

The Climate of Newspaper Coverage:
Communication of Climate Change Uncertainty in India

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Abstract

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Scientists are more certain than ever that climate change is occurring and is an anthropogenic driven process; however, consensus and public understanding are lagging behind. While climate science is a highly uncertain field, groups of scientists like the Intergovernmental Panel on Climate Change (IPCC) are working to better communicate about the issue. By examining articles published before and after the first volume of the Fifth Assessment Report (AR5), this study looks to uncover how uncertainty is communicated in English-language Indian newspapers. Utilizing methods of content analysis, related newspaper articles were coded for communication of uncertainty, sources of information, and climate change impacts discussed. I find that IPCC is not the most widely used source of information about global climate change. Second, I find that the uncertainty language defined in the AR5 report is not frequently used in newspapers.

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1. INTRODUCTION

Climate change is an emerging, prominent, and global issue that will affect all countries and populations in foreseen and unforeseen ways. It has been defined as the preeminent international environmental issue the world faces in the 21st century¹. While historically there has been stratification of scientific opinion regarding this issue, scientists now agree that not only is climate change occurring but is also caused by anthropogenic activities¹⁻⁶. Climate scientists are now reporting that it is extremely likely humans are the dominant cause of warming since the onset of the 20th century⁶. However, this consensus is not observed in the public domain^{1,7-9}. This could be a direct result of the complexity of this issue¹⁰. As with many other environmental concerns, climate change is highly uncertain and poorly defined¹¹. Furthermore it is complicated by extended time lines, extreme weather events, political stakes, and economic dependence^{12,13}. By examining articles published before and after the Physical Science Basis of the IPCC's Fifth Assessment Report, this study looks to uncover what language is used in English-language Indian newspapers when communicating climate change uncertainty.

1.1 Public Perceptions of Climate Change

Scientific uncertainty is impacting public perceptions of the need for global climate change policy and therefore, the willingness to act to mitigate¹². For these reasons, gauging public perceptions of climate change is critically important^{1,12}. Leiserowitz (2007) acknowledges that combating global climate change will require the collective and simultaneous action of billions of people¹. Individuals play a large role in action-taking and decision-making for climate change. However, it has been found that awareness of an issue is insufficient to motivate a response. A deeper understanding is required for individual and communal reaction^{1,14}. Unfortunately, even when individuals understand this phenomena, most of the

general public still view solutions to climate change as the national and international government's responsibility¹³.

Public opinion also has a strong influence on policy makers, determining what action will be taken on political, economic, and social issues¹. This is particularly true in democracies, where policymakers' motivation is tightly linked with societal goals⁷. Therefore, constituents' beliefs and attitudes play a role in the "supply and demand" of responses to an issue^{9,15}. Furthermore, misinterpretation and skepticism work as barriers to the development of political action^{1,9}. In the case of climate change, these barriers are common, particularly because in the face of global climate change and the uncertain information, decision-making, and policy formation are based on imperfect information¹².

Assessing what people understand and how they interpret this uncertain information are critical to this field. Public perceptions drive policy and willingness to act. At this time, very little is known about global perceptions of climate change; studies have been conducted in developed countries such as the Japan¹⁶, United States, and the United Kingdom; however, there are very few global studies, especially those that evaluate perceptions in developing countries^{1,17,18}. Leiserowitz's (2007) work in "International Public Opinion, Perception, and Understanding of Global Climate Change" found that global awareness and calls for action to combat climate change have been gaining momentum over time; however, developing countries lag behind¹. While many people are aware of climate change and generally understand the phenomena, often individuals are confused by the uncertainties of the science behind it¹³. As awareness and public concern are increasing, many speculate the divide in public opinion is driven or exacerbated by the uncertainty surrounding models and projections of climate science^{1,19}. The term global climate change itself identifies that the issue is fundamentally

complex; events are wide spread, ever changing, and are inherently undefined¹¹. Other than scientists, few individuals understand the models, data, and findings that contribute to this field let alone the uncertainty of each facet. Furthermore, it is extremely difficult for scientists to explain uncertainty to the general public in a way that is easy and understandable¹³.

1.2 Climate Change Uncertainty

Just as many other environmental issues, climate change is highly uncertain and poorly defined¹¹. Uncertainty is an ubiquitous and omnipresent factor of scientific research²⁰. As a field, climate science is dependent on many facets and moving components; among these, uncertainties arise at various stages and levels of the scientific process^{6,13,21}. While research can reduce the uncertainty stemming from specific aspects of climate change research, this field will never be void of uncertainty²³. It is recognized that uncertainties result from different locations, levels, natures, and knowledge bases²⁴. They can result from variability and natural fluctuations, research methods, human actions, including combinations of these factors^{6,12,13,21,22}.

While crucial to studying current and future scenarios, modeling is an inevitable source of uncertainty. Models are simplifications of actual events; they allow us to approximate what is occurring and project what to expect²⁵. For these reasons, results of climate models will never produce definitive results. Walker et al. (2003) categorized five types of uncertainty that can arise from modeling based studies, including context uncertainty, input uncertainty, model structure uncertainty, parameter uncertainty, and modeling technical uncertainty²⁶.

Others have noted that uncertainty can also arise from human action. Linguistics, measurement error, approximation and interpretation, subjective judgment, disagreement, and recognized ignorance each play a role^{6,22,24}. Consensus and agreement of findings can also be a large source of uncertainty, especially for large scientific bodies. Interdisciplinary group of

scientists with a range of backgrounds, beliefs, and world-views^{22,27}. As Moss and Schindler describe, “what is known or even knowable” is often disputed among disciplines and individuals, ever complicating the field²². As mentioned, ignorance can be a source of uncertainty. While recognized “unknowns” can be minimized through exploration and research, there is also what Donald Rumsfeld, American politician, called “unknown unknowns”²⁸. The facets we are unaware and naïve about also make the future of climate change more uncertain.

Unknowns arise at both the input and output of information, which can complicate communication of the issue¹³. As Tol (2003) stated, “[u]ncertainty abounds in climate change. Uncertainty also abounds in the literature about climate change”²⁹. There are a variety of classifications and typologies used to communicate about uncertainty and its components; some include ranges, probability, confidence, likelihood, and agreement^{20,30}.

It is also uncertain how individuals, communities, and countries will face the pending changes of climate changes. Collectively the impacts of climate change, the pending and current alterations to the world’s climate, have the ability to influence socio-economic factors of human life. These include the lives, livelihoods, economic, social, and cultural assets, services, and infrastructure of society³¹. These consequences and outcomes of climate change are considered the biggest unknown in the cascade of uncertainty relating to climate change^{31,32}. The science and impacts of climate change are uncertain, just as the world’s ability to adapt to it is³⁰.

Each of these facets takes part in the cascading effect of uncertainty; it is recognized that the uncertainty builds and accrues when measuring, projecting, communicating, and presenting solutions of climate change³⁰. By examining newspaper articles surrounding the publication of a large, intergovernmental, scientific document, this study looks to uncover the communication practice of English-language Indian print press. Utilizing methods of content analysis, this study

explores the communication of uncertainty of climate change, sources of information, and impacts published throughout India. The subsequent sections discuss how the leading intergovernmental, climate change organization and the media communicate about uncertainty, the relevance of the study location, methodology, and findings.

2. REPORTING AND COMMUNICATING UNCERTAINTY

2.1 The IPCC

To answer global concerns about the climate change, the Intergovernmental Panel on Climate Change (IPCC) was established in 1988^{33,34}. Still the largest effort of this kind, the IPCC was created by World Meteorological Organisation and the United Nations Environment Programme^{35,36}. This intergovernmental body works to assess global knowledge of the causes, impacts, and potential outcomes relating to climate change while exploring potential responses and mitigation strategies to solve the current crisis^{35,36}. The IPCC does not collect new data; it draws together research from the most reputable scientists from over 190 countries across the globe who compile and evaluate the most current socio-economic, technical, and ecological data relating to climate change³⁷.

The IPCC aims to produce balanced and scientifically credible reports that address global climate change with the goal of providing advice that is policy-relevant but not policy-prescriptive for the world^{33,34,38}. Through these documents, IPCC experts digest, translate, and condense data into relatable and understandable forms of knowledge for different audiences³⁵.

Their purpose, as stated is to review and assess data in order to

[p]rovide the world with a clear scientific view on the current state of knowledge in climate change and its potential environmental and socio-economic impacts.... Because of its scientific and intergovernmental nature, the IPCC embodies a unique opportunity to provide rigorous and balanced scientific information to decision makers^{7,37}.

The IPCC is viewed as the leading scientific body for reporting evidence and data on climate

change³⁹. Caravilho (2007) regards the media as “secondary validators” of climate science by distilling and reporting on the claims of groups such as the IPCC, who are the “primary validators” of the science⁴⁰. This study focuses specifically on the IPCC framework.

Like all other climate assessments, the authors of the IPCC’s Assessment Reports are obligated to communicate uncertainties that are tied to the data presented⁴¹. Over the last 26 years, the IPCC has published four full Assessment Reports, the First Assessment Report in 1990, the Second Assessment Report in 1995, the Third Assessment Report in 2001 and the Fourth Assessment Report (AR4) in 2007. In 2009, the IPCC began working on the Fifth Assessment Report (AR5). They have since published the first two volumes of the report, Working Group I Report "The Physical Science Basis" and Working Group II Report "Impacts, Adaptation and Vulnerability". AR5 is due to be finalized and published at the end of 2014, which will include the third volume, Working Group III Report "Mitigation of Climate Change"⁴². Each of these documents contains a Technical Summary and a Summary for Policymakers. Following these three volumes, the IPCC will publish the AR5 Synthesis Report, which will synthesize and integrate the previous three volumes, in a non-technical fashion³⁸. Together these documents are used as a source to set agendas and “[act] as a legitimizing device for research” as Adger (2006) conveys⁴³.

Other than scientists, few individuals understand the models, data, and findings that contribute to this field let alone the uncertainty of each facet. Furthermore, it is extremely difficult for scientists to explain uncertainty to the general public in a way that is easy and understandable¹³. In the midst of this challenging and poorly defined issue, the IPCC is charged with the difficult task of providing useful information to decision makers while still staying true to science⁴⁴. While the methods to communicate uncertainty are improving, they are ever-

changing. Ultimately, with all its limitations, the IPCC's developments have provided what Risbey and Kandlikar (2007) call a "richer platform to communicate climate science for policy⁴¹." The IPCC is at the forefront of climate change science and their publications and international environmental assessments have been instrumental in spreading and sharing information on the current and future climate scenarios¹⁹.

Throughout the evolution of the IPCC, methods to communicate and display data have also evolved. In the first two Assessment Reports, Working Groups within the IPCC used subjective perspective to explain uncertainty^{24,41}. However, these methods were deemed insufficient to convey the degree of uncertainty that was imbedded in the reports. To remedy this, the IPCC has employed calibrated language scales and specific procedures to express uncertainty; providing tools and a system for author teams to appropriately and consistently describe findings throughout the report. Uncertainty is portrayed both quantitatively and qualitatively throughout in order to summarize findings, judgment, and issues^{6,24}.

Within AR4 and AR5, the IPCC has made substantial progress in measuring and communicating uncertainty; methods were adjusted to better convey information⁴⁵. Changes were guided by recommendations from the independent review by the InterAcademy Council in 2010⁴⁵. Language about changes from AR4 to AR5 can be seen in Appendix A. The IPCC notes that one of their several crosscutting methodologies is the "Consistent Evaluation of Uncertainties and Risks". These methods can be found in "Guidance Note for Lead Authors of the IPCC Fifth Assessment Report on Consistent Treatment of Uncertainties"⁴⁵. As explained in the Technical Summary of the Physical Science Basis Report from AR5, two distinct methods are used to communicate climate change uncertainty to fully encompass the correctness and completeness of information shared.

2.1.1 Qualitative Methods

Within the AR5, qualitative methods were used to indicate both the amount and quality of the evidence and the level of agreement regarding a finding, or the overall understanding of data^{24,45}. The amount of evidence is guided by the “validity of findings”, which the IPCC defines as the type and consistency of information. The amount of evidence is assessed by the quantity and quality of sources and data. Together, these indicate whether the statement or proposition is valid, resulting in the level of evidence. Throughout the report, authors label evidence as much, medium, or limited^{24,45,46}. The level of agreement or consensus regarding a finding is determined by the amount of concurrence throughout the literature and among experts on the chapter teams. In other words, it is representative of the subjective probability of a reported result occurring and its correctness. Phrases high, medium, or low are used to describe the levels of agreement^{6,24,45–47}. See Table 1 for depiction of qualitative phrases.

Table 1. Qualitatively defined levels of understanding from AR5

| | | | |
|--|------------------|------------------|------------------|
| Level of agreement or consensus ↑ | High agreement | High agreement | High agreement |
| | Limited evidence | Medium evidence | Robust evidence* |
| | Medium agreement | Medium agreement | Medium agreement |
| | Limited evidence | Medium evidence | Robust evidence |
| | Low agreement | Low agreement | Low agreement |
| | Limited evidence | Medium evidence | Robust evidence |
| Amount of evidence (theory, observations, models) → | | | |

*In AR4, IPCC used the phrase “much evidence”

Source: Mastrandrea, M. D. et al. Guidance Note for Lead Authors of the IPCC Fifth Assessment Report on Consistent Treatment of Uncertainties
Guidance Note for Lead Authors of the IPCC Fifth Assessment Report, p 3, 2010.

2.1.2 Methods

Quantitative

Quantified measures of uncertainty in probabilistic forms (percentages) that are calibrated with variations of the ‘likelihood’ qualifier are also used. These measures and statistical analyses are based on expert judgment and observations⁴⁷. This method is used to show a probabilistic

estimate that an event or outcome will occur, as the “Guidance Note for Lead Authors of the IPCC Fourth Assessment Report on Addressing Uncertainties” explains, “refers to a probabilistic assessment of some well-defined outcome having occurred or occurring in the future”^{6,46,47}. AR4

and AR5

Table 2. Quantitative - Likelihood Scale from AR5

utilized the

same ranges,

see Table 2. for

specifics.

| Term* | |
|------------------------|------------------------|
| Virtually certain | 99 - 100 % probability |
| Very likely | 90 - 100 % probability |
| Likely | 66 - 100 % probability |
| About as likely as not | 33 - 66% probability |
| Unlikely | 0 - 33% probability |
| Very unlikely | 0 - 10% probability |
| Exceptionally unlikely | 0 - 1% probability |

* Additional terms (extremely likely: 95–100% probability, more likely than not: >50–100% probability, and extremely unlikely: 0–5% probability) may also be used when appropriate.

Source: Mastrandrea, M. D. et al. Guidance Note for Lead Authors of the IPCC Fifth Assessment Report on Consistent Treatment of Uncertainties Guidance Note for Lead Authors of the IPCC Fifth Assessment Report, p 3, 2010.

2.2 The Media

While the IPCC Assessment Reports, published in all UN languages and also available online, are accessed by a variety of audiences from around the world, much of the general public still relies on media outlets for their information^{4,38}. Because of the strong influence the IPCC has on informing climate change field, it is important to examine how media sources portray uncertainty in relation to other sources or bodies of information.

Mass media are conventionally defined as the combination of print media from newspapers, magazines, and popular literature and the electronic coverage through television, radio, film and music⁴⁸. Furthermore, various forms of media are a vehicle for culture and

learning worldwide⁴⁶. Additionally, the media plays a significant role in influencing both political and public opinions⁴⁷. Mitchell (2009) identifies that in international environmental issues, the mass media play a major and crucial part in creating concern and facilitating knowledge sharing around a particular issue⁴⁹. Similarly, Höppner (2010) categorizes the media as “mediators of communication” among involved parties, especially with complex environmental issues such as climate change⁵⁰. Especially internationally, newspapers have been found as a significant source of information dissemination for climate science and related news^{3,50,51}. Newspapers represent one of the key venues for scientists to disseminate information to the public as supported by Boykoff and Boykoff (2007) who consider newspapers as a “social relationship” between the public and the science³. Furthermore, research has also found that media has the potential to significantly influence policy agendas and legislative activity. Dolšák and Houston (in press) found that news articles about the need for climate change policy tend to increase legislative activity, while those debating the occurrence of climate change tend to decrease political activity⁵².

Often, media coverage of complex and disputed issues is criticized. Many methods and findings relating to climate change science are difficult to infer and translate to more understandable and accessible content and terms. Boykoff and Boykoff (2007) argue that the language of science does not translate easily for communication to other audiences outside of the science community. They acknowledge that,

[s]cientific findings constitute a specialized mode of knowledge that is almost always packaged in professional language. Scientists generally employ a lexicon of caution and speak in a language of probability, which usually does not translate smoothly into the crisp, unequivocal commentary that is valued in the press³.

Furthermore the authors explain that for science to fit into the broader media, it needs to be translated into more colloquial terms.

However, although such translation may reach a wider community, rephrasing into colloquial terms can sometime influence the message. Asayama and Ishii (2014) note “media coverage of climate science is context-dependent, influenced by various—ideological, organizational and socio-political—factors, and may evoke different public/political responses”³⁴. Framing, a means to process large amounts of information to communicate a focused idea to an audience, can be used as a journalistic tactic to convey a specific message^{53,54}. Antilla (2005) discusses a variety of definitions of framing, presenting Entman’s description, “to select and highlight certain ‘facets of events or issues’ and make ‘connections among them so as to promote a particular interpretation, evaluation, and/or solution’”^{51,55}. Entman (1993) specifies that frames can play four specific roles in news discourse including, defining problems, diagnosing causes, making moral judgments, and suggesting remedies⁵⁶. These functions call attention to specific aspects and facts, making particular themes more salient and influencing how messages are interpreted while influencing audiences to construct meaning around them. Framing can be driven through a variety of roles, which include the communicator and/or journalist, the source, the receiver and/or audience, and the culture^{53,56}. Ultimately, frames have power when employed, specifically relating to climate change, which historically is a highly debated field.

3. FOCUS AREA: INDIA

Home to over 1.2 billion people, India is the world’s largest democracy characterized by a rich history, a flourishing civil society, and diverse cultures and religions. Citizens have freedom of speech and access to public debate; thus constituents’ opinions are significant factors in defining action and government policy^{57,58}. In the last decade, the country has become a major player in the global economy and currently the fourth-largest economy in the world⁵⁷. Now

classified as a middle-lower income country by the United Nations Conference on Trade and Development, India is still “developing” but is now faced with new challenges as a result of climate change⁵⁹.

3.1 Climate Change Impacts

In the middle of South Asia, India is among the most vulnerable regions in the face of climate change. The IPCC defines vulnerability as “the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change”⁶⁰. Low lying coastal land is susceptible to inundation from sea level rise, inland foothills are threatened by flooding in the event of Himalayan glacial retreat, and the seasonal monsoonal cycle is likely to be disrupted by global climatic shifts which could have dramatic effects on the country's agricultural output^{15,55,56}. The IPCC reports that India has seen increasing trends in annual mean temperature, in addition to an increase in annual rainfall in the north-west during summer monsoon season⁶¹. Furthermore, AR5 reports with high confidence that the subcontinent of South Asia will face rising temperatures. States throughout the country will also experience water shortages in the next coming decades and by 2080 agriculture output is expected drop by 30–40 percent⁶². In other areas, AR5 reports that there is medium confidence that India will see flooding, comparable or greater in both magnitude and frequency of past floods. This could be linked to changes in Asian-Australian monsoon, which is expected to increase and thus Indian rainfall is expected to increase.

In addition to climate and temperature pressures, the population is rapidly growing and is projected to surpass China as the most populous country by 2013⁶³. As population booms, the importance of access to resources, specifically fresh water, grows. Water is tightly coupled with the country's susceptibility to the effects of global climate change⁶¹. In response to a changing

environment, ecosystem service, human well-being, and livelihoods will be severely impacted⁶⁴. The country is largely comprised of an agrarian society and therefore highly sensitive to changes relating to temperature and rainfall^{61,65}.

3.2 India's Influence on Climate Change

While India is confronted by many challenges in the face of climate change, they are also a part of the problem. IPCC reported in AR4 that South Asia alone will be responsible for approximately one-fifth of energy consumption during the 21st century, and India is at the forefront of the issue⁶⁷. This acknowledges that while a vulnerable region, populations present in South Asia are also contributing the issue of climate change. India is one of the world's top CO₂ emitters behind just China, the United States, and European Union^{68,69}. CO₂ emissions have been steadily increasing and between 1990 and 2011, India tripled its CO₂ emissions. CO₂ emissions increased by 6.8% in 2012 alone^{68,69}. This high ranking is largely due to the large economy, growing population, and domestically available coal. CO₂ emissions are predicted to increase 2.5 times more by 2035^{68,70}.

To further complicate the issue of climate change in India, few individuals recognize what is actually causing such dramatic changes and how they are directly responsible. In 2010, Gallup polled residents from the top five greenhouse gas-emitting countries around the world: China, India, Japan, Russia, and the United States. Among the nations polled, the population of India is reported to be the least aware of the issue. Researchers conducted 6,000 interviews in India, reaching a nationally representative sample of adults⁷¹. When asked, "How much do you know about global warming or climate change?," only 35% reported they know a great deal or something about it.

4. METHODS

4.1. Research Questions and Hypotheses

There is a strong need to study how journalists communicate about uncertainty, especially in this under-studied and highly vulnerable area of the world. Furthermore, understanding if there is a connection between large, intergovernmental bodies' publications and regional or local newspapers could provide insight to a variety of fields. For these reasons, this analysis has addressed the following questions:

Research Question 1: To what extent does media coverage of climate change in India rely on the IPCC as a source of information; does frequency change over time? I hypothesize that the press relies mostly on scientific institutions, and among them predominantly on IPCC, as a source of information in reference to the climate change issue. Furthermore, I hypothesize that over time, specifically immediately following a publication of a new IPCC report, the articles rely more on IPCC as the source of information.

Research Question 2: Does the media, when it reflects uncertainty, utilize the IPCC terminology? Specifically, is the IPCC terminology used more after the publication of the AR5 than before? I hypothesize that newspaper articles will increase their use of the IPCC terminology post the publication of AR5.

Research Question 3: Lastly, how frequently is uncertainty communicated when covering specific impacts and issues of climate change rather than reporting about climate change in general? Here I hypothesize that discussion of uncertainty will be more prevalent when one or multiple issues are addressed as in this case, author will communicate about climate change in more depth and therefore, more likely, mention some form of uncertainty.

4.2 Sampling Methods

Historically, in India, English is the official working language of the government, due to its colonial legacy. Second to Hindi, English is the most widely spoken language in the country, 41% identify it as their primary language⁷². While it varies among the states, English functions as a linking language across regions and is required for communication across government sectors^{72,73}. A variety of regional and national newspapers are published in English throughout the country, which is analyzed in this study. Articles from English-print newspapers were accessed via Access World News. The 28 newspapers used in this study and information about location, readership, publisher, and scope are displayed in Appendix B.

Terms used in the headline to indicate related articles include “global warming,” “climate change,” and “greenhouse gas” (guided by methods presented in Billett 2010)⁵⁸. These terms have been determined as successful for previous climate change media analyses, ensuring the gamut of casual references does not deter from the main coverage of the climate change^{51,58}. It is recognized that searching by headlines limits the number of articles returned on the subject of global climate change; this was necessary to reduce the size of the article population in a consistent way. Headlines are often used as attention grabbers, enticing readers with exciting subjects and phrases, and therefore a sufficient way to get a representative sample of articles⁷⁴.

In this analysis articles published six months before and after the publication dates of AR5’s first volume, dated 27 September 2013, were examined. Articles published between 28 March 2013 and 27 March 2014 were included in the study. In total, 212 articles were returned from the database search; however, duplicate, opinion, and editorial pieces were excluded from the search. Furthermore, articles not pertaining to the research questions were not included, meaning articles needed at least one sentence discussing the issue of climate change or global warming. For instance, pieces regarding climate change conferences or action plans that did not

acknowledge the issue were excluded. Overall 168 articles were coded for and used in the analysis.

4.3 Data Collection

This study constitutes a discourse and content analysis that focuses on climate change newspaper coverage in India. Content analysis is a necessary method of studying communication practices. This mechanism provides a systematic, repetitive method to analyze original content or as Berelson (1952) defines, “a research technique for the objective, systematic, and quantitative description of the manifest content of communication”^{75,76}. The units of this content analysis are articles from English-language newspapers based in India.

A coding scheme was developed to encompass the main themes of the research and answer the posed questions. Themes included discussion of uncertainty, sources of information, and issues or impacts highlighted in the articles. All data are represented by a dichotomous coding scheme, with publication date in relation to the AR5’s Physical Science Basis functioning as a dummy variable (0 before, 1 after).

4.3.1 Coding for Uncertainty

Uncertainty was coded for when colloquial or IPCC terminology was used. If the languages matched that of the IPCC, according to Table 1. (Qualitative) and Table 2. (Quantitative), it was coded as UIPCC. IPCC vocabulary from the 2007 Fourth Assessment Report was also included. Any other discussion of uncertainty, for example, “...could increasingly become frequent occurrences...” (6/20/13, Business Line. P42) or “Climate [modeling] studies have shown that both ends of the spectrum...” (6/22/13, New Indian Express, P46), was considered colloquial language. Any articles that did not communicate about climate change in these two ways were coded to represent that uncertainty was not mentioned in the

article at all.

4.3.2. Coding for Sources

When coding for sources, all references to individuals, organizations, governmental bodies, and “other” were noted when discussing issues of climate change and uncertainty. Multiple sources were coded for within the articles when referencing climate change. Research institutions, scientists, professors of science were all considered as a “scientific” source, then distinguished as international or domestic. Governmental sources were coded when a source was from a political party, foreign government, or a sector of the Indian ministry, then distinguished as international or domestic. Any other source was coded as such, largely populated by local farmers, nongovernmental organizations, and the World Bank. When the IPCC was referenced in any form - full name, acronym, or Rajendra Pachauri, Chairman of the IPCC, it was coded as such. When the articles lacked a reference to a source when discussing climate change, it was coded as no source.

4.3.3. Coding for Issues and Impacts

Lastly, issues were coded; any mention of impacts or issues relating to climate change in the press was noted, as was the location of this/these issues. Issues categories consisted of the following:

- Precipitation: changes in location of rains, increased or decreased precipitation
- Monsoons: alternations to seasonal rains or monsoons cycles
- Floods: occurrence or destruction from floods
- Glacial change: changes to glaciers and glacial melt
- Temperature: Increase or decrease

- Sea level rise
- Storms: Extreme or severe storms, including cyclones and typhoons

Any other issues, such as ocean acidification or droughts were coded as well. Any article that did not discuss any specific issue, rather just talked generally about climate change as an issue were coded accordingly.

4.3.4. Intercoder Reliability Test

The coding methodology was tested for agreement following the methodology developed by Freelon (2013), returning an average percent agreement of 86.4% ($\alpha = 6.909$)⁷⁷. Refer to Appendix C for a detailed report. Conducting intercoder reliability is a crucial for data returned from content analysis; when $\alpha \geq .667$ ⁷⁸ conclusions are considered acceptable.

4.4 Analysis

To analyze the data, cross tabulation tables were created. Cross tabs, also known as contingency tables, are commonly used in qualitative data analysis and social science research. By displaying data as a matrix format, the frequency distribution of variables is displayed and relationships among variables can be distinguished⁷⁹. Chi-square analyses were completed to test for statistical significance^{1*}.

4.5 Limitations

Utilizing the English-written newspapers may not be representative of the overall national press, but it allows insight what is occurring in a developing country. I also acknowledge that as a developing country, many individuals in India do not have access to newspapers or speak and read English. However, once one-person accesses information, it can

^{1*} Chi Squared tests are sensitive to number of observations; in the case of a small sample size, G-test were run using R Project for Statistical Computing. The results are the same.

casually be shared and therefore have a greater reach than the readership of the regional and national papers.

This study did not pull articles from every English-India newspaper, given the constraints of Access World News. Moreover, utilizing multiple newspapers throughout the country with various affiliations, backgrounds, readerships, and locales may provide a more diverse communication methodology than some of the more well-read, national papers alone. However, including regional and weekly papers to this study better represents what is reaching the diverse populations that live throughout India. As shown in Appendix B, articles were pulled from over 21 newspapers, published in over eight different cities.

5. RESULTS

5.1 Frequency of IPCC References

To answer the first research question, the frequency of IPCC references in the press was examined. Across the 168 articles analyzed, 220 mentions of the coded sources were made. Results show that together, the IPCC, and both other scientific categories (international and domestic) constitute the majority of sources used (64.29%). However, only 16.7% of the 168 articles referenced the IPCC. While the data supports the first hypothesis, that scientific institutions are the greatest source of information when informing articles about climate change, evidence shows that the IPCC is not the most used scientific source, rejecting the second part of the hypothesis.

To answer if frequency of IPCC as a source changes over time, I created a cross-tabulation table with IPCC citation and time (articles published pre and post the AR5). Table 3 shows that prior to the publication of the report, 10.9% of cited sources included the IPCC and 10.2% after the publication of the AR5. Further, as χ^2 test indicates, the relationship between the

time of the newspaper article (pre vs. post AR5) and IPCC citation is not statistically significant ($\chi^2 = 0.029$, $p=0.864$). Therefore, the data do not support my hypothesis about the increased use of IPCC as a source of information after the publication of AR5.

Table 3. Statistical comparison of IPCC as a source over time

| IPCC as Source | Time | | |
|-----------------------|----------------------|------------------------|--------------|
| | <i>Before AR5</i> | <i>After AR5</i> | <i>Total</i> |
| IPCC not cited | 79 (89.9%) [78.6] | 109 (89.1%) [188.4] | 188 |
| IPCC cited | 9 (10.9%) [9.4] | 23 (10.2%) [22.6] | 32 |
| Total | 88 | 132 | 220 |

This table represents the observed and expected values of the interaction of these two variables (before and after functioning as a dummy variable), in addition to the percentage of instances of the observed values. N=220. Observed values are displayed in the top rows followed by the percentages in parentheses. Below, the expected value is displayed in brackets. Totals of observed data appear at the end of columns and rows. $\chi^2 = 0.02945$; $df = 1$; $p=0.8637473$

5.2 Use of IPCC Language

When answering the second research question, the coding results suggest that the English-Indian press does not entirely embrace the idea of communicating climate change uncertainty. Overall, 71 of 168 articles (42.3%) communicated about uncertainty in some form (mentioned colloquially and employing IPCC language). While this is not the majority as hypothesized, it is noteworthy that communication of uncertainty is still present in a substantial number of articles within the English-Indian print-press.

Furthermore, when tested against time, before and after the report was published, there was no significant relationship of how uncertainty was communicated in climate change newspaper coverage ($p>0.1$), shown in Table 4. Together, these results reject the hypotheses; India's English-press did not adopt the technical language that the IPCC employs for uncertainty communication in the post AR5 articles.

Table 4. Comparison of uncertainty communication before and after AR5

| Uncertainty Comm. | Time | | |
|-------------------|-------------------|------------------|--------------|
| | <i>Before AR5</i> | <i>After AR5</i> | <i>Total</i> |
| UMC | 27 (84.4%) | 31 (79.5%) | 58 |
| | [26.1] | [31.9] | |
| UIPCC | 5 (15.6%) | 8 (20.5%) | 13 |
| | [5.9] | [7.1] | |
| Total | 32 | 39 | 71 |

$\chi^2 = 0.2808$; $df = 1$; $p = 0.5962048$

5.3 Impacts and Uncertainty Communication

Lastly, to answer the final research question, impacts and issues discussed in the press were analyzed against coverage of uncertainty. Results are shown in Table 5. As presented, 112 of 168 articles (66.6%) communicate about one or more specific issue such as temperature change, sea level rise, fluctuations in precipitation, etc. When the press covers these issues, journalists are about as likely as not to communicate about uncertainty. When no issue is discussed, journalists are significantly less likely to employ language of uncertainty ($p < 0.1$).

Table 5. Comparison of uncertainty communication and issues covered in the press

| Uncertainty Comm. | Discussion of Issues | | |
|-------------------|----------------------|---------------------------|--------------|
| | <i>No Issue</i> | <i>Issue(s) Discussed</i> | <i>Total</i> |
| UNM | 42 (75%) | 55 (49.1%) | 97 |
| | [32.3] | [64.6] | |
| UM | 14 (25%) | 57 (50.9%) | 71 |
| | [23.6] | [47.3] | |
| Total | 56 | 112 | 168 |

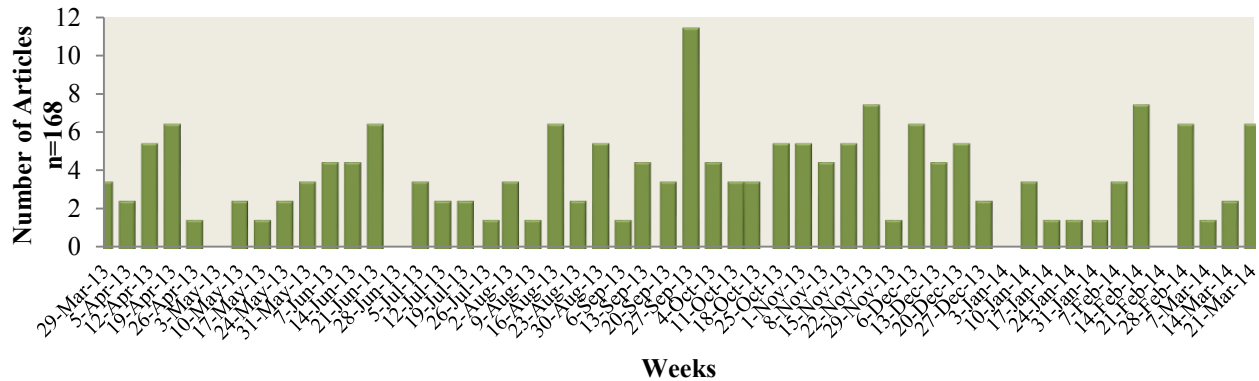
$\chi^2 = 10.25758$; $df = 1$; $p = 0.0013612$

6. DISCUSSION

6.1 Climate Change Coverage in India's Print Press

Weekly coverage of global climate change in India is depicted in Figure 1. This figure indicates the ebb and flow of climate change in Indian print press. In late September 2013, following the publication of AR5 Physical Science Basis there was a distinct increase in articles related to the topic. This is likely due to increased attention from the report and enhanced by coverage of Cyclone Phailin (October 4th, 2013) the second largest cyclone to land on India, impacting over 12 million people. This spike shows that coverage of climate change peaked just after the new report, however this cannot be linked to the amount of uncertainty discussed in print or language surrounding it. I speculate that other increases during the study period were

Figure 1. Weekly climate change newspaper coverage throughout India



similarly driven by large events and climate related meetings, such as the Uttarakhand floods that devastated the India state (June 14-17, 2013), Typhoon Haiyan (November 8, 2013), and the United Nations Framework Convention on Climate Change in Warsaw (November 11-23, 2013).

6.2 Uncertainty Communication

While strong acceptance of climate change was apparent in the articles, there was not consensus regarding communication of uncertainty. Articles that did not discuss uncertainty often had short lines about the current or impending threat of climate change, but typically

conveyed this broader and complex issue as a simple yet definitive threat. Additionally, articles of this kind were often brief. Some articles used language such as “[g]lobal warming is a greatest challenge for mankind which needs to be addressed immediately” (Star of Myrose, 12/28/13), while others referenced the impacts it will have. For example “[c]limate change results from the gradual increase of sea surface temperature” (New Indian Express, 5/22/13) or “Climate change is threatening to impact the bottomline of the [organized] tea industry in India...” (The Hindu, 6/25/13).

Conversely, those that were categorized as communicating uncertainty in colloquial terms were usually lengthier and described the issue in more depth. Some articles used more scientific terminology to communicate the uncertainty, with language such as "There are ecological surprises caused by climate change scenarios such as rising sea level and increasing temperature which we are not aware because of low understanding and non-availability of data which the new tool will help us" (New Indian Express, 4/15/13). Others portrayed a more general explanation of the issue using casual phrases like ‘likely,’ ‘might,’ or ‘could’. The word ‘likely’, while one of the IPCC’s uncertainty phrases, was frequently used in an informal tone. One example comes from the Free Press Journal, which reads, “Recent decades have likely been the wettest on record in the semiarid Tibetan plateau” (2/18/14).

While most articles encountered did not explicitly approach the issue of uncertainty relating to climate change, others presented the issue outright. These articles spoke clearly of the uncertainty surrounding climate change and its unresolved and evolving nature. Some examples of clear and explicit reference to climate change uncertainty include,

- “The scientific evidence of... climate change has strengthened year after year, leaving few uncertainties apart from the serious consequences,” the Panel's chairman Rajendra

Pachauri said at the start of the gathering”(The Statesman, 9/23/13)

- “There are still many uncertainties related to the science of climate change, and much understanding is still evolving in the scientific world” (Business Line, 10/5/13)
- “The basic physics of climate change is not at dispute, but knowledge about how all the complex factors influencing the global climate work together is still sketchy”(Financial Express, 10/7/13)

This is interesting because one would expect that these are the articles that would most likely utilize the language of the IPCC.

The aforementioned excerpts came from articles that cited the IPCC. While one may expect that these are the articles that would utilize the language of the IPCC, they did not. In articles that did utilize the qualitative and quantitative language of the IPCC mostly referenced the most recent information about anthropogenic climate change, reporting “It is extremely likely that human influence on climate caused more than half of the observed increase in global average surface temperature from 1951 to 2010” (The Hindu, 8/21/13). The majority of articles using this language did so in providing direct quotes from the report and most were quantitative measures. Only two of the UIPCC coded articles employed the qualitative language seen in Table 1.

It is important to note that the draft reports of the IPCC were leaked before the final publication date and made their way to the press. This could potentially cushion the number of times the IPCC was referenced as a source prior to the official publication date and skew these results. Even with this cushion, ultimately these results suggests that the English print-press in India does not use one of the leading source of international climate change information as often as one would expect.

6.3 Portraying Issues

Coverage of climate change waxes and wanes as important and impactful climate events occur. Events or hot topic issues continue to drive the discussion of climate change in the press. The changes surrounding climate change communication are more likely a factor of what was occurring at the time, such as large cyclones and monsoon, rather than an influence from the IPCC Assessment Report. It is arguable that real events and disasters have a greater impact and effect on the press than a report such as the IPCC Assessment Report; these occurrences affect and reach more individuals than a document ever will, which likely drives this sensation.

7. CONCLUSION

Conveying information about environmental issues, like climate change, has challenges. This is especially difficult when the facts are disseminated through the media and the topic is highly uncertain. The cascade of uncertainty from modeling, linguistics, biases, and translation all complicate and potentially prohibit understanding of the issue at hand. Furthermore, uncertainty about environmental problems is frequently used as an excuse for political inaction. Therefore, it is important to understand how scientists reduce uncertainty over time and how that reduction is communicated to the public, in this case through the Indian-English press. This is particularly necessary for a country like India, where billions of people are simultaneously contributing to global climate change and facing the treats of the phenomena. The findings presented here suggest that studying journalism in India could provide an in-depth explanation of media coverage in India, working as a basis for other developing nations.

Results show that scientific institutions are the greatest source of information when informing articles about climate change in India. However, evidence shows that the IPCC is not the most used scientific source. Results also indicate that the English-Indian print-press does not

utilize the technical terminology employed by the IPCC. This is possibly in relation to the difficult nature of translating scientific language for a more general audience. As Boykoff and Boykoff (2007) suggest, in order for scientific language to make it to the broader media and general public, it needs to be translated into more colloquial terms³. This is largely the reason why the language of the IPCC does not appear in the print throughout India.

Continued research in this field would increase understanding of international perceptions of climate change and if and how uncertainty works as a barrier to understanding and comprehending the issue. This research would be greatly supported by more studies examining all languages covered in the Indian print-press. Studies in other developing countries would also provide a global context to these results. Increasing understanding of global knowledge and perceptions of climate change will be beneficial down the line when tackling the issues of policy inaction against climate change.

8. APPENDICES

APPENDIX A: Changes in Uncertainty Communication from AR4 to AR5

Source: Mastrandrea, M. D. et al. in Guid. Note Lead Authors IPCC Fifth Assess. Rep. Consistent Treat. Uncertainties Guid. Note Lead Authors IPCC Fifth Assess. Rep. 1–2 (2010). at <<https://www.ipcc-wg1.unibe.ch/guidancepaper/ar5-uncertainty-guidance-note-annexes.pdf>> ⁸¹

Evidence and Agreement: The AR4 guidance ... presented calibrated language to describe the amount of evidence and degree of agreement regarding a finding in qualitative terms. The AR5 guidance ... extends this approach to incorporate explicit evaluation of the type, amount, quality, and consistency of evidence, with a modified set of summary terms. Author teams are instructed to make this evaluation of evidence and agreement the basis for any key finding, even those that employ other calibrated language (level of confidence, likelihood), and to provide a traceable account of this evaluation in the text of their chapters.

Confidence: The AR4 guidance ... presented quantitatively calibrated levels of confidence intended to characterize uncertainty based on expert judgment regarding the correctness of a model, analysis or statement. The AR5 guidance ... retains these terms, but no longer defines them quantitatively. Instead, levels of confidence are intended to synthesize author teams' judgments about the validity of findings as determined through their evaluation of evidence and agreement, and to communicate their relative level of confidence qualitatively.

Likelihood: The AR4 guidance ... presented the quantitative likelihood scale, to be used when describing a probabilistic assessment of a variable or its change, or some well defined outcome having occurred or occurring in the future. The AR5 guidance ... retains this scale, more explicitly instructing authors to base likelihood assignments on quantitative analysis and noting that three additional terms were used in AR4 in limited circumstances and may be used in AR5 when appropriate. The AR5 guidance also is more explicit about the relationship and distinction between confidence and likelihood, and encourages the presentation of more precise probabilistic information (e.g., percentile ranges, probability distributions) instead of likelihood when possible.

APPENDIX B: Newspapers searched via Access World News

| Newspapers | Published By: | # of Articles Coded | Published In: | Scope of Paper | Daily Circulation |
|-----------------------|-------------------------|----------------------------|----------------------|-----------------------|--------------------------|
| Assam Tribune | The Assam Tribune Group | 7 | Guwahati | Regional | NA |
| Business Line | The Hindu Group | 10 | Chennai | National | 175,000 |
| Daily News & Analysis | Deepak Rathi | 15 | Mumbai | Regional | 926,000 |

| | | | | | |
|-----------------------------------|-----------------------|----|-----------|----------|-----------|
| Financial Express | Indian Express group | 3 | New Delhi | National | NA |
| Free Press Journal | Indian National Press | 8 | Mumbai | Regional | NA |
| Garhwal Post [Weekly] | Satish Sharma | 6 | Dehrandun | Regional | NA |
| Hindu, The | The Hindu Group | 39 | Chennai | National | 2,258,000 |
| Hindustan Times | HT Media Ltd | 14 | New Delhi | National | 3,786,000 |
| Indian Express | Indian Express Group | 2 | Delhi | Regional | NA |
| Kashmir Images | NA | 7 | Srinagar | Regional | NA |
| Kashmir Monitor, The | Shamim Meraj | 2 | Srinagar | Regional | NA |
| Mail Today | India Today Group | 3 | New Delhi | Regional | NA |
| Mid Day | Jagran Prakashan Ltd | 1 | Mumbai | Regional | NA |
| MINT | HT Media Ltd | 7 | New Delhi | Regional | 222,000 |
| The New Indian Express | Indian Express Group | 18 | Chennai | Regional | 309,252 |
| Pioneer, The | Chandan Mitra | 10 | New Delhi | National | NA |
| Political and Business Daily, The | NA | 2 | New Delhi | Regional | 155,000 |
| Star of Mysore | NA | 2 | Mysore | Regional | NA |
| Statesman, The | The Statesman Ltd. | 11 | Kolkata | Regional | 230,000 |
| Telegraph, The | ABP Group | 1 | Kolkata | Regional | 1,254,000 |

APPENDIX C: Intercoder Reliability Data

| Article # | Uncertainty | | | | | | Sources of Information | | | | | | | | | | | | Temporal Element * | | | | | | | | | | | |
|----------------------|-------------|--------|-------|-------|--------|--------|------------------------|--------|--------|------|--------|--------|--------|--------|--------|--------|---|---|--------------------|---|---|---|---|---|---|---|---|---|---|---|
| | UNM | UMC | UIPCC | OD | OI | GD | GI | SD | SI | IPCC | NS | TP | TC | TF | TN | | | | | | | | | | | | | | | |
| 4 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | |
| 6 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 |
| 7 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 |
| 8 | 1 | 1 | 0 | 0 | 0 | 0 | 3 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 |
| 9 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 |
| 10 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 11 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 41 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 67 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 |
| 84 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 |
| 95 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 |
| 118 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 144 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 |
| 156 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 |
| 173 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 |
| 205 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 211 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0 |
| % Agreement | 76.50% | 76.50% | 100% | 82.4% | 88.20% | 88.20% | 100% | 82.40% | 88.20% | 100% | 94.10% | 76.50% | 58.80% | 82.40% | 94.10% | 85.89% | | | | | | | | | | | | | | |
| Scott's Pi | 0.485 | 0.485 | 1 | 0.603 | 0.544 | 0.433 | NA | 0.612 | 0.595 | 1 | -0.03 | 0.19 | 0.165 | 0.642 | -0.3 | 6.754 | | | | | | | | | | | | | | |
| Cohen's Kapa | 0.493 | 0.85 | 1 | 0.611 | 0.553 | 0.452 | NA | 0.617 | 0.595 | 1 | 0 | 0.261 | 0.287 | 0.643 | 0 | 7.362 | | | | | | | | | | | | | | |
| Krippendorff's Alpha | 0.5 | 0.5 | 1 | 0.615 | 0.557 | 0.45 | NA | 0.624 | 0.607 | 1 | 0 | 0.214 | 0.189 | 0.653 | 0 | 6.909 | | | | | | | | | | | | | | |

*Data was collected before coding of issues was determined (5/23/14) and therefore are not included here and the temporal element is not included in this study. White columns indicate coding by an unbiased party, tan columns indicate original coding. Inter-coder reliability was calculated using Freelon, D. ReCal OIR's methods. Average values are shown on the right side of the table.

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