open up financial and telecommunication sectors) was associated with higher M&A flows. 	<ul style="list-style-type: none"> Bilateral service agreements and tax treaties increase international M&A activity.
55. Ginsburg T (2005) International Substitutes for Domestic Institutions: Bilateral Investment Treaties and Governance. <i>International Review of Law and Economics</i> 25: 107-123. [<i>Law</i>]	<ul style="list-style-type: none"> Do BITs affect governance in developing countries? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of governance indicators on 177 countries from 1995-2002. 	<ul style="list-style-type: none"> BIT adoption showed no consistent associations with changes in governance. BIT adoption was negatively associated with the quality of the domestic legal system. 	<ul style="list-style-type: none"> BITs have an ambiguous impact on states' governance, and in some cases may diminish governance quality.
56. Grosse R, Trevino LJ (2005) New institutional economics and FDI location in Central and Eastern Europe. <i>Management International Review</i> 45: 123-145. [<i>Economics</i>]	<ul style="list-style-type: none"> Do BITs affect the uncertainty and costs of long-term capital investment for foreign investors? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of FDI inflow data on 13 Central and Eastern European countries from 1990-1999. 	<ul style="list-style-type: none"> The cumulative number of BITs signed by Central and Eastern European countries was associated with higher FDI in that region. 	<ul style="list-style-type: none"> BITs reduce the costs and uncertainties foreign investors have towards capital investment, thereby increasing FDI.
57. Neumayer E, Spess L (2005) Do Bilateral Investment Treaties Increase Foreign Direct Investment to Developing Countries? <i>World Development</i> 33: 1567-1585. [<i>Development</i>]	<ul style="list-style-type: none"> Do BITs increase FDI in developing countries? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of data on FDI inflows to 119 developing countries from 1970-2001. 	<ul style="list-style-type: none"> The cumulative number of BITs signed by a developing country was associated with higher FDI inflows. The effect was stronger in countries with high levels of political risk. 	<ul style="list-style-type: none"> BITs with developed countries increases FDI inflows to developing countries. BITs may attract FDI by stabilizing risky investment environments.

Panel A1.4: Summaries of 33 Quantitative Evaluations of International Financial Law (Continued)

Studies	Questions	Methods	Findings	Authors' Conclusions
58. von Stein J (2005) Do Treaties Constrain or Screen? Selection Bias and Treaty Compliance. <i>American Political Science Review</i> 99: 611-622. [PS]	<ul style="list-style-type: none"> Does the IMF's Articles of Agreement have constraining effects on state behavior or are differences just the result of screening effects? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of data on state commitment to IMF Article VIII and payment restrictions in 133 countries from 1967-1997 using Heckman model for selection bias. 	<ul style="list-style-type: none"> The positive effects of IMF law on state compliance observed in Simmons (2000) was significantly reduced after controlling for selection effects. 	<ul style="list-style-type: none"> States that ratify international laws often already meet the requirements. International treaties have a screening rather than constraining effect on state behavior.
59. Simmons BA, Hopkins, DJ (2005) The Constraining Power of International Treaties: Theory and Methods. <i>American Political Science Review</i> 99: 623-631. [PS]	<ul style="list-style-type: none"> Does the IMF's Articles of Agreement have constraining effects on state behavior in addition to screening effects? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of data on state commitment to IMF Article VIII and payment restrictions in 133 countries from 1967-1997 using propensity score matching for selection bias. 	<ul style="list-style-type: none"> The positive effects of IMF law on state compliance observed in Simmons (2000) was replicated after matching treaty signatories with similar non-signatories to reduce selection bias. 	<ul style="list-style-type: none"> In addition to its screening effect, international treaties also have a strong and positive direct effect on state behavior.
60. Egger P, Merlo V (2007) The Impact of Bilateral Investment Treaties on FDI Dynamics. <i>The World Economy</i> 30: 1536-1549. [Economics]	<ul style="list-style-type: none"> Do BITs increase FDI? Do BITs have a greater long-term than short-term impact on FDI? 	<ul style="list-style-type: none"> Generalized method of moments analysis of data on outward FDI stocks from 24 countries to 28 host countries from 1980-2001. 	<ul style="list-style-type: none"> BIT adoption was associated with higher outward FDI stocks. The long-term impact of BITs was substantially higher than the short-term impact. 	<ul style="list-style-type: none"> BITs have a dynamic impact on foreign investment, with their effects on FDI being considerably higher in the long run.

Panel A1.4: Summaries of 33 Quantitative Evaluations of International Financial Law (Continued)

Studies	Questions	Methods	Findings	Authors' Conclusions
61. Büthe T, Milner HV (2008) The Politics of Foreign Direct Investment into Developing Countries: Increasing FDI through International Trade Agreements? <i>American Journal of Political Science</i> 52: 741-762. [PS]	<ul style="list-style-type: none"> Do multilateral trade agreements influence FDI in developing countries? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of FDI inflow data on 122 developing countries from 1970-2000. 	<ul style="list-style-type: none"> WTO/GATT membership and the cumulative number of PTAs signed were associated with higher FDI inflows. 	<ul style="list-style-type: none"> Joining multilateral trade agreements increases FDI, probably by boosting the credibility of their commitments to liberal economic policies.
62. Hafner-Burton EM, Montgomery AH (2008) Power or Plenty: How Do International Trade Institutions Affect Economic Sanctions? <i>Journal of Conflict Resolution</i> 52: 213-242. [PS]	<ul style="list-style-type: none"> Do PTAs affect the likelihood of member states to initiate economic sanctions against one another? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of PTA membership and enforcement data on 226 cases of bilateral economic sanctions between 1947-2000. 	<ul style="list-style-type: none"> Mutual membership in PTAs was not associated with the likelihood of economic sanctions. PTAs were associated with higher economic sanctions when the initiator had a large presence in the entire PTA network. 	<ul style="list-style-type: none"> PTAs do not prevent member states from enacting economic sanctions against one another, and may increase sanctions if the initiator is central within the network of all PTAs.
63. Millimet DL, Kumas A (2008) Reassessing the Effects of Bilateral Tax Treaties on US FDI Activity. [Working Paper No. 704] Southern Methodist University. <i>Economics</i>	<ul style="list-style-type: none"> Do bilateral tax treaties (BTTs) increase FDI? 	<ul style="list-style-type: none"> Quantile treatment effect distributional analysis of data on USA inbound FDI from 91 countries and USA outbound FDI to 44 countries from 1980-1999. 	<ul style="list-style-type: none"> In distributions of both inbound and outbound FDI activity, BTTs decreased FDI activity at higher quantiles and increased FDI activity at lower quantiles. 	<ul style="list-style-type: none"> BTTs increase FDI activity if activity at the time of treaty signage is low, and decrease FDI activity if activity at the time of treaty signage is high.

Panel A1.4: Summaries of 33 Quantitative Evaluations of International Financial Law (Continued)

Studies	Questions	Methods	Findings	Authors' Conclusions
64. Yackee JW (2008) Bilateral Investment Treaties, Credible Commitment, and the Rule of (International) Law: Do BITs Promote Foreign Direct Investment? <i>Law & Society Review</i> 42: 805-832. [Law]	<ul style="list-style-type: none"> Do BITs increase FDI? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of data on FDI flows from the top 18 capital-exporting countries to all other countries from 1945-2002. 	<ul style="list-style-type: none"> BITs were not associated with FDI inflows, even when limiting the analysis to BITs that allow foreign investors to initiate international arbitration against the states hosting their investments. 	<ul style="list-style-type: none"> BITs, even the formally strongest ones with international arbitration provisions, do not increase FDI in developing countries.
65. Aisbett E (2009) Bilateral Investment Treaties and Foreign Direct Investment: Correlation versus Causation. In: Sauvart K, Sachs L, editors. <i>The Effect of Treaties on Foreign Direct Investment: Bilateral Investment Treaties, Double Taxation Treaties, and Investment Flows</i> . Oxford: Oxford University Press. pp. 395-437. [Economics]	<ul style="list-style-type: none"> Do BITs increase FDI to developing countries? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of data on FDI outflows from 24 OECD countries to 28 developing countries from 1980-1999. 	<ul style="list-style-type: none"> Although BIT adoption was associated with increased FDI outflows, it was found to be endogenous; this may be due to omitted variables (e.g., improved policy environment in host country increases both BITs and FDI) or reverse causality (e.g., increased FDI promotes BIT signage). The number of BITs signed with other OECD countries was not associated with FDI outflows. 	<ul style="list-style-type: none"> BITs do not have a direct effect on foreign investment, nor do they signal a stable investment climate. The initial strong association between BITs and FDI was driven by the endogeneity of BIT adoption.
66. Barthel F, Busse M, Neumayer E (2009) The Impact of Double Taxation Treaties on Foreign Direct Investment: Evidence from Large Dyadic Panel Data. <i>Contemporary Economic Policy</i> 28: 366-377. [Economics]	<ul style="list-style-type: none"> Do double taxation treaties (DTTs) increase FDI? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of dyadic FDI stock data on 30 source countries to 105 host countries from 1978-2004. 	<ul style="list-style-type: none"> DTT adoption was associated with higher FDI stocks between the two partner countries. 	<ul style="list-style-type: none"> DTTs promote foreign investment.

Panel A1.4: Summaries of 33 Quantitative Evaluations of International Financial Law (Continued)

Studies	Questions	Methods	Findings	Authors' Conclusions
<p>67. Blonigen BA, Davies RB (2009) Do Bilateral Tax Treaties Promote Foreign Direct Investment? In: Sauvart K, Sachs L, editors. <i>The Effect of Treaties on Foreign Direct Investment: Bilateral Investment Treaties, Double Taxation Treaties, and Investment Flows</i>. Oxford: Oxford University Press. pp. 461-485. [Economics]</p>	<ul style="list-style-type: none"> Do BTTs increase FDI flows among OECD countries? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of outbound FDI flow and stock data on 23 OECD countries from 1982-1992. 	<ul style="list-style-type: none"> BTTs signed before 1983 ('old' BTTs) were associated with increased FDI activity, but this activity could have existed before treaty signage. BTTs signed between 1983-1992 ('new' BTTs) were associated with decreased FDI activity. 	<ul style="list-style-type: none"> BTTs do not promote foreign investment.
<p>68. Blonigen BA, Davies RB (2009) The Effects of Bilateral Tax Treaties on U.S. FDI Activity. In: Sauvart K, Sachs L, editors. <i>The Effect of Treaties on Foreign Direct Investment: Bilateral Investment Treaties, Double Taxation Treaties, and Investment Flows</i>. Oxford: Oxford University Press. pp. 485-513. [Economics]</p>	<ul style="list-style-type: none"> Do BTTs involving the USA increase countries' FDI activity? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of FDI flow and stock data for the USA with 65 host countries from 1966-1992. 	<ul style="list-style-type: none"> BTTs signed from 1972-1992 were associated with decreased outbound affiliate sales and FDI stocks from the USA, and were not associated with inbound FDI affiliate sales and stocks to the USA. The decreases in outbound FDI activity occurred near the times of treaty signage. 	<ul style="list-style-type: none"> BTTs do not promote USA FDI activities. Tax treaties may reduce tax evasion rather than promote investment, driving out investors motivated for tax reasons.

Panel A1.4: Summaries of 33 Quantitative Evaluations of International Financial Law (Continued)

Studies	Questions	Methods	Findings	Authors' Conclusions
<p>69. Büthe T, Milner HV (2009) <i>Bilateral Investment Treaties and Foreign Direct Investment: A Political Analysis</i>. In: Sauviant K, Sachs L, editors. <i>The Effect of Treaties on Foreign Direct Investment: Bilateral Investment Treaties, Double Taxation Treaties, and Investment Flows</i>. Oxford: Oxford University Press. pp. 171-225. [PS]</p>	<ul style="list-style-type: none"> Do BITs increase FDI to developing countries? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of FDI inflow data on 122 developing countries from 1970-2000. 	<ul style="list-style-type: none"> The cumulative number of BITs signed by a developing country was associated with higher FDI inflows. 	<ul style="list-style-type: none"> BITs increase FDI in developing countries probably by boosting their reputation among investors.
<p>70. Coupé T, Orlova I, Skiba A (2009) <i>The Effect of Tax and Investment Treaties on Bilateral FDI Flows to Transition Countries</i>. In: Sauviant K, Sachs L, editors. <i>The Effect of Treaties on Foreign Direct Investment: Bilateral Investment Treaties, Double Taxation Treaties, and Investment Flows</i>. Oxford: Oxford University Press. pp. 681-715. [Economics]</p>	<ul style="list-style-type: none"> Do DTTs and BITs simultaneously increase FDI in countries undergoing economic transition? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of data on FDI inflows from 17 OECD countries to nine transitional countries from 1990-2001. 	<ul style="list-style-type: none"> BIT adoption, but not DTT adoption, was consistently associated with increased FDI inflows. 	<ul style="list-style-type: none"> BITs increase FDI in developing countries, but DTTs do not.

Panel A1.4: Summaries of 33 Quantitative Evaluations of International Financial Law (Continued)

Studies	Questions	Methods	Findings	Authors' Conclusions
<p>71. Egger P, Larch M, Pfaffermayr M, Winner H (2009) <i>The Impact of Endogenous Tax Treaties on Foreign Direct Investment: Theory and Empirical Evidence</i>. In: Sauvant K, Sachs L, editors. <i>The Effect of Treaties on Foreign Direct Investment: Bilateral Investment Treaties, Double Taxation Treaties, and Investment Flows</i>. Oxford: Oxford University Press. pp. 513-541. [Economics]</p>	<ul style="list-style-type: none"> Do BTTs increase outward FDI? 	<ul style="list-style-type: none"> Difference-in-difference analysis of data on outward FDI stocks from 18 OECD countries to 31 host countries from 1985-2001 using propensity score matching for non-random selection into treaty formation. 	<ul style="list-style-type: none"> BTT adoption was associated with decreased outward FDI stocks. 	<ul style="list-style-type: none"> BTTs do not promote foreign investment.
<p>72. Gallagher KP, Birch MBL (2009) <i>Do Investment Agreements Attract Investment? Evidence from Latin America</i>. In: Sauvant K, Sachs L, editors. <i>The Effect of Treaties on Foreign Direct Investment: Bilateral Investment Treaties, Double Taxation Treaties, and Investment Flows</i>. Oxford: Oxford University Press. pp. 295-311. [PS]</p>	<ul style="list-style-type: none"> Do BITs increase FDI, specifically from the USA to developing countries in Latin America and Mesoamerica? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of FDI inflow data on 24 countries in Latin America and Mesoamerica from 1980-2003. 	<ul style="list-style-type: none"> The number of BITs signed with the USA was not associated with FDI inflows from the United States in either Latin America or Mesoamerica. The total number of BITs signed with any country was associated with higher total FDI inflows to states in Latin America but not Mesoamerica. 	<ul style="list-style-type: none"> BITs with the USA do not increase American FDI in Latin America or Mesoamerica.

Panel A1.4: Summaries of 33 Quantitative Evaluations of International Financial Law (Continued)

Studies	Questions	Methods	Findings	Authors' Conclusions
73. Grieco JM, Gelpi CF, Warren TC (2009) <i>When Preferences and Commitments Collide: The Effect of Relative Partisan Shifts on International Treaty Compliance. International Organization</i> 63: 341-355. [PS]	<ul style="list-style-type: none"> • How influential is ratification of the IMF's Articles of Agreement after a shift in a state's executive partisan orientation? 	<ul style="list-style-type: none"> • Time-series cross-sectional analysis of data on financial openness and payment restrictions in 182 countries from 1967-1997 using genetic matching for selection bias. 	<ul style="list-style-type: none"> • A state's shift to the left was associated with diminished, but still overall higher, compliance with IMF law. 	<ul style="list-style-type: none"> • IMF law remains influential on state behavior even if the state experiences a shift in executive political orientation away from monetary openness.
74. Louie HJ, Rousslang DJ (2009) <i>Host-Country Governance, Tax Treaties, and U.S. Direct Investment Abroad</i> . In: Sauvant K, Sachs L, editors. <i>The Effect of Treaties on Foreign Direct Investment: Bilateral Investment Treaties, Double Taxation Treaties, and Investment Flows</i> . Oxford: Oxford University Press. pp. 541-563. [Economics]	<ul style="list-style-type: none"> • Do BTTs with the USA affect the rate of return that USA companies require on their FDI? 	<ul style="list-style-type: none"> • Cross-sectional analysis of data on the rates of return to USA FDI required from 46 countries in 1992, 1994 and 1996. 	<ul style="list-style-type: none"> • BTT adoption was not associated with rates of return required for USA FDI. • High corruption and political instability were associated with increased rates of return required for USA FDI. 	<ul style="list-style-type: none"> • USA investors expect higher rates of return on their FDI in countries that have poor governance. • BTTs with the USA have no effect on the expected rates of return from partner countries.

Panel A1.4: Summaries of 33 Quantitative Evaluations of International Financial Law (Continued)

Studies	Questions	Methods	Findings	Authors' Conclusions
<p>75. Millimet DL, Kumas A (2009) It's All in the Timing: Assessing the Impact of Bilateral Tax Treaties on U.S. FDI Activity. In: Sauviant K, Sachs L, editors. <i>The Effect of Treaties on Foreign Direct Investment: Bilateral Investment Treaties, Double Taxation Treaties, and Investment Flows</i>. Oxford: Oxford University Press. pp. 635-659. [Economics]</p>	<ul style="list-style-type: none"> Do BTTs increase FDI? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of inbound FDI activity data for the USA from 91 countries and outbound FDI activity data from the USA to 44 countries between 1980-1999. 	<ul style="list-style-type: none"> BTT adoption was modestly associated with higher time-lagged inbound FDI stocks and flows, and not associated with inbound affiliate sales. BTT adoption showed inconsistent associations with outbound FDI activity, with the outcomes differing depending on empirical specifications. 	<ul style="list-style-type: none"> BTTs may promote inbound foreign investment, but the impact is realized years after adoption. Statistical modeling assumptions and timing effects are important in studying the effects of BTTs on foreign investment.
<p>76. Neumayer E (2009) Do Double Taxation Treaties Increase Foreign Direct Investment to Developing Countries? In: Sauviant K, Sachs L, editors. <i>The Effect of Treaties on Foreign Direct Investment: Bilateral Investment Treaties, Double Taxation Treaties, and Investment Flows</i>. Oxford: Oxford University Press. pp. 659-687. [Development]</p>	<ul style="list-style-type: none"> Do DTTs increase FDI in developing countries? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of data on outbound FDI stocks from the USA to 114 developing countries from 1970-2001, and data on total inbound FDI stocks and FDI inflows on 120 developing countries from 1970-2001. 	<ul style="list-style-type: none"> DTTs with the USA were associated with higher USA outbound FDI stocks. The cumulative number of DTTs signed was associated with higher inbound FDI stocks and FDI inflows from all countries. The positive effect of DTTs on FDI is restricted to middle-income countries. 	<ul style="list-style-type: none"> DTTs with the USA promote FDI from USA investors. DTTs with developed countries in general promote total FDI. However, DTTs may only be effective in middle-income countries.

Panel A1.4: Summaries of 33 Quantitative Evaluations of International Financial Law (Continued)

Studies	Questions	Methods	Findings	Authors' Conclusions
<p>77. Salacuse JW, Sullivan NP (2009) Do BITS Really Work?: An Evaluation of Bilateral Investment Treaties and Their Grand Bargain. In: Sauviant K, Sachs L, editors. <i>The Effect of Treaties on Foreign Direct Investment: Bilateral Investment Treaties, Double Taxation Treaties, and Investment Flows</i>. Oxford: Oxford University Press. pp. 109-171. [Law]</p>	<ul style="list-style-type: none"> Do BITS with the USA affect total FDI in developing countries? Do BITS with the USA increase FDI outflows from the USA? 	<ul style="list-style-type: none"> Cross-sectional analyses of FDI inflow data on more than 100 developing countries in 1998, 1999 and 2000. Time-series cross-sectional analysis of data on FDI outflows from the USA to 31 countries from 1991-2000. 	<ul style="list-style-type: none"> BITS with the USA were associated with higher cumulative FDI in developing countries, but only when a state's total number of BITS with OECD countries is below the sample average. BITS with the USA were associated with higher FDI outflows from the USA to the participating developing country. 	<ul style="list-style-type: none"> BITS with the USA increase FDI in developing countries, both generally from other countries and specifically from the USA.
<p>78. Yackee J (2009) Do BITS Really Work? Revisiting the Empirical Link Between Investment Treaties and Foreign Direct Investment. In: Sauviant K, Sachs L, editors. <i>The Effect of Treaties on Foreign Direct Investment: Bilateral Investment Treaties, Double Taxation Treaties, and Investment Flows</i>. Oxford: Oxford University Press. pp. 379-395. [Law]</p>	<ul style="list-style-type: none"> Do BITS increase FDI to developing countries? Do BITS increase investor confidence by stabilizing risky investment environments? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of data on FDI flows from the top 18 FDI source countries to 101 developing countries from 1985-2003. 	<ul style="list-style-type: none"> The cumulative number of BITS signed was associated with lower FDI inflows. BIT adoption was associated with increased FDI inflows as the level of political risk in the host country decreased. 	<ul style="list-style-type: none"> BITS do not increase FDI in developing countries. Instead of stabilizing risky investment environments, BITS may only be effective in low-risk countries.

Panel A1.4: Summaries of 33 Quantitative Evaluations of International Financial Law (Continued)

Studies	Questions	Methods	Findings	Authors' Conclusions
79. Busse M, Königer J, Nunnenkamp P (2010) FDI Promotion Through Bilateral Investment Treaties: More Than a Bit? <i>Review of World Economics</i> 146: 147-177. [Economics]	<ul style="list-style-type: none"> Do BITs increase FDI in developing countries? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of data on FDI flows from 28 countries to 83 developing countries from 1978-2004. 	<ul style="list-style-type: none"> BIT adoption was associated with higher FDI inflows in both low- and middle-income countries. BIT adoption was associated with decreased political constraints on a state's executive branch. 	<ul style="list-style-type: none"> BITs increase FDI to developing countries and may even substitute for domestic measures aiming to improve good political governance.
80. Tobin JL, Rose-Ackerman S (2011) When BITs Have Some Bite: The Political-Economic Environment for Bilateral Investment Treaties. <i>Review of International Organizations</i> 6: 1-32. [PS]	<ul style="list-style-type: none"> Do BITs increase FDI in developing countries? Under what conditions are BITs effective? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of data on FDI inflows from OECD countries to 97 developing countries from 1984-2007. 	<ul style="list-style-type: none"> The number of BITs signed was associated with higher FDI inflows, but the effect was conditional on the host country's political and economic environment. The marginal FDI from an additional BIT decreased as the total number of BITs signed by other countries in the world increased. 	<ul style="list-style-type: none"> BITs promote foreign investment, but only in countries that have some stability in their investment environment; BITs cannot substitute for domestic institutions. The benefit of entering BITs falls as the global network of BITs signed expands.

BIT = Bilateral Investment Treaty | BTT = Bilateral Tax Treaty | DTT = Double Taxation Treaty | FDI = Foreign Direct Investment | IMF = International Monetary Fund | M&A = Merger and Acquisition | OECD = Organisation for Economic Co-operation and Development | PS = Political Science

Panel A1.5: Summaries of 10 Quantitative Evaluations of International Environmental Law

Studies	Questions	Methods	Findings	Authors' Conclusions
81. Mitchell RB (1994) Regime Design Matters: Intentional Oil Pollution and Treaty Compliance. <i>International Organization</i> 48: 425-458. [PS]	<ul style="list-style-type: none"> Did oil pollution treaties achieve greater effects by restricting tanker oil discharges or mandating tankers to install pollution-reduction equipment? 	<ul style="list-style-type: none"> Descriptive statistics comparing tanker oil discharge levels to legal limits (1972-1977) and the presence of pollution-reduction equipment in all crude oil tankers in different time periods (pre-1970-1991). 	<ul style="list-style-type: none"> Average tanker oil discharge levels for oil company tankers were reduced but remained at three times the legal limit, while discharges from independent tankers were at thirty times the limit. Tankers showed high compliance in installing pollution-reduction equipment, ranging from 94% to 98% compliance. 	<ul style="list-style-type: none"> The treaty requiring installation of pollution-reduction equipment was significantly more effective than one that set limits to oil discharge levels. Treaties aiming to achieve the same goal differ in outcome depending on their design.
82. Murdoch JC, Sandler T (1997) The Voluntary Provision of a Pure Public Good: The Case of Reduced CFC Emissions and the Montreal Protocol. <i>Journal of Public Economics</i> 63: 331-349. [Economics]	<ul style="list-style-type: none"> Did the Montreal Protocol cause reductions in chlorofluorocarbon (CFC) emissions or simply codify voluntary reductions by polluters before the treaty came into force in 1989? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of CFC emission data in 61 countries that reduced CFC emissions from 1986-1989. 	<ul style="list-style-type: none"> States included in the data set reduced CFC emissions by 41.6% from 1986-1989. Gross national product (GNP) was associated with reductions in CFC emissions. 	<ul style="list-style-type: none"> States reduced CFC emissions below treaty-mandated levels prior to the Montreal Protocol taking effect. The Montreal Protocol may have been purely symbolic since states were already voluntarily reducing CFC emissions.

Panel A1.5: Summaries of 10 Quantitative Evaluations of International Environmental Law (Continued)

Studies	Questions	Methods	Findings	Authors' Conclusions
83. Murdoch JC, Sandler T, Sargent K (1997) A Tale of Two Collectives: Sulphur versus Nitrogen Oxides Emission Reduction in Europe. <i>Economica</i> 64: 281-301. [Economics]	<ul style="list-style-type: none"> Why was the Helsinki Protocol successful in reducing sulfur emissions in European states, yet the Sofia Protocol was not successful in reducing nitrogen oxides emissions? 	<ul style="list-style-type: none"> Time-series cross-sectional analysis of sulfur and nitrogen oxides emission data in 25 European countries from 1980-1990. 	<ul style="list-style-type: none"> For sulfur, GNP and political freedoms were associated with emission reductions. For nitrogen oxides, GNP was not associated with emission levels, but political freedoms were associated with increased emissions. Reductions in pollutants entering from neighbouring states were associated with emission increases. 	<ul style="list-style-type: none"> Efforts to reduce sulfur and nitrogen oxides emissions diverge in outcome due to differences in the source and spread of each pollutant. States adopt the strategic behavior of limiting their cleanup efforts as neighbouring states reduce their emissions.
84. Helm C, Sprinz D (2000) Measuring the Effectiveness of International Environmental Regimes. <i>Journal of Conflict Resolution</i> 44: 630-652. [Economics]	<ul style="list-style-type: none"> Were the Helsinki and Oslo Protocols effective in reducing sulfur dioxide and nitrogen dioxide emissions, respectively? 	<ul style="list-style-type: none"> Formal model analysis of sulfur dioxide emission data in 25 European countries from 1980-1993, nitrogen dioxide emission data in 24 European countries from 1987-1994, and expert judgements. 	<ul style="list-style-type: none"> Both the Helsinki Protocol and Oslo Protocol were associated with reduced emissions of their targeted pollutants, but at levels below the calculated optimums. 	<ul style="list-style-type: none"> The Helsinki Protocol and Oslo Protocol both showed positive effects, but performance of their regimes resulted in emission levels significantly above desired levels.

Panel A1.5: Summaries of 10 Quantitative Evaluations of International Environmental Law (Continued)

Studies	Questions	Methods	Findings	Authors' Conclusions
85. Miles E, Underdal A, Andresen S, Wettestad J, Skjaereth JB, Carlin EM (2002) <i>Environmental Regime Effectiveness: Confronting Theory with Evidence</i> . Cambridge: MIT Press. 508 p. [Environmental Policy]	<ul style="list-style-type: none"> Do international environmental laws improve the state of the environment? Under what conditions are such laws effective? 	<ul style="list-style-type: none"> Descriptive statistics and qualitative comparative analysis of data on the biophysical environment and environmental practices for 14 international environmental laws from 1900-1997. 	<ul style="list-style-type: none"> International environmental laws were associated with substantial improvements in state behavior and moderate improvements in environmental outcomes. Strong institutional capacity (IGO support, majority rule, integrated epistemic community, state leadership) was associated with greater effectiveness and the combination of divergent interests among ratifying states and uncertainty on the nature of the problem was associated with diminished effectiveness. 	<ul style="list-style-type: none"> International environmental laws make a positive difference, but are more effective in promoting behavioral changes than improving the biophysical environment. The impact of a law depends on both the nature of the problem and the institutional capacity of available to support the law's implementation.
86. Finus M, Tjøtta S (2003) The Oslo Protocol on sulfur reduction: the great leap forward? <i>Journal of Public Economics</i> 87: 2031-2048. [Environmental Economics]	<ul style="list-style-type: none"> Did the Oslo Protocol on Further Reduction of Sulfur Emissions (1994) reduce sulfur emissions in European states? 	<ul style="list-style-type: none"> Cross-sectional analysis of predicted estimates of sulfur emissions for 33 European countries from 2000. 	<ul style="list-style-type: none"> The sulfur emission reduction levels set by and the increase in net benefits expected from the Oslo Protocol were lower than the Nash Equilibrium and social optimum predictions for what was expected without a protocol. 	<ul style="list-style-type: none"> Sulfur emission abatement targets and global welfare under the Oslo Protocol are lower than those expected without an international environmental agreement.

Panel A1.5: Summaries of 10 Quantitative Evaluations of International Environmental Law (Continued)

Studies	Questions	Methods	Findings	Authors' Conclusions
87. Ringquist EJ, Kostadinova T (2005) <i>Assessing the Effectiveness of International Environmental Agreements: The Case of the 1985 Helsinki Protocol. American Journal of Political Sciences</i> 49: 86-102. [Environmental Policy]	<ul style="list-style-type: none"> • Did the Helsinki Protocol reduce sulfur dioxide emissions in Europe? 	<ul style="list-style-type: none"> • Time-series cross-sectional analysis of sulphur dioxide emission data on 19 European countries from 1980-1994 using three methods for selection bias. 	<ul style="list-style-type: none"> • Ratification of the Helsinki Protocol was associated with lower sulfur dioxide emissions, but the effect was not statistically significant after controlling for non-random selection into the Protocol with a random trend estimation model that accounted for time trends before and after the Protocol. 	<ul style="list-style-type: none"> • The Helsinki Protocol did not cause lower sulfur dioxide emissions among ratifying states. • The better environmental performance of ratifiers is likely attributable to domestic factors present before the Protocol was adopted.
88. Breitmeier H, Young O, Zurn M (2006) <i>Analyzing International Environmental Regimes: From Case Study to Database.</i> Cambridge: MIT Press. 336 p. [PS]	<ul style="list-style-type: none"> • Do international environmental laws change state behavior and improve the problems they seek to address? • What are the characteristics of successful laws? 	<ul style="list-style-type: none"> • Descriptive statistics of environmental data and the characteristics of 23 international environmental laws from 1946-1998. 	<ul style="list-style-type: none"> • State behaviour met or exceeded legal requirements in 62% of cases. • Coders perceived that laws influenced state behavior in 86% of cases. • Laws seemed to motivate state compliance with mandated behavioral changes more than actually improve the environment. 	<ul style="list-style-type: none"> • Adopting international laws is followed by significant compliance behavior. • Laws are more effective at promoting states to meet the laws' behavioral goals than at solving the underlying problem they seek to address.
89. Bernauer T, Siegfried T (2008) <i>Compliance and Performance in International Water Agreements: The Case of the Naryn/Syr Darya Basin. Global Governance</i> 14: 479-501. [PS]	<ul style="list-style-type: none"> • Did the 1998 Naryn/Syr Darya basin agreement achieve state compliance and optimal water management? 	<ul style="list-style-type: none"> • Time-series analysis using data on water release from the Toktogul reservoir, the main reservoir of the Naryn/Syr Darya basin, from 1980-2006. 	<ul style="list-style-type: none"> • Water release targets set in the agreement were widely met, indicating strong state compliance. • Implementation of the agreement's provisions did not achieve optimal water release. 	<ul style="list-style-type: none"> • The Naryn/Syr Darya basin agreement induced state compliance with water management provisions but did not end up achieving the goal that was sought.

Panel A1.5: Summaries of 10 Quantitative Evaluations of International Environmental Law (Continued)

Studies	Questions	Methods	Findings	Authors' Conclusions
90. Breitmeier H, Underdal A, Young OR (2011) The Effectiveness of International Environmental Regimes: Comparing and Contrasting Findings from Quantitative Research. <i>International Studies Review</i> 13: 579-605. [PS]	<ul style="list-style-type: none"> • What are the effects of international environmental laws? • What are the factors that may contribute to their effectiveness? 	<ul style="list-style-type: none"> • Conducted further statistical analyses on datasets from Miles et al. (2002) and Breitmeier et al. (2006) including environmental data and characteristics of 14 and 23 international environmental laws, respectively. 	<ul style="list-style-type: none"> • In both data sets, international laws were usually associated with positive environmental effects, with clear knowledge of the problem associated with effectiveness. • Divergent interests among member states was associated with poor regime performance, while majority voting was associated with better performance. 	<ul style="list-style-type: none"> • International environmental laws can make significant contributions to solving environmental problems. • Effectiveness may be contingent on clear knowledge of the problem, similar interests among member states, and low-threshold decision rules.

CFC = Chlorofluorocarbon | GNP = Gross National Product | PS = Political Science

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Appendix 2: Examples of Accountability Mechanisms

Panel A2.1: Nine International Agreements and their Associated Accountability Mechanisms

Agreement	Transparency Mechanisms	Oversight Mechanisms	Complaint Mechanisms	Enforcement Mechanisms
Health				
1) International Health Regulations	State Parties and the Director-General of the World Health Organization (WHO) are to report to the World Health Assembly (WHA) on the implementations of the Regulations.	<p>WHO is to periodically conduct studies to review and evaluate the Regulations, particularly provisions regarding health surveillance, and submit its findings to the WHA.</p> <p>The WHA is to periodically review implementation of the Regulations and can request the advice of a Review Committee; an expert committee appointed by the Director-General.</p> <p>The Review Committee is to meet periodically to make recommendations to the Director-General about the functioning of the Regulations. The Director-General should transmit these recommendations to the WHA.</p>	<p>Disputes between Parties about the interpretation or application of the Regulations are to be settled first through negotiation or any other peaceful means of their choice, including good offices, mediation, or conciliation.</p> <p>Unresolved disputes can be mediated by the Director-General, or adjudicated through binding arbitration if among states that have voluntarily accepted arbitration as compulsory with regard to all disputes concerning the interpretation or application of the Regulations.</p> <p>Intractable disputes can be referred to the International Court of Justice.</p>	None.
2) WHO Framework Convention on Tobacco Control	Each Party is required to submit to the Conference of the Parties periodic reports on its implementation of the Convention, which are to include information on: legislative, executive, administrative, or other measures taken to implement the Convention; any constraints or barriers encountered, and measures taken to overcome these barriers; financial and technical assistance provided or received for tobacco control; tobacco research and surveillance; tobacco taxation rates; tobacco consumption trends; data on tobacco trade, storage, and distribution.	The Conference of the Parties is to consider reports submitted by the Parties and adopt regular reports on the overall implementation of the Convention.	<p>Disputes between Parties regarding the interpretation or application of the Convention are first to be settled through negotiation or any other peaceful means of their choice, including good offices, mediation, or conciliation.</p> <p>Unresolved disputes can be resolved through ad hoc arbitration in accordance to procedures adopted by the Conference of the Parties.</p>	None.

Panel A2.1: Nine International Agreements and their Associated Accountability Mechanisms (Continued)

Agreement	Transparency Mechanisms	Oversight Mechanisms	Complaint Mechanisms	Enforcement Mechanisms
Human Rights				
3) International Covenant on Economic, Social and Cultural Rights	State Parties are to report to the United Nations (UN) Secretary-General on the measures adopted and progress made in achieving the observance of the rights described in the Covenant. The Secretary-General is then to transmit the reports to the UN Economic and Social Council and other specialized agencies.	<p>The UN Economic and Social Council is to review reports from State Parties and can submit reports to the UN General Assembly with a summary of the information received and recommendations.</p> <p>UN specialized agencies may report to the Economic and Social Council about progress made in achieving the observance of the provisions falling within the scope of their activities and may provide recommendations.</p> <p>The UN Economic and Social Council may transmit reports from State Parties and specialized agencies to the Human Rights Council.</p> <p>Under the Optional Protocol, if the Committee receives reliable information indicating grave or systematic violations by a State Party of any of the rights set forth in the Covenant, the Committee shall invite that State Party to cooperate in the examination of the information. The Committee may designate one or more of its Members to conduct an inquiry and to report urgently to the Committee. After examining the findings of such an inquiry, the Committee shall transmit these findings to the State Party concerned with any comments and recommendations. The State Party concerned shall, within six months, submit its observations to the Committee.</p>	<p>Under the Optional Protocol, communications may be submitted by or on behalf of individuals or groups of individuals claiming to be victims of a violation of any of the rights set forth in the Covenant. The Committee is to bring the communication to the attention of the State Party concerned. Within six months, the receiving State Party is to explain or clarify the matter and the remedy, if any. The Committee is to make available its good offices to the Parties concerned with a view to reaching a friendly settlement of the matter. If unsuccessful, the Committee shall continue to examine the communications received and shall transmit its views on the communication, together with its recommendations, if any, to the Parties concerned. The State Party shall give due consideration to the views and recommendations of the Committee and shall submit to the Committee, within six months, a written response, including information on any action taken in the light of the views and recommendations of the Committee.</p> <p>Under the Optional Protocol, a State Party that considers that another State Party is not fulfilling its obligations can initiate a process resembling the process described above.</p>	None.

Panel A2.1: Nine International Agreements and their Associated Accountability Mechanisms (Continued)

Agreement	Transparency Mechanisms	Oversight Mechanisms	Complaint Mechanisms	Enforcement Mechanisms
<p>4) Convention against Torture and Other Cruel, Inhuman or Degrading Treatment or Punishment</p>	<p>State Parties are to report to the Committee against Torture on measures taken to implement the Convention at least every four years. The Committee consists of ten experts.</p> <p>The UN Secretary-General shall transmit the report to all State Parties.</p>	<p>Reports from State Parties are to be reviewed by the Committee against Torture, which can make comments and suggestions to the State Parties.</p> <p>The Committee is to submit an annual report on its activities to the State Parties and the UN General Assembly.</p> <p>If the Committee has evidence suggesting that torture is being systematically practiced in the territory of a State Party, the Committee can designate its Members to make an inquiry into the issue. The Committee is then to report its findings and suggestions to the State Party concerned. The process is to be confidential, but after consultations with the State Party, a summary account can be included in the Committee's annual report.</p>	<p>If a State Party notifies another State Party that the former considers that the latter is not giving effect to the provisions of the Convention, the receiving State is to reply with an explanation or clarification.</p> <p>If the matter is not settled within six months, either State can refer the matter to the Committee against Torture. The Committee is to make available its good offices to the State Parties concerned with a view to a friendly solution of the matter. The Committee is to submit a report to the State Parties summarizing the facts and any solution reached within 12 months.</p> <p>Communications from or behalf of individuals can be submitted to the Committee against Torture about alleged violation of any provision of the Convention. The Committee is to bring this communication to the attention of the State Party concerned, and the receiving State is to submit an explanation or clarification to the Committee within six months. The Committee is to examine the matter and forward its views to the individual and State Party concerned.</p> <p>Disputes between State Parties about the interpretation or application of the Convention are first to be sought settled through negotiation and then arbitration. If no agreement is reached on the organization of the arbitration, any one of the Parties may refer the dispute to the International Court of Justice.</p>	<p>None.</p>

Panel A2.1: Nine International Agreements and their Associated Accountability Mechanisms (Continued)

Agreement	Transparency Mechanisms	Oversight Mechanisms	Complaint Mechanisms	Enforcement Mechanisms
5) Convention on the Rights of Persons with Disabilities	<p>Each State Party is to collect statistics and research data to help implement policies related to the Convention, and to disseminate this to the public and ensure accessibility to persons with disabilities and others.</p> <p>Each State Party is to submit to the Committee on the Rights of Persons with Disabilities a comprehensive report on measures taken and progress made at least every four years or whenever the Committee requests.</p> <p>Each report is to be made available to the public and all State Parties.</p>	<p>The Committee is to consider reports from each State Party, make suggestions and recommendations, and can request further information.</p> <p>The Committee can itself examine the State Party’s implementation of the Convention if submission of a report is significantly overdue.</p> <p>The Committee is to report every two years to the UN General Assembly and the UN Economic and Social Council and make suggestions and recommendations based on the State Parties' reports.</p>	None.	None.
Environment				
6) UN Framework Convention on Climate Change (including the Kyoto Protocol)	<p>Each Party is to periodically communicate to the Conference of the Parties a national inventory of anthropogenic emissions and removals. The 43 “Annex I” State Parties, those with industrialized or transitioning economies, are to submit annual inventories. Each Party is also to communicate the measures taken to implement the Convention. Parties to the Kyoto Protocol are to include information related to its implementation.</p> <p>The Secretariat is to make communications publicly available.</p>	<p>National communications and greenhouse gas inventories from Annex I Parties are to be reviewed by international teams of independent experts. The results of their work are to be made publicly available. For Parties to the Kyoto Protocol, each Parties’ report is to be reviewed by an expert review team. All review reports are to be forwarded to the Compliance Committee for consideration. Expert review teams are also to prepare a report for the Conference of Parties.</p> <p>The Conference of Parties is to regularly review implementation by the Parties and the overall effects of the measures taken.</p>	<p>The Compliance Committee of the Kyoto Protocol is to consider questions of implementation, which can be raised by expert review teams or a Party to the Protocol. The Facilitative Branch is to provide advice and facilitation to Parties in implementing requirements.</p> <p>Disputes concerning interpretation or application of the Convention is first to be settled through negotiation or other peaceful means. Unsettled disputes can be referred to the International Court of Justice or arbitration if the Parties have declared one or both of these means as compulsory. If unsuccessful, the dispute is to be submitted to a conciliation commission. The Kyoto Protocol contains similar provisions.</p>	<p>The Enforcement Branch of the Kyoto Protocol’s Compliance Committee oversees reporting requirements. The Branch can suspend eligibility to participate in the Protocol.</p> <p>The Enforcement Branch also determines whether a Party is non-compliant with its emissions commitment. If a Party’s emissions exceed its holdings of Kyoto Protocol units, it must make up the difference, plus a penalty of 30%, in the next commitment period. The Party must also develop a compliance action plan, and its eligibility to “sell” credits under emissions trading will be suspended.</p>

Panel A2.1: Nine International Agreements and their Associated Accountability Mechanisms (Continued)

Agreement	Transparency Mechanisms	Oversight Mechanisms	Complaint Mechanisms	Enforcement Mechanisms
<p>7) Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (“Aarhus Convention”)</p>	<p>Each Party is to report regularly to the Meeting of the Parties on their achievements.</p>	<p>The Compliance Committee is to prepare, at the request of the Meeting of Parties, a report on compliance with or implementation of the Convention.</p> <p>The Compliance Committee is to monitor, assess, and facilitate the implementation of and compliance with the Parties’ reporting requirements.</p> <p>The Meeting of the Parties is to keep under continuous review the implementation of the Convention.</p> <p>The Meeting of the Parties is to review the policies for and legal and methodological approaches to access to information, public participation in decision-making, and access to justice, with a view of further improving them.</p>	<p>The Compliance Committee can review a Party’s compliance, and this process can be triggered by a Party to the Convention, the Secretariat, members of the public or non-governmental organizations (NGOs), or the Committee’s own initiative. The Committee can make recommendations to the Meeting of the Parties or directly to individual Parties.</p> <p>Disputes between Parties on the interpretation or application of the Convention are first to be solved through negotiation or by any other means acceptable to the Parties. Unresolved disputes are to be submitted to either the International Court of Justice or an arbitration tribunal.</p>	<p>The Meeting of the Parties can, upon consideration of a report and any recommendations of the Compliance Committee, decide upon appropriate measures to bring about full compliance with the Convention. These measures may include to provide advice and facilitate assistance, issue declarations of non-compliance, issue cautions, or suspend special rights and privileges accorded to the Party under the Convention.</p>
<p>8) Minamata Convention on Mercury</p>	<p>Each Party is to facilitate the exchange of information, including epidemiological information concerning health impacts associated with exposure to mercury and mercury compounds.</p> <p>Each Party is to provide public information on epidemiology, results of monitoring activities, and activities to meet the obligations under the Convention.</p> <p>Each Party is to report to the Conference of the Parties on the measures it has taken to implement the Convention, the effectiveness of those measures, and possible challenges.</p>	<p>The Implementation and Compliance Committee is to review compliance with the Convention.</p> <p>The Conference of the Parties is to keep under continuous review and evaluation the implementation of the Convention and to consider any recommendations from the Committee.</p> <p>The Conference of the Parties is to evaluate the effectiveness of the Convention periodically, based on reports from the Parties and other available information.</p>	<p>Disputes concerning interpretation or application of the Convention is first to be sought settled through negotiation or other peaceful means. If unsuccessful, the dispute can be sought settled through arbitration or the International Court of Justice if the Parties have declared one or both of these means as compulsory. If unsuccessful or if the Parties have not accepted the same means of dispute settlement, the dispute is to be submitted to a conciliation commission.</p>	<p>None.</p>

Panel A2.1: Nine International Agreements and their Associated Accountability Mechanisms (Continued)

Agreement	Transparency Mechanisms	Oversight Mechanisms	Complaint Mechanisms	Enforcement Mechanisms
Trade				
<p>9) Marrakesh Agreement establishing the World Trade Organization</p>	<p>Each Member is to notify other Members, through the appropriate body, of changes in relevant laws, regulations, policy statements, and public notices. A consolidated notification is to be provided to the Secretariat annually.</p> <p>Each Member is to periodically report to the Trade Policy Review Body (TPRB) on their trade policies and practices. The Secretariat is also to provide a report to the TPRB on the trade policies and practices of Members under review.</p> <p>The Secretariat is to periodically report to the TPRB on the implementation of the Agreement.</p> <p>The reports by the Member under review and by the Secretariat, together with the TPRB meeting minutes, are to be published and forwarded to the Ministerial Conference.</p>	<p>Based on reports from Members and the Secretariat, the TPRB is to periodically review the trade policies and practices of Members.</p> <p>Following adoption of a panel or Appellate Body report, the Party is to notify its intentions on implementation of the recommendations. The Dispute Settlement Body (DSB) is to keep the intended implementation under regular surveillance by keeping it in its meeting agenda until the issue is resolved. The Member concerned is to provide DSB with a status report on its implementation of the recommendations or rulings at least 10 days before each DSB meeting.</p>	<p>In the event of a dispute, the complaining Member can request another Member to enter into consultations. The Member to which the request is made shall do so within 30 days.</p> <p>If the consultations fail to settle the dispute within 60 days, the complaining Party may request the DSB to establish a panel. The panel is to be composed of three or five well-qualified individuals.</p> <p>Panel reports are to be completed within three or six months, depending on urgency of the matter. Panel reports are to be adopted within 60 days of issuance, unless the DSB decides against it or a Party decides to appeal.</p> <p>During all stages, the Parties can request other means of dispute settlement, such as good offices, conciliation, mediation, and arbitration.</p> <p>If one or both Parties appeal to the panel's decision, the Appellate Body is to conduct a review within 60 or 90 days. The resulting report is to be unconditionally accepted by the Parties within 30 days, unless the DSB decides otherwise.</p> <p>If the DSB authorizes the complaining Party to suspend application of concessions or other obligations, disagreements on the level of suspension or principles of retaliation can be referred to arbitration.</p>	<p>If the Member concerned fails to bring the measure found to be inconsistent with a covered agreement into compliance therewith or otherwise comply with the recommendations and rulings within the reasonable period of time, the Member shall, if so requested, enter into negotiations with any Party having invoked the dispute settlement procedures, with a view to developing mutually acceptable compensation.</p> <p>If no satisfactory compensation is agreed upon within 20 days, any Party having invoked the dispute settlement procedures may request from the DSB authorization to suspend application of concessions or other obligations (i.e., to impose trade sanctions).</p>

Appendix 3a: Full Description of Study Methodology

Overview

This study was developed to assess the scientific quality and sensationalism of news media coverage during global pandemics like SARS (2003) and H1N1 (2009). The goal of assessing these qualities is to detect shortcomings of media coverage and identify areas for improvement in future news reporting during pandemic periods. Articles published during the SARS and H1N1 pandemic alert periods were retrieved from the LexisNexis database based on searches for related terms. In addition, we conducted a literature review of strategies to evaluate sensationalism and scientific quality. Drawing on the Index of Scientific Quality developed by Oxman et al. (1993) and a pragma-linguistic framework of sensational illocutions outlined by Molek-Kozakowska (2013), we developed a new standardized method and data abstraction tool for rating news media articles for these characteristics. Three research assistants coded 500 news media articles using this data abstraction tool. The coded articles were used as a training set for a text analysis classification tool, MaxEnt, on 163,433 news media articles. Based on the training set data, MaxEnt estimated both the probability that an article was relevant to SARS or H1N1 and assigned it a score for each of scientific quality and sensationalism.

Step 1: Pilot Testing Search Strategies to Retrieve News Media Articles

We first conducted pilot searches to select the database that would be best to use for this study. Factiva and LexisNexis databases were both considered. At the time of the study, LexisNexis provided access to over 15,000 sources, including 3,000 newspapers and 2,000 magazines from around the world. Factiva provided access to over 35,000 sources. After researching synonyms for the two pandemics, search phrases were entered into both databases to assess the breadth and relevance of the results (Panel A3a.1).

Panel A3a.1: Search Strategies to Retrieve News Media Articles

Search Terms	Search Limitations	LexisNexis Results	Factiva Results	Search Date
("pandemic" OR "epidemic" OR "outbreak") AND [{"SARS" OR "severe acute respiratory syndrome" OR "coronavirus"}]	March 17, 2009 – May 2010	998 articles	92,992 articles	July 24, 2013
("pandemic" OR "epidemic" OR "outbreak") AND ("H1N1" OR "S-OIV" OR "swine" OR "flu" OR "influenza")]	March 17, 2009 – May 2010	1,000 articles	104,475 articles	July 24, 2013
("SARS" or "severe acute respiratory syndrome" or "coronavirus" or "sars-cov" or "contagion" or "public health emergency of international concern")	March 15, 2003 – May 18, 2004, and in English	Not available	226,390 articles	August 5, 2013
(("flu" or "influenza") and ("pig" or "swine" or "hog")) or "h1n1" or "a(h1n1)" or "s-oiv" or "contagion" or "public health emergency of international concern"	April 23, 2009 – September 10, 2010, and in English	Not available	244,416 articles	August 5, 2013
"SARS" or "severe acute respiratory syndrome" or "coronavirus" or "sars-cov"	March 15, 2003 – May 18, 2004, and in English	Not available	224,340 articles	August 12, 2013
(("flu" or "influenza") and ("pig" or "swine" or "hog")) or "h1n1" or "a(h1n1)" or "s-oiv" or "swine origin influenza"	April 23, 2009 – September 10, 2010, and in English	Not available	225,024 articles	August 12, 2013

We analyzed the overall relevance of the articles found by conducting a random sample of the articles. Using R 2.15.1, a random sample of 20 articles was selected from each search, using seed "12345." For the SARS search on July 24, 2013, 16/20 articles were deemed relevant. For the H1N1 search, 12/20 articles were deemed relevant. The search was revised and retried on the Factiva database on August 5, 2013. Using the same sampling procedure as above, 19/20 articles on SARS were and 15/20 articles on H1N1 were deemed relevant. The search was revised and retried on the Factiva database on August 12, 2013. Using the same sampling procedure as above, 19/20 articles on SARS and 20/20 articles on H1N1 articles were deemed relevant.

While Factiva yielded highly relevant results, issues surrounding their licensing and access to articles prevented it from being a feasible option. Specifically, Factiva strictly limits the number of

articles one can download and email requests to their offices for special access to the database were denied. Additionally, there were concerns about the quality of articles compared to LexisNexis. Social science librarians at Harvard University advised that LexisNexis would be a better source because of its extensive collection of newspaper and magazine articles. For these reasons, LexisNexis was chosen as the best database for this study. While Factiva retrieved more articles per search (i.e., increased sensitivity), LexisNexis provided more relevant search results (i.e., increased specificity). Initial search results for LexisNexis appear low, as the database limits results to the first 1,000 results if there are more than that number in a given search. Therefore, the final search was conducted day-by-day to make sure all relevant articles were retrieved.

Step 2: Implementing the Optimized Search Strategy for Retrieving News Media Articles

The final searches were conducted through the LexisNexis database. The SARS search (March 15, 2003 – May 18, 2004) retrieved 89,846 news media articles, and the H1N1 search (April 23, 2009 – September 10, 2010) retrieved 73,587 news media articles, for a total of 163,433 articles. Articles were downloaded and spliced using a script coded in the Python language to put news media articles into individual text files. Another script copied the metadata from these articles into a CSV file.

Step 3: Identifying Methods for Evaluating Scientific Quality and Sensationalism of News

We conducted literature reviews of studies evaluating the sensationalism and scientific quality of articles to gain a better understanding of how to create the initial data abstraction form. On July 29, 2013 and August 1, 2013 we conducted searches on scientific quality through PubMed and Google Scholar with the search terms (“academic” OR “scientific” AND “quality”) AND (“evaluate” OR “rate” OR “assess” OR “validity”). Panel A3a.2 summarizes the most relevant articles that helped inform our understanding of how to evaluate scientific quality.

Panel A3a.2: Articles Describing Indicators of Scientific Quality

Article	Indicators of Scientific Quality
Eysenbach G, Powell J, Kuss O, Sa ER (2002) Empirical studies assessing the quality of health information for consumers on the world wide web: a systematic review. <i>JAMA</i> 287(20): 2691-2700.	Accuracy, completeness, readability, design, disclosure of authorship/ownership/sponsorship/advertising, sources clear, statement of purpose, date of creation/update, author/physician credentials, author's affiliation, references provided, links provided, feedback mechanisms/fax number/email address provided, copyright notice <i>*Yes/No/Partially</i>
Soot LC, Moneta GL, Edwards JM (1999) Vascular surgery and the Internet: a poor source of patient-oriented information. <i>Journal of Vascular Surgery</i> 30(1): 84-91.	Author affiliation (academic, news, physician)
Oxman AD, Guyatt GH, Cook DJ, Jaeschke R, Heddle N, Keller J (1993). An index of scientific quality for health reports in the lay press. <i>Journal of Clinical Epidemiology</i> 46(9): 987-1001.	Index of Scientific Quality: applicability, opinion vs fact, valid information, magnitude of findings, precision of findings, consistency, consequences of findings, overall quality rating <i>*5-point scale, each variable weighted differently</i>
Charnock D, Shepperd S, Needham G, Gann R (1999) DISCERN: an instrument for judging the quality of written consumer health information on treatment choices. <i>Journal of Epidemiology and Community Health</i> 53(2): 105-111.	DISCERN method: explicit aims, aims achieved, relevance to patients, sources/currency of information, bias, reference to uncertainty, etc. <i>*5-point scale</i>

Additionally, searches were conducted on July 29, 2013 and August 1, 2013 using both PubMed and Google Scholar with the search terms (“sensationalism” OR “sensationalist”) AND (“news” OR “newspaper” OR “print” OR “media”). Panel A3a.3 summarizes the most relevant articles that helped inform our understanding of how to evaluate sensationalism.

Panel A3a.3: Articles Describing Indicators of Sensationalism

Article	Indicators of Sensationalism
Niederkröthenthaler T, Voracek M, Herberth A, Till B, Strauss M, Etzersdorfer E, Eisenwort B, Sonneck G (2010) Role of media reports in completed and prevented suicide: Werther v. Papageno effects. <i>British Journal of Psychiatry</i> 197(3): 234-243.	Sentence length, article length, dichotomous thinking, type/token ratio, photographs, emotionality <i>*programmed MySQL database to search for key terms in text</i>
Pirkis JE, Burgess PM, Francis C, Blood RW, Jolley DJ (2006) The relationship between media reporting of suicide and actual suicide in Australia. <i>Social Science & Medicine</i> 62(11): 2874-2886.	Item type (“news, feature, editorial, other”), page number
Swain KA (2007) Outrage factors and explanations in news coverage of the anthrax attacks. <i>Journalism & Mass Communication Quarterly</i> 84(2): 335-352.	Speculation, conflicting reports, hoaxes/false alarms, vague advice, off-record attribution
Spratt M (2001) Science, journalism, and the construction of news: how print media framed the 1918 influenza pandemic. <i>American Journalism</i> 18(3): 61-79.	Citing mortality figures, naming victims
Burgers C, de Graaf A (2013) Language intensity as a sensationalistic news feature: the influence of style on sensationalism perceptions and effects. <i>European Journal of Communication Research</i> 38(2): 167-188.	Use of intensifiers as descriptors (e.g., gigantic, very, etc.)

While many of these articles explored ways to identify sensationalism in the media, none had proposed a standardized method for evaluating sensationalism. Another Internet search of sensationalism in the news was conducted on August 12, 2013 using the same search terms but this time mining the retrieved articles’ citations. This search was conducted in the hope of finding any overlooked approaches, methods or frameworks that could be helpful for evaluating sensationalism of news media coverage. Further research showed that there were multiple articles that had evaluated or explored sensationalism of specific news topics or mediums, such as suicide, health scares and television footage. Panel A3a.4 lists the main findings of the most relevant articles.

Panel A3a.4: Articles Describing Methods for Evaluating Sensationalism in the Media (Continued)

Source	Topic	Content Analysis	Definitions/Measures
Burgers C, de Graaf A (2013) Language intensity as a sensationalistic news feature: the influence of style on sensationalism perceptions and effects. <i>Communications</i> 38(2): 167-188.	Sensationalism in print media	<ul style="list-style-type: none"> • Use of 16 intensifiers/densifiers as descriptors (impact on readers' feelings of newsworthiness, attitude, belief content) 	Sensationalism: "content features or formal features of messages that have the capability to provoke attention and arousal responses in viewers" (168).
Grabe ME, Zhou S, Barnett B (2001) Explicating sensationalism in television news: content and the bells and whistles of form. <i>Journal of Broadcasting & Electronic Media</i> 45(4): 635-655.	Sensationalism in television news	<ul style="list-style-type: none"> • Content categories (health, politics, etc.) • Video maneuvers (zooming, eyewitness angles) • Transitional effects • Audio effects • Newscaster voice attributes 	Sensationalism, a quality of stories that provokes "more sensory and emotional reactions than what society has deemed proper to desire or experience" (637).
Molek-Kozakowska K (2013) Towards a pragma-linguistic framework for the study of sensationalism in news headlines. <i>Discourse & Communication</i> 7(2): 173-197.	Sensationalism in news media	<p>List of 120 most-read UK articles:</p> <ul style="list-style-type: none"> • asked "how sensational was this article?" on 5-point Likert scale with no categories used • Elements of sensationalism: <ul style="list-style-type: none"> ○ exposing ○ speculating ○ generalizing ○ warning ○ extolling 	Sensationalism: "discourse strategy of 'packaging' information in news headlines in such a way that news items are presented as more interesting, extraordinary and relevant than might be the case" (173).
Niederkroenthaler T, Voracek M, Herberth A, Till B, Strauss M, Etzersdorfer E, et al. (2010) Role of media reports in completed and prevented suicide: Werther v. Papageno effects. <i>British Journal of Psychiatry</i> 197(3): 234-243.	Suicide	<ul style="list-style-type: none"> • sentence length • article length • dichotomous thinking (looking at list of words expressing certainty & giving each a score) • type/token ratio • photographs • emotionality (183 words from German affective dictionary) • focus of article 	Relationship between "media content" and suicide rates. Sensationalism: "large amounts of emotionality, reduction in complexity (as indicated by short sentences), large amounts of dichotomous thinking and a lack of richness of vocabulary" (236).

Panel A3a.4: Articles Describing Methods for Evaluating Sensationalism in the Media (Continued)

Source	Topic	Content Analysis	Definitions/Measures
Pirkis JE, Burgess PM, Francis C, Blood RW, Jolley DJ (2006) The relationship between media reporting of suicide and actual suicide in Australia. <i>Social Science & Medicine</i> 62(11): 2874-2886.	Suicide	<ul style="list-style-type: none"> • item page number (front page/not) • item type (news, feature, editorial, other). • item date • the focus of the item (completed suicide, attempted suicide, suicidal ideation) • the content of the item (experience, statistics, research, policy/programs, opinion piece, etc) • suicide method referred to 	<p>No definition of sensationalism given.</p> <p>Measuring impact on suicide rates following content of news articles explicating suicide.</p>
Ransohoff DF, Ransohoff RM (2001) Sensationalism in the media: when scientists and journalists may be complicit collaborators. <i>Effective Clinical Practice</i> 4(4): 185-188.	Sensationalism in medical and science reporting	<p>Explanations of why sensationalism in medical reporting happens and how people can hopefully reduce it.</p> <ul style="list-style-type: none"> • easier than reporting more complex issues • gains readership • scientists may benefit from publicity • suggest certifying medical journalists • form professional organization to monitor sensationalism 	<p>No formal definition of sensationalism, but do say that “complexity of a problem may be sacrificed to the expediency of a simple and gripping story” (185).</p>
Spratt M (2001) Science, journalism, and the construction of news: how print media framed the 1918 influenza pandemic. <i>American Journalism</i> 18(3): 61-79.	1918 Flu Pandemic	<p>Coders evaluate:</p> <ul style="list-style-type: none"> • story content • use of mortality figures • use of authoritative sources, • use of biomilitaristic metaphor • mention of preventions or cures 	<p>Objectivity, empirical observation, reliance on expert sources</p>
Swain KA (2007) Outrage factors and explanations in news coverage of the anthrax attacks. <i>Journalism & Mass Communication Quarterly</i> 84(2): 335-352.	Anthrax reporting	<ul style="list-style-type: none"> • outrage rhetoric, including mentions of fear/panic, terrorism/bioterrorism, or contagion • speculation • conflicting reports • coverage of hoaxes/false alarms • vague advice • off-record attribution 	<p>Measuring factors that influence “outrage” after watching or reading news items covering anthrax reports</p>

Panel A3a.4: Articles Describing Methods for Evaluating Sensationalism in the Media (Continued)

Source	Topic	Content Analysis	Definitions/Measures
Tannenbaum PH, Lynch MD (1960) Sensationalism: the concept and its measurement. <i>Journalism & Mass Communication Quarterly</i> 37(3): 381-392.	Measures of sensationalism	Sendex technique (on a scale) <ul style="list-style-type: none"> • accurate - inaccurate • good - bad • responsible – irresponsible • wise – foolish • acceptable – unacceptable • colorful – colorless • interesting – uninteresting • exciting – unexciting • hot – cold • active – passive • agitated – calm • bold – timid 	“Sensationalism means that the stories in a publication are under- distanced: that is, that they supply more sensations and emotional reactions than we desire individually or than society has deemed proper for us to desire. It ...has to do with the psychological distance we wish to keep between our- selves and our perceptions of events in the world” (382).
Vettehen PH, Nuijten K, Peeters A (2008) Explaining effects of sensationalism on liking of television news stories the role of emotional arousal. <i>Communication Research</i> 35(3): 319-338.	Liking of television news stories	<ul style="list-style-type: none"> • story content (negative content is sensationalist) • camera positions • background music • zoom-in movements • short story duration • laypersons commenting on an issue 	Sensationalism: “capability to provoke attention or arousal responses in viewers “(320).

Step 4: Adapting an Existing Tool for Quantitatively Measuring Scientific Quality

Using these literature reviews, a pilot data abstraction tool was developed drawing questions from Oxman et al.’s Index of Scientific Quality and Molek-Kozakowska’s framework for assessing sensationalism in the news media. Oxman et al. (1993) was selected because it was a peer-reviewed and empirically validated measure of scientific quality. After surveying experts in research methodology, questions were developed by Oxman et al. that each evaluate the quality of health-related news reports; specifically, epidemiologists, statisticians and journalism scholars at McMaster University and the University of Western Ontario in Canada were asked to read 85 articles related to health reports. They were then asked to apply Feinstein’s “framework for evaluating sensibility”⁶ to decide which questions to include in the index. The questionnaire initially included 21 items, but these were then reduced to eight items after initial rounds of pre-testing. The questions cover: 1) applicability, 2)

opinions vs. facts, 3) validity, 4) magnitude, 5) precision, 6) consistency, 7) consequences, and 8) an overall assessment of the scientific quality.

Step 5: Developing a New Tool for Quantitatively Measuring Sensationalism

Molek-Kozakowska (2013) was selected to inform the development of the data abstraction tool's questions evaluating sensationalism, as this was the only source that had devised a rating system for sensationalism that was applicable to news media articles. This method did not rely on simple lexicon or dictionary methods, which was a common feature of other approaches we considered. Molek-Kozakowska (2013) developed six sensationalist illocutions commonly found in the news media by surveying a focus group. These illocutions included 1) exposing, 2) speculating, 3) generalizing, 4) extolling, 5) warning, and 6) other/unspecified. The focus group read the most popular headlines in 2012 from a British news tabloid and identified and discussed what aspects made a headline more or less sensationalist. Through these discussions, Molek-Kozakowska (2013) identified these six sensationalist illocutions.

Using the eight questions from Oxman et al.'s (1993) Index of Scientific Quality and the six questions from Molek-Kozakowska's (2013) illocutions of sensationalism, the pilot data abstraction tool was developed. The questions adapted from these sources were not altered at this stage, except for adding examples to the questions from Oxman et al. (1993) in order to match the style of the Molek-Kozakowska questions – which included examples – as well as provide additional clarity. A professional copy editor then revised the data abstraction tool to maximize clarity and understanding.

Step 6: Pilot Testing the Quantitative Measurement of Scientific Quality and Sensationalism

To pilot test the data abstraction tool, a random sample of twenty articles was drawn from the complete article set (using R 2.15.1, seed 12345) and then scored by three research assistants. Of these

twenty articles (average word count: 440.15), nine articles were deemed relevant by all three research assistants. Each research assistant independently coded the eligible articles on eight measures of scientific quality and six measures of sensationalism. Each element was rated on a five-point Likert-type scale. Cohen's ^{**} and Fleiss' kappa scores of inter-rater reliability and intraclass correlation coefficients ^{††} were calculated to assess agreement among raters. The specific ICC calculated was an ICC 3, which is for a fixed number of scorers where every scorer rates every category. ^{††} While Fleiss et al. (1973) ^{§§} "[establish] the equivalence of weighted kappa with the intraclass correlation coefficient under general conditions" (614), both kappa scores and intraclass correlation coefficients were calculated for added completeness (Panel A3a.5).

Panel A3a.5: Assessing Agreement Among Raters in the First Pilot of 20 Articles

Question	2 raters p	2 raters kappa	2 raters p	2 raters kappa	2 raters p	2 raters kappa	Fleiss p	Fleiss kappa	p-value	ICC
1	0.000	0.900	0.000	0.824	0.000	0.892	0.000	0.635	0.000	0.980
2	0.001	0.765	0.000	0.867	0.001	0.760	0.000	0.470	0.000	0.930
3	0.000	0.868	0.000	0.894	0.000	0.830	0.000	0.413	0.000	0.950
4	0.000	0.824	0.000	0.748	0.000	0.702	0.000	0.429	0.000	0.930
5	0.005	0.553	0.001	0.768	0.028	0.387	0.000	0.287	0.000	0.830
6	0.004	0.590	0.001	0.739	0.002	0.577	0.000	0.392	0.000	0.880
7	0.000	0.841	0.001	0.769	0.000	0.880	0.000	0.429	0.000	0.950
8	0.000	0.918	0.000	0.906	0.000	0.854	0.000	0.466	0.000	0.970
9	0.000	0.811	0.051	0.337	0.073	0.310	0.000	0.455	0.000	0.880
10	0.000	0.748	0.002	0.563	0.000	0.765	0.000	0.493	0.000	0.920
11	0.001	0.677	0.027	0.378	0.160	0.302	0.000	0.478	0.000	0.810
12	0.000	0.821	0.030	0.433	0.001	0.667	0.000	0.366	0.000	0.920
13	0.001	0.649	0.221	0.269	0.001	0.694	0.000	0.610	0.000	0.770
14	0.000	0.829	0.010	0.468	0.008	0.547	0.000	0.475	0.000	0.940
Overall	0.000	0.710	0.000	0.723	0.000	0.796	0.000	0.458	0.000	0.930

Using data and lessons learned from this pilot testing exercise, the data abstraction tool was revised to contain only six questions assessing scientific quality and six questions assessing

^{**} Cohen J (1960) A coefficient of agreement for nominal scales. *Educational and Psychological Measurement* 20(1): 37-46.

^{††} Bartko JJ (1966) The intraclass correlation coefficient as a measure of reliability. *Psychological Reports* 19(1): 3-11.

^{††} Shrout PE, Fleiss JL (1979) Intraclass correlations: uses in assessing rater reliability. *Psychological Bulletin* 86(2): 420-428.

^{§§} Fleiss JL, Cohen J (1973) The equivalence of weighted kappa and the intraclass correlation coefficient as measures of reliability. *Educational and Psychological Measurement* 33: 613-619.

sensationalism. Research assistants found a high degree of co-linearity and redundancy in certain questions modified from the Index of Scientific Quality. Consolidating to six questions allowed for clearer, more accurate scoring. In the final form, these categories for scientific quality and sensationalism were slightly revised given feedback from research assistants. The final categories on scientific quality were 1) applicability, 2) opinions vs. facts, 3) validity, 4) precision, 5) context, and 6) overall assessment. Other/unspecified was revised to be an overall score of sensationalism. The six questions on sensationalism remained the same for both the pilot and final data abstraction tool, with only minor changes to the phrasing of the sensationalist illocutions. The revision process consisted of analyzing kappa scores for each question and a conference call between research assistants to discuss areas for further clarification and improvement.

In parallel, the first twenty of these pilot articles were posted on Amazon's Mechanical Turk service to compare how other coders rated the same articles. To ensure that articles coded by the scorers – “Turks” – were done so to high standard, articles were rejected if randomly coded. “Random” articles were ones where the eligibility the Turk had selected was the opposite of what the three research assistants had selected. Other exclusionary criteria were if the publisher information was missing or incorrect, or if numbers were inconsistent (i.e., academic quality was rated “5” but the final overall score was a “1”). If a Turk submitted 3+ articles of poor quality, the user was blocked from submitting additional articles. Ultimately, the Mechanical Turk parallel study was discontinued due to poor coding quality and concerns over the validity of the results.

Step 7: Coding an Initial Training Set of 200 News Media Articles

Three research assistants coded a random sample of 200 articles (average word count: 554.5) to serve as the training set for a computer text analysis classification program. Of these articles, 76 were ultimately deemed relevant. After initial coding, there were still 8 articles where one of the three

research assistants disagreed on relevance. For these situations, an email discussion followed in order to elaborate on the thought process that led to the research assistant’s decision to include or exclude the article. The goal was to have 100% agreement on eligibility of each of the 200 articles in the training set. After discussing, all research assistants agreed in their decision to include or exclude a given article, leading to the 76 articles that were coded. Below are the kappa scores and intraclass correlation coefficients (ICC) for the coding of the 200 articles (Panel A3a.6).

Panel A3a.6: Assessing Agreement Among Raters in the Initial Training Set of 200 Articles

Question	[VT,TJ] p	[VT,TJ] kappa	[VT, JW] p	[VT, JW] kappa	[JW,TJ] p	[JW,TJ] kappa	Fleiss p	Fleiss kappa	p-value	ICC
1	0.000	0.900	0.000	0.942	0.000	0.906	0.000	0.726	0	0.99
2	0.000	0.961	0.000	0.962	0.000	0.960	0.000	0.740	0	0.98
3	0.000	0.891	0.000	0.905	0.000	0.922	0.000	0.689	0	0.96
4	0.000	0.931	0.000	0.912	0.000	0.873	0.000	0.633	0	0.98
5	0.000	0.954	0.000	0.942	0.000	0.895	0.000	0.632	0	0.98
6	0.000	0.951	0.000	0.971	0.000	0.958	0.000	0.843	0	0.99
7	0.000	0.949	0.000	0.860	0.000	0.840	0.000	0.653	0	0.95
8	0.000	0.939	0.000	0.804	0.000	0.828	0.000	0.746	0	0.94
9	0.000	0.924	0.000	0.825	0.000	0.949	0.000	0.758	0	0.95
10	0.000	0.913	0.000	0.854	0.000	0.912	0.000	0.715	0	0.96
11	0.000	0.911	0.000	0.902	0.000	0.919	0.000	0.838	0	0.93
12	0.000	0.970	0.000	0.936	0.000	0.944	0.000	0.763	0	0.96
Overall	0.000	0.922	0.000	0.895	0.000	0.930	0.000	0.703	0	0.98

Step 8: Applying Maximum Entropy Modeling to Evaluate All 163,433 News Media Articles

The coded articles were used as the training set for a maximum entropy modeling using the MaxEnt package (v1.3.3.1) for R statistical software (v2.15.1). The MaxEnt program constructs a logarithmic model based on the training set of text documents and estimates the likelihood of a specific article belonging to a given category. Maximum entropy works by multinomial logistic regression and is best suited for large data sets. The MaxEnt program makes a document-term matrix, where the documents are the rows and each word in the article is a column. Using word frequencies and

relationships between terms, MaxEnt creates a regression to predict the probability that a given text document belongs to each of the categories defined by the training documents.

Maximum entropy is one of many machine-learning approaches that can be used for text analysis, including naïve Bayes, K-nearest neighbor, support vector machines, boosting, and rule learning. The advantage of maximum entropy is that it does not assume independence of terms; this functionality allows for the use of bigrams and phrases in the modeling without the possibility of overlapping that would multiply the probability of a document being classified into one category or another. This means that future iterations of this maximum entropy model could differentiate between the phrases “is statistically significant” and “not statistically significant” without violating modeling assumptions. This would not be immediately possible if using, for example, a naïve Bayes approach – although the terms could be coded manually as different phrases.^{***} Maximum entropy modeling has been used in various fields of study (Panel A3a.7).

Panel A3a.7: Examples of Studies using Maximum Entropy Modeling for Text Classification (Continued)

Study	Objective	Results
Verma S, Vieweg S, Corvey W, Palen L, Martin JH, Palmer M, et al. (2011) Natural language processing to the rescue?: Extracting "situational awareness" tweets during mass emergency. Paper presented at the Fifth International AAAI Conference on Weblogs and Social Media; California, USA.	Demonstrate a means to automatically identify messages on Twitter related to situational awareness during mass emergencies	Classifier achieved >80% accuracy in categorizing tweets
Hillard D, Purpura S, Wilkerson J (2007) An active learning framework for classifying political text. Paper presented at: the 2007 Annual Meeting of the Midwest Political Science Association; 2007 Apr 14-17; Illinois, US.	Develop a framework and tools for topic classification by classifying Congressional bill titles as a proxy for the full text of Congressional bills	Maximum entropy model accuracy was 85.5% for major topic (20 classes) and 77% for subtopic (226 classes)
Mehra N, Khandelwal S, Patel P (2002) Sentiment identification using maximum entropy analysis of movie reviews. Stanford, CA: Stanford University.	Use movie reviews to train and test a classifier in recognizing patterns of word usage and subsequently placing text in categories without supervision	Accuracy was found to vary with the number of features included; highest accuracy achieved was 85%

^{***}Anjaria M, Guddeti RMR (2014) *A novel sentiment analysis of social networks using supervised learning*. *Social Network Analysis and Mining* 4(1): 1-15.

Panel A3a.7: Examples of Studies using Maximum Entropy Modeling for Text Classification (Continued)

Study	Objective	Results
Quercia D, Capra L, Crowcroft J (2012) The social world of Twitter: topics, geography, and emotions. Paper presented at: AAAI ICWSM 2012. Proceedings of the Sixth International Conference on Weblogs and Social Media; Ontario, Canada.	Test whether established sociological theories of real-life networks resemble those networks on Twitter	Two classifiers were used in sentiment classification (maxent and word count); both were found to perform very similarly (Pearson's $r=0.73$)
Go A, Bhayani R, Huang L (2009) Twitter sentiment classification using distant supervision. Stanford, CA: Stanford University.	Introduce a means to automatically classify the sentiment of Twitter messages as either positive or negative with respect to a query	Classifier accuracy was reported for various features: unigram (80.5%), bigram (79.1%), unigram + bigram (83%), and unigram + part of speech (79.9%)

Before running MaxEnt, articles containing fewer than 500 characters were removed to ensure news article records were not blank and that there was enough information in the article to warrant classifying it. The MaxEnt program first reads in the whole file of articles and creates a corpus of documents. The corpus was cleaned through functions that removed punctuation, capitalization, non-English words, white spaces, characters, and non-ASCII letters. The remaining words were then tokenized and stemmed to reduce the corpus to the most salient terms. Word stems refer to the part of the word to which one can apply additional affixes to change the tense, number, or part of speech (i.e. "stop" is the stem of "stopping" and "stopped"). Tokenization uses regular expressions to identify common language patterns. Regular expressions are special text strings that help locate word patterns commonly used in a certain language; for instance, regular expressions are often used to identify the same word with different spellings or common phrases. In tokenization, a string of words or letters is segmented into meaningful words and phrases known as "tokens." Only words between four and twenty letters long were considered, and each word had to appear in at least fifteen documents to be included in the corpus. Twenty-five articles were designated to be held out to ensure the maximum entropy model did not over-fit the data. The corpus was then converted into a document term matrix,

where a model was fitted to the training set. The model is designed to predict the relevance and scientific quality and sensationalism scores for each of the documents.

Step 9: Evaluating the Validity of the Classification Model using a Test Set

Two new research assistants were enlisted to code a random sample of 200 articles (average word count: 502.22). This step was conducted to see if the model could be validated when articles were coded by another set of judges. ICC and kappa scores were lower for this sample coded by different research assistants, but still very high. This indicates that the model operates well across raters. A paired t-test was also calculated to determine if the difference between human and computer means was significantly different (Panel A3a.8).

Panel A3a.8: Assessing Agreement Between Raters in the Validation Test Set of 200 Articles

Question	[MM, NN] p	[MM, NN] kappa	p-value	ICC
1	0	0.819	0	0.92
2	0	0.879	0	0.92
3	0	0.860	0	0.83
4	0	0.884	0	0.85
5	0	0.891	0	0.91
6	0	0.922	0	0.96
7	0	0.805	0	0.87
8	0	0.971	0	0.92
9	0	0.852	0	0.94
10	0	0.892	0	0.88
11	0	0.837	0	0.90
12	0	0.934	0	0.93
Overall	0	0.806	0	0.90

Step 10: Expanding the Training Set to 500 News Media Articles and Evaluating its Validity

Three research assistants coded an additional 300 articles to create a full training set of 500 articles (average word count: 524.24). The number of articles in the training set was increased to bolster the computer model’s ability to predict the scientific quality and sensationalism of the full set of articles.

Among research assistants, inter-rater reliability and intraclass correlation measures improved for the full set of 500 articles (Panel A3A.9). In total, there were 26 articles where research assistants disagreed on the article’s eligibility (i.e., one person disagreed with the other two people’s decision). These disagreements were resolved through discussion and inter-rater reliability and intraclass correlation measures were recalculated (Panel A3a.10). Ultimately, 195 articles were deemed relevant and coded by all research assistants. These 500 articles were used as the training set for the MaxEnt model.

Panel A3a.9: Assessing Agreement Among Raters in the Validation Test Set of 500 Articles Before Resolving Disagreements on Relevance

Question	[VT,TJ] p	[VT,TJ] kappa	[VT, JW] p	[VT, JW] kappa	[JW,TJ] p	[JW,TJ] kappa	Fleiss p	Fleiss kappa	p-value	ICC
1	0.000	0.782	0.000	0.907	0.000	0.791	0.000	0.714	0	0.99
2	0.000	0.814	0.000	0.863	0.000	0.784	0.000	0.562	0	0.97
3	0.000	0.797	0.000	0.754	0.000	0.799	0.000	0.498	0	0.95
4	0.000	0.827	0.000	0.898	0.000	0.758	0.000	0.552	0	0.98
5	0.000	0.853	0.000	0.940	0.000	0.786	0.000	0.554	0	0.98
6	0.000	0.865	0.000	0.933	0.000	0.881	0.000	0.715	0	0.99
7	0.000	0.819	0.000	0.737	0.000	0.791	0.000	0.675	0	0.96
8	0.000	0.733	0.000	0.722	0.000	0.761	0.000	0.577	0	0.96
9	0.000	0.630	0.000	0.739	0.000	0.745	0.000	0.709	0	0.95
10	0.000	0.758	0.000	0.690	0.000	0.624	0.000	0.596	0	0.96
11	0.000	0.663	0.000	0.721	0.000	0.726	0.000	0.720	0	0.95
12	0.000	0.767	0.000	0.816	0.000	0.736	0.000	0.595	0	0.97
Overall	0.000	0.875	0.000	0.839	0.000	0.900	0.000	0.690	0	0.98

Panel A3a.10: Assessing Agreement Among Raters in the Validation Test Set of 500 Articles After Resolving Disagreements on Relevance

Question	[VT,TJ] p	[VT,TJ] kappa	[VT, JW] p	[VT, JW] kappa	[JW,TJ] p	[JW,TJ] kappa	Fleiss p	Fleiss kappa	p-value	ICC
1	0.000	0.935	0.000	0.954	0.000	0.961	0.000	0.815	0	0.99
2	0.000	0.960	0.000	0.879	0.000	0.944	0.000	0.656	0	0.97
3	0.000	0.885	0.000	0.778	0.000	0.883	0.000	0.585	0	0.95
4	0.000	0.945	0.000	0.909	0.000	0.921	0.000	0.631	0	0.98
5	0.000	0.953	0.000	0.958	0.000	0.938	0.000	0.642	0	0.98
6	0.000	0.959	0.000	0.943	0.000	0.983	0.000	0.837	0	0.99
7	0.000	0.962	0.000	0.843	0.000	0.886	0.000	0.788	0	0.96
8	0.000	0.857	0.000	0.763	0.000	0.913	0.000	0.665	0	0.95
9	0.000	0.810	0.000	0.839	0.000	0.902	0.000	0.786	0	0.95
10	0.000	0.908	0.000	0.789	0.000	0.889	0.000	0.684	0	0.96
11	0.000	0.815	0.000	0.809	0.000	0.866	0.000	0.832	0	0.94
12	0.000	0.936	0.000	0.888	0.000	0.910	0.000	0.683	0	0.97

Overall	0	0.924	0.000	0.887	0.000	0.942	0.000	0.735	0	0.98
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Step 11: Applying the Classification Model to a Simple Random Sample of 10,000 Articles

10,000 articles longer than 500 characters were randomly generated from the full set of articles. MaxEnt was run in a two-step approach. In step 1, article relevance was determined by testing the full 500 articles training set against the 10,000 article test set. Of these 10,000, 3625 articles were determined to be relevant by the model. 1101 of these articles were about SARS; 2524 of these articles were about H1N1. In step 2, these 3625 articles were copied to a new file. The 195 relevant articles from the 500 article training set were then used to evaluate the six measures of sensationalism and the six measures of scientific quality. We conducted independent 2-sample t-tests to determine if the average scores between the pandemics were significantly different.

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Appendix 3b: Final Tool for Measuring Scientific Quality and Sensationalism of News Records⁺⁺⁺

Finalized on 12 March 2014

Your task is to read a series of short newspaper articles about pandemic outbreaks and answer a few questions about their scientific quality and sensationalism. Scientific quality is a measure of an article’s reliability and credibility on a given topic. Sensationalism is a way of presenting articles to make them seem more interesting or extraordinary than they actually are. After reading each article, you will be asked to rate its scientific quality and sensationalism using a scale from 1 to 5. Six questions evaluate the scientific quality of the newspaper article, and six questions evaluate sensationalism. Your work is helping to support important research being conducted at Harvard University (USA), Sciences Po Paris (France) and McMaster University (Canada) to improve health news coverage and global pandemic responses. For questions, please contact the principal investigator Steven Hoffman at pandemics.study@gmail.com.

NEWSPAPER ARTICLE #: _____

0. PRELIMINARY QUESTION TO CONFIRM ELIGIBILITY OF NEWSPAPER ARTICLE [Please select “Yes” or “No”]

Is this a newspaper article primarily focused on the Severe Acute Respiratory Syndrome (SARS) pandemic in 2003-2004 or the A(H1N1) swine flu pandemic in 2009-2010?

Yes ___ No ___

If “yes”, please answer all remaining questions. If “no”, please stop here and proceed to the next newspaper article.

A1. SCIENTIFIC QUALITY: APPLICABILITY [Please select “1”, “2”, “3”, “4” or “5”]

Is it clear to whom the information in the article is applicable and how it affects them?

An example of a very applicable headline that deserves a “5” is:

“New medication could improve treatment for children with type 1 diabetes”

<i>No</i>		<i>Partially</i>		<i>Yes</i>	
<i>potentially misleading</i>		<i>minor lack of clarity</i>		<i>minimal ambiguity</i>	
1	2	3	4	5	

A2. SCIENTIFIC QUALITY: OPINIONS VERSUS FACTS [Please select “1”, “2”, “3”, “4” or “5”]

Are facts clearly distinguished from opinions?

An example of a statement that distinguishes between opinions and facts and deserves a “5” is:

“Most climate experts believe humans are the cause of global warming; others disagree”

<i>No</i>		<i>Partially</i>		<i>Yes</i>	
<i>potentially misleading</i>		<i>statements are attributed to sources, but the underlying evidence is ambiguous</i>		<i>the evidence underlying the main points is clearly cited</i>	
1	2	3	4	5	

A3. SCIENTIFIC QUALITY: VALIDITY [Please select “1”, “2”, “3”, “4” or “5”]

Is there an assessment of the validity or credibility of information that is reported in a clear way?

An example of a valid statement that deserves a “5” is:

“Study findings may not be reliable due to the small sample size.”

<i>No</i>		<i>Partially</i>		<i>Yes</i>	
<i>validity not assessed or potentially misleading</i>		<i>study design or type of evidence reported, but not properly assessed</i>		<i>strength of the research methods adequately assessed</i>	
1	2	3	4	5	

⁺⁺⁺ Questions evaluating scientific quality were drawn from Oxman AD, Guyatt GH, Cook DJ, Jaeschke R, Heddle N, Keller J (1993) An index of scientific quality for health reports in the lay press. *Journal of Clinical Epidemiology* 46(9): 987-1001. Questions evaluating sensationalism were adapted from Molek-Kozakowska, K (2013) Towards a pragma-linguistic framework for the study of sensationalism in news headlines. *Discourse & Communication* 7(2): 173-197.

A4. SCIENTIFIC QUALITY: PRECISION [Please select “1”, “2”, “3”, “4” or “5”]

Is information reported in a precise way, such as about potential benefits, costs, risks of harm or trade-offs?

An example of a precise statement that deserves a “5” is:

“Seatbelts lower the risk of death and injury by 50%”

<i>No</i>		<i>Partially</i>		<i>Yes</i>	
<i>not done or potentially misleading</i>		<i>precision of effects or risks is ambiguous</i>		<i>precision of main effects or risks clearly reported</i>	
1	2	3	4	5	

A5. SCIENTIFIC QUALITY: CONTEXT [Please select “1”, “2”, “3”, “4” or “5”]

Is information reported in the broader context of what is known about the issue?

An example of a well-contextualized statement that deserves a “5” is:

“Several previous studies have confirmed that serotonin plays a role in many Autism cases”

<i>No</i>		<i>Partially</i>		<i>Yes</i>	
<i>not done or potentially misleading</i>		<i>more than one study discussed but some ambiguity on consistency</i>		<i>many studies and consistency clearly reported</i>	
1	2	3	4	5	

A6. SCIENTIFIC QUALITY: GLOBAL ASSESSMENT [Please select “1”, “2”, “3”, “4” or “5”]

Based on your answers to the previous five questions, how would you rate the overall scientific quality of the article?

<i>Low</i>		<i>Moderate</i>		<i>High</i>	
<i>critical or extensive shortcomings</i>		<i>potentially important but not critical shortcomings</i>		<i>minimal shortcomings</i>	
1	2	3	4	5	

B7. SENSATIONALISM: EXPOSING [Please select “1”, “2”, “3”, “4” or “5”]

Does the article attempt to expose certain events, such as condemning a case of disease, failed policy, waste of money, or personal misbehaviour?

An example of an exposing statement that deserves a “5” is:

“\$100 to skip classes! Schools accused of bribing worst pupils to stay away when inspectors visit”

<i>No</i>		<i>Partially</i>		<i>Yes</i>	
<i>minimal exposing</i>		<i>somewhat exposing</i>		<i>a lot of exposing</i>	
1	2	3	4	5	

B8. SENSATIONALISM: SPECULATING [Please select “1”, “2”, “3”, “4” or “5”]

Does the article offer a guess or suggest what the future consequences of an issue are likely to be?

An example of a speculative statement that deserves a “5” is:

“Hate preacher to go ‘free in months’: Radical cleric cannot be deported say European Human Rights judges”

<i>No</i>		<i>Partially</i>		<i>Yes</i>	
<i>minimal speculation</i>		<i>some speculation</i>		<i>a lot of speculation</i>	
1	2	3	4	5	

B9. SENSATIONALISM: GENERALIZING [Please select “1”, “2”, “3”, “4” or “5”]

Does the article make generalizing statements that extrapolate a trend out of an incident or pass a judgement about a whole class of people? An example of a generalizing statement that deserves a “5” is:

“Rise of the hugger mugger: ‘Sociable’ thieves who cuddle while they rob”

<i>No</i>		<i>Partially</i>		<i>Yes</i>	
<i>minimal generalizing</i>		<i>somewhat generalizing</i>		<i>a lot of generalizing</i>	
1	2	3	4	5	

B10. SENSATIONALISM: WARNING [Please select "1", "2", "3", "4" or "5"]

Does the article generate anxiety about an issue or offer suggestions on how to avoid becoming a victim?

An example of a statement that includes a strong warning and deserves a "5" is:

"A sausage a day could lead to cancer: Pancreatic cancer warning over processed meat"

<i>No</i>		<i>Partially</i>		<i>Yes</i>
<i>minimal warnings</i>		<i>some warnings</i>		<i>a lot of warnings</i>
1	2	3	4	5

B11. SENSATIONALISM: EXTOLLING [Please select "1", "2", "3", "4" or "5"]

Does the article exaggerate facts as extraordinary, project events as historic, praise individuals for heroic acts, etc.?

An example of an extolling statement that deserves a "5" is:

"Teen victim heroically moves Prime Minister to bring in new drug-driving laws fit for a new century"

<i>No</i>		<i>Partially</i>		<i>Yes</i>
<i>minimal extolling</i>		<i>somewhat extolling</i>		<i>a lot of extolling</i>
1	2	3	4	5

B12. SENSATIONALISM: GLOBAL ASSESSMENT [Please select "1", "2", "3", "4" or "5"]

Based on your answers to the previous five questions, how would you rate the overall sensationalism of the article?

<i>Low</i>		<i>Moderate</i>		<i>High</i>
<i>not at all sensationalizing</i>	<i>not too much sensationalizing</i>	<i>somewhat sensationalizing</i>	<i>fairly sensationalizing</i>	<i>very sensationalizing</i>
1	2	3	4	5

C13. PUBLISHER [Please write in text]

Which newspaper published this article? _____

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Appendix 3c: R Code for Implementing Data Processing, Statistical Analyses and Text Classification

```
#####  
## STEP (1)  
## The following code is used to create a control csv file. The control file specifies which  
## articles are in the training set, along with their respective coding, and which articles are  
## in the test set. The csv file you read in should contain the ratings of the human coders and  
## follow the same formatting as the example template. The code will aggregate and average the  
## ratings for each article. You can specify which question you want to code the article by.  
## Remember to create new control files for each question type, and whenever you change which  
## articles are contained in the training set.  
#####  
  
# specify full set of articles  
filenames <- list.files("/home/steven/lexis")  
filedat <- data.frame(filenames, filenames)  
  
# specify which coding document to use - complete list of human coders' responses  
# must be in correct format, otherwise errors will occur below  
dat <- read.csv("/home/steven/Pandemics_Responses.csv")  
  
# function that averages human coders' inputs and creates a control .csv file  
avgscore <- function(col, fun = mean, filename = "control.csv")  
{  
  library(plyr)  
  meanr <- function(x) round(fun(x, na.rm = TRUE))  
  dat_agg <- ddply(dat, .(Article), numcolwise(meanr))  
  
  # pad article name with zeros so that it matches text file  
  dat_agg$Article_pad <- sprintf("%08d", dat_agg$Article)  
  dat_agg$Article_pad <- paste0(dat_agg$Article_pad, ".txt")  
  
  # specify training articles  
  dat_agg$Train <- 1  
  
  # ignore blank cells  
  dat_agg <- dat_agg[!is.na(dat_agg$A1), ]  
  
  control <- merge(dat_agg[, c("Article_pad", col, "Train")], filedat,  
                 by.x="Article_pad", by.y="filenames.1", all.y = TRUE)  
  control <- control[, -4]  
  
  control[is.na(control$Train), "Train"] <- 0  
  
  control <- control[order(control$Train, decreasing = TRUE), ]  
  
  # add headers to control file  
  colnames(control) <- c("ROWID", "TRUTH", "TRAININGSET")  
  
  write.csv(control, file=filename, na = "", row.names = FALSE, quote = FALSE)  
}  
  
# specify which control file you want to create, i.e. designate question type and name file  
avgscore("Eligibility", filename = "control_elig_500.txt")  
avgscore("A6", filename = "control_A6_200.txt")  
avgscore("B12", filename = "control_B12_MMNN.txt")
```

```

#####
## STEP (2)
## The following code is to copy and paste certain files that you want into new folders. You will
## need to specify and create the folders you want to add files to. You can 1) create a folder of
## just training documents, 2) rename the training documents with "training" in front, 3) set up
## a random sample of articles, 4) copy files of a certain length to a new folder, 5) copy
## eligible files into a new folder 6) or read in a list of files to copy to a new folder. Only
## use which functions you need. In general, you will have to set up new training files when you
## start a new task, and copy the eligible files over to a new folder after you do the first
## round of MaxEnt.
#####

# specify which control file you are using in order to build a subset of the training files
train.info <- read.csv("/home/steven/control_A1_500.txt")
# set up subset with just training documents
# only necessary when you add or subtract articles from the training set
for(i in train.info[train.info$TRAININGSET == 1, "ROWID"]) {
  file.copy(paste("/home/steven/lexis/", i, sep = ""), paste("/home/steven/10kQ/", i, sep = ""))
}

# rename training set files - add "training" to beginning of file name
# only necessary when you change articles in training set
training_dir <- "/home/steven/10kQ/"
filenames_training <- list.files(training_dir)
test <- file.rename(from = file.path(training_dir, filenames_training),
                    to = file.path(training_dir,
                                    paste("training", filenames_training, sep = "_")))

# now copy these files into big corpus folder

# set up a random sampling of articles from the larger set
# useful if you want to test before running MaxEnt of a huge number of articles
filenames_test <- list.files("/home/steven/longer_lexis/") # full folder of articles
filenames_samp <- sample(filenames_test, size = 10000)
setwd("/home/steven/lexis/")
file.copy(from = filenames_samp, to = "/home/steven/10thous/") # destination of subset

# copy files that are longer than a certain length into a new folder
cutoff <- 500 #needs to be more than this number of characters
origin_folder <- "/home/steven/lexis/"
destination_folder <- "/home/steven/longer_lexis/"
files <- list.files(origin_folder)
for(ii in 1:length(files)) {
  filename <- paste(origin_folder,files[ii],sep="")
  file <- readChar(filename, file.info(filename)$size)
  if(nchar(file) > cutoff) {
    write(file,paste(destination_folder,files[ii],sep=""))
  }
}

# copy eligible files into a new folder (where labels = 1)
# only use when you have eligibility output and need to create new folder with those articles
origin_folder <- "/home/steven/lexis/"
destination_folder <- "/home/steven/10kelig/"
files <- read.csv("/home/steven/maxent_elig_10thous.csv")
for(ii in 1:nrow(files)) {
  if(files[ii,"labels"] == 1) {
    filename <- paste(origin_folder,files[ii,"docnames"],sep="")
    file <- readChar(filename, file.info(filename)$size)
    write(file,paste(destination_folder,files[ii,"docnames"],sep=""))
  }
}

# copy a certain list of file names into a new folder
# use if you want to test MaxEnt vs human coders
origin_folder <- "/home/steven/lexis/"
destination_folder <- "/home/steven/10kelig/"
files <- read.csv("/home/steven/maxent_elig_10thous.csv")
for(ii in 1:nrow(files))
{
  filename <- paste(origin_folder,files[ii,"docnames"],sep="")
  file <- readChar(filename, file.info(filename)$size)
  write(file,paste(destination_folder,toString(files[ii,"docnames"]),sep=""))
}

```

```

#####
## STEP (3)
## The following code is to run the MaxEnt model. Be sure to specify which control file to use,
## which file to read from (file contains all training articles - renamed with "training" in
## title - and all test articles). Remember that control files will be different for step 1 and
## step 2 of MaxEnt - eligibility step contains more training articles, but step 2 will only be
## using articles that are already eligible. Also specify what to call csv file where outputs are
## written. You can turn different options on/off for cleaning corpus, depending on what type of
## results you want.
#####

#load packages
library(tm)
library(maxent)

# designate which control csv to use to train MaxEnt model
# be sure to change this when you change question type - otherwise errors will occur
train.info <- read.csv("/home/steven/control_B11_500.txt")

# create corpus for training
# be sure to specify which folder to use
# training files must also be in the folder, with proper naming (i.e. must say "training")
corpus <- Corpus(DirSource(as.vector("/home/steven/10kelig/"), encoding = "UTF-8"),
  readerControl = list(reader = readPlain,
    language = "en"))

clean_corpus <- function(corpus) {
# -----
# tokenize the text - you can turn various options on/off

# getTokenizers()

corpus <- tm_map(corpus, MC_tokenizer) # splits some hyphens
# corpus <- tm_map(corpus, scan_tokenizer) # does not split hyphens
# strsplit_space_tokenizer <- function(x) unlist(strsplit(x, "[[:space:]]+"))
# corpus <- tm_map(corpus, strsplit_space_tokenizer) # does not split hyphens

# -----
# clean up text using transformations

# getTransformations() # list possible transformations

corpus <- tm_map(corpus, tolower)
corpus <- tm_map(corpus, removePunctuation, preserve_intra_word_dashes = TRUE)
# corpus <- tm_map(corpus, removeNumbers)
corpus <- tm_map(corpus, removeWords, words = stopwords("english"))
corpus <- tm_map(corpus, stripWhitespace)

# -----
# additional text cleaning

# convert words with non-ASCII characters to ASCII encoding, then remove non-ASCII letters
corpus <- tm_map(corpus, iconv, from = "latin1", to = "ASCII", sub = "")
# remove isolated dashes (not intra-word)
# corpus <- tm_map(corpus, function(x) x[x != "-" & x != "---" & x != "----" & x != "-----"])
# remove dashes at the start of words
# corpus <- tm_map(corpus, function(x) unlist(strsplit(x, split = "^-")))
# remove blank strings
corpus <- tm_map(corpus, function(x) x[x != ""])

# -----
# stem words

# stemming using Snowball package (or SnowballC)
# note: need to disable AWT for Java to work before loading any packages
corpus <- tm_map(corpus, stemDocument)
# corpus <- tm_map(corpus, SnowballStemmer)

# transform back into class "PlainTextDocument"
corpus <- Corpus(VectorSource(corpus))

```

```

return(corpus)
}

corpus <- clean_corpus(corpus)
# inspect(corpus[1]) # look through the different words in corpus

# -----
# create a control list for the DocumentTermMatrix function

ctrl <- list(
  # "weightTf": term frequency weighting (default)
  # "weightTfIdf": inverse document frequency weighting (takes the rarity of the word into
consideration)
  weighting = weightTf,
  language = "english",
  wordLengths = c(4, 20), # specify min and max letters
  minDocFreq = 15 # each word must appear in at least n documents
)

# -----
# create DTM with all terms

dtm <- DocumentTermMatrix(corpus, control = ctrl)
# dtm <- as.compressed.matrix(DocumentTermMatrix(corpus, control = ctrl))

# can use this to figure out which specifications make the best model
# tune_model <- tune.maxent(
#   feature_matrix = dtm[grep("training", rownames(dtm)), ], # DTM indexing the training set
#   code_vector = train.info$TRUTH[train.info$TRAININGSET == 1], # vector of labels for DTM
#   nfold = 3,
#   showall = TRUE)

# train a multinomial logistic model
model <- maxent(
  feature_matrix = dtm[grep("training", rownames(dtm)), ], # DTM indexing the training set
  code_vector = train.info$TRUTH[train.info$TRAININGSET == 1], # vector of labels for DTM
  set_heldout = 25,
  use_sgd = TRUE) # integer specifying number of documents in test set

#part that takes a long time - MaxEnt is applying model to all articles
results <- predict(
  object = model,
  feature_matrix = dtm[grep("training", rownames(dtm),invert = TRUE), ]) #DTM indexing testset

results <- as.data.frame(results)
results$docnames <- grep("training", rownames(dtm), value = TRUE, invert = TRUE)

head(results, 10) # look at first 10 results

# write output to csv in a designated folder
setwd("/home/steven/MaxentOutput/")
write.csv(results, file="maxent_10k_B11.csv", row.names = FALSE)

# In results, rows are documents, columns are labels/classes
# the rows sum to 1, which is the sum of the probabilities
# for each document being in each label/class

#####

```