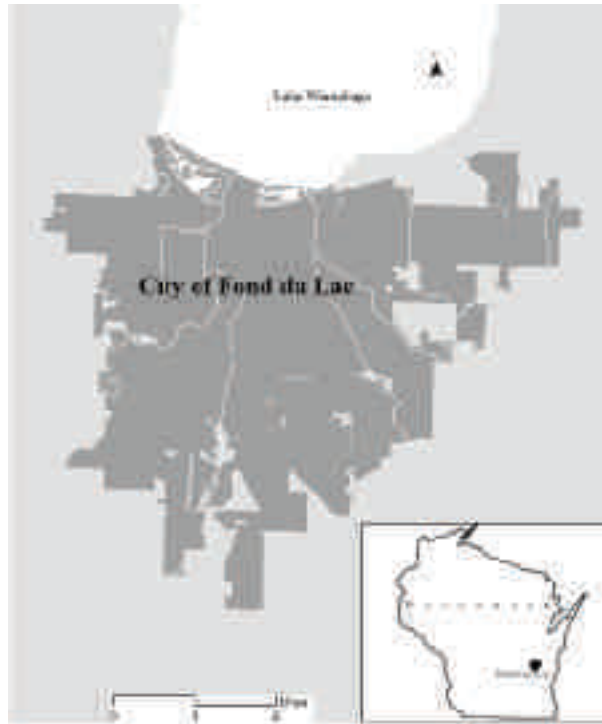


Management 2004). Flash flooding in urban areas often takes residents by surprise. According to Gruntfest and Handmer (2001), the high potential for loss of life and disruption from flash flooding requires identification of the location of flooding, properties, and the people at risk. Therefore, investment should not only be applied to identifying high-risk flood areas, such as the ones near rivers and oceans, but also to the mapping of other potential urbanized flood-hazard areas. I studied the possibility of using a relatively simple, fast, effective, and economical way of mapping flood hazards in an urban setting, which could benefit other small cities.

As evident in Chan's (1997) study, flood events that took place as a consequence of rapid development and environmental degradation are quickly forgotten because people choose to see only the positive benefits of a rising economy while ignoring negative side effects. Flood maps could be used as a constant reminder of hazards. Flood risk management should be a part of community development and residents could play a role in managing flood risks without relying on external entities (Osti et al. 2008). The procedure and results of the proposed flood hazard mapping tasks would encourage community-based flood management and improved local use of flood maps. I planned to accomplish that goal by using spatial analysis tools of geographic information systems (GIS). That spatial technology is capable of assessing and estimating regions of hazard by creating thematic maps and overlapping them to produce a final hazard map (Mansor et al. 2004). Therefore, this study used GIS to integrate spatial data and produced a flood risk map that is accessible and easily understood. I also plan to develop a post-flood mapping guideline to be implemented during and immediately after flood events as well as adjust existing FEMA maps and provide an assessment of potential damage.

It is important to have accurate flood maps because the National Flood Insurance Program (NFIP), directed by FEMA, requires local governments to enact floodplain management guidelines. If these guidelines are followed, private developments in designated flood-prone areas are eligible for federally subsidized flood insurance (Dzurik 2003). FEMA has already created more than 80,000 flood insurance rate maps for roughly 20,000 communities and provides flood insurance rate map data to be used with commonly available desktop GIS and mapping programs (Whitney 1997). To bring both the information and the technology up to date, FEMA launched a Flood Map Modernization program called the Map Modernization Project. It aims to make the nation's flood maps more accurate and to convert them to a GIS format. FEMA cannot do this sizable task alone, and has therefore utilized community programs and partnered with local agencies (Quarles et al. 2002; Engelhard 2004).

The site selected for this project is the city of Fond du Lac, Wisconsin (fig. 1). On June 12, 2008, Fond du Lac was devastated by a major flooding event (fig. 2). Since then, the city has been in the process of updating floodplain maps and regulations that have not changed since 1988. Updating the floodplain maps is part of a FEMA effort that uses digital technology to make the maps easier to interpret (Veremis 2008). According to Fond du Lac Community Development director, Wayne Rollin, "there are no big changes in terms of floodplain boundaries, but a big change in the usability and quality of the map." However, many residents say that the June 2008 flood was unexpected because they never knew that they resided in a flood-prone area, thus they were not prepared to take action. For this reason, the city of Fond du Lac is an ideal site to conduct a study on ways to delineate the extent of past flood events for mapping purposes. Thus, I mapped the 2008 Fond du Lac flood areas using oblique amateur aerial photographs and assessed the recent FEMA floodplain map of the site. The study assessed a relatively cheap way to create, adjust, or update FEMA flood maps of Fond du Lac and the methodology and lessons learned can help similar small cities across the nation adjust their flood maps.



**Figure 1.** Location of Fond du Lac in Wisconsin including Lake Winnebago and river networks. Map created using ArcMap 9.3.

### **Methodology**

The use of GIS and remote sensing for mapping the flooded areas and an overlay analysis (spatial comparison) to assess the local FEMA flood map were the two major components of this project. To begin mapping the flooded area I needed to make a selection from several aerial photographs that were taken after the event. These were received courtesy of Adam Dorn, a GIS specialist serving at the Fond du Lac City/County building. Specific photographs with an optimal aerial view (covering a wide area) and an oblique vantage point were chosen. However, since the photographs were not geographically referenced to a specific location within Fond du Lac, I worked with Fond du Lac representatives to discover their locations.

After finding the photographs' locations, I fitted them to the other spatial data (map) by matching their features with corresponding features on other layers (i.e., roads) that are in a known coordinate system. This matching process is referred to as *georeferencing*, the task of aligning geographic data to a known coordinate system. I then reduced their distortions with a process called *rectification*, the process of applying a mathematical transformation to an image so that the result is a *planimetric* (having no indications of relief) image. This is done because raw digital images, such as the oblique photographs used for this project, are not aligned with any conventional geographic coordinate systems, and they commonly contain internal geometric distortions that occur during the image acquisition process (California Institute of Technology 2007). During a georeferencing task, control points must be accurately located, sufficient in number for the transformation model selected, and distributed uniformly across the image (MacroImages Inc. 2009). With the newly georeferenced/rectified



**Figure 2.** Oblique aerial photograph showing severity of damages to the city of Fond du Lac the morning after the event. *Photo courtesy of Adam Dorn, Fond du Lac Sheriff's Department, and Fond du Lac Reporter.*

aerial photographs, flooded areas can be traced/digitized and interpolated between photos. To do this, I delineated the contour of the affected areas of the June 2008 Fond du Lac flood event and created a new layer with the ArcMap software.

For the second aspect of the study, the most recent layer of FEMA flood maps of the area (a polygon layer) was compared to the layer of flood polygons resulting from the completion of the first part of the project. The two (assumed dissimilar) polygon layers were subject to a spatial overlay analysis technique, which provided coincident (common/overlapping) areas as well as non-coincident (non-overlapping) areas of each input polygon. The use of this technique is supported because we often need to overlay layers that have completely different underlying geographies in order to combine attributes from the two input layers into a third output layer (California State University, Fullerton 2009). *Union, intersect, symmetrical difference, and identity* are the four types of overlays one could use to compare the two flood maps. However, I only wanted to produce the coincident and non-coincident sections of both maps. Therefore, I used only the intersect and the symmetrical difference overlay methods. Intersect preserves features that fall within the area extent common to the inputs while symmetrical difference preserves features that fall within the area extent that is common to only one of the inputs (Chang 2009).

### ***Overview of Resulting Methodology***

The four major components of this project were the use of GIS and remote sensing for determining the flooded areas, the application of union and overlay GIS analysis to assess the flooded areas not accounted for in the FEMA flood maps, a damage assessment of the areas, and the determination of the possible cause of the flooding (riverine vs. inadequate storm drainage).

### Assessment of the Flooded Area

I first used a sample location of the flooded area that I selected from several aerial photographs taken after the event. Specific photographs with an oblique aerial view (covering a wide area) were chosen to conduct the processes of georeferencing, rectification and delineation of the flooded areas. However, because the photographs of the selected area were fewer than needed and some were severely oblique, the photos I could rectify were severely disconnected (with respect to distance) and did not cover a large enough area (fig. 3). This is because only photos of flooded areas were taken instead of the entire city. Therefore, I could not use them alone for a manual flood delineation as originally suggested. Instead I used all available photographs, including the severely oblique ones, of the site that displayed flooded areas in the following process.

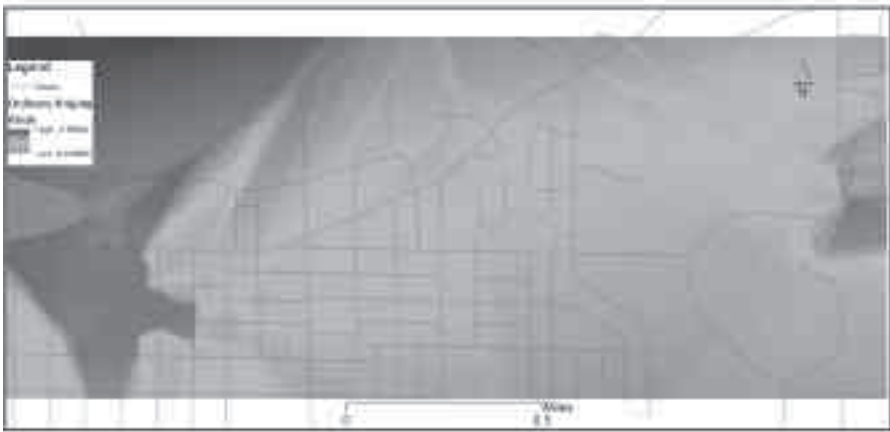


**Figure 3.** Some rectified oblique photos.

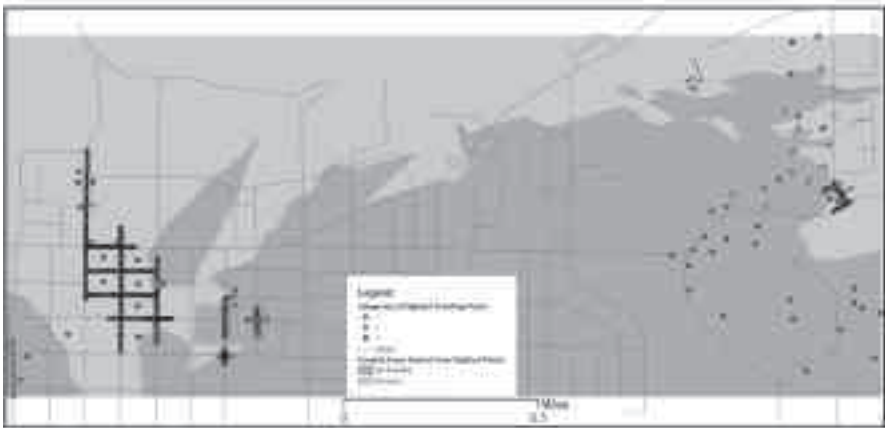
After finding the photographs' locations, I represented the flooded extent (on the photo) by digitizing points over the corresponding ground features using a process called point digitizing. Each point was assigned a flood intensity value based on a scale of 1 to 3: "1" described minimum flooding, "2" described moderate flooding, and "3" described maximum flooding (fig. 4). I *interpolated* (estimated surface values at unsampled points based on known surface values of surrounding points) the newly digitized flood points of the area using the Ordinary Kriging<sup>1</sup> method, a form of interpolation. From the output of the interpolation (fig. 5), I selected the cell values that were greater than two in order to distinguish areas that were moderate to severely flooded from the areas that were barely or not flooded at all (fig. 6). I then converted the grid containing severely flooded areas from raster (representation of the world using a surface divided into a regular grid of cells) to vector (representation of the world using points, lines, and polygons) to compare them to the FEMA layer (also vector) by using a union overlay analysis process.



**Figure 4.** Digitized points of the flooded area using a severity scale attribute of 1 (min) – 3 (max).



**Figure 5.** Interpolation (Kriging) of digitized points with a value greater than two (2).



**Figure 6.** Selection of flooded areas with cell values that are greater than two (2) from the interpolation of the digitized points.



Comparing Flood Assessment by Photos to FEMA Map

For the second aspect of the study, I used the most recent version of the FEMA flood maps of the area. This FEMA flood map layer contains attributes that express the severity of the different flood zones. Although there are several FEMA flood zones (table 1), I only selected zones AE and AH located in the “High-Risk Areas” for this project because we are only interested in the high-risk zones that are not directly related to the lake and river flooding.

AREA	ZONE	DESCRIPTION
Moderate to Low-Risk Areas	Ward B (unshaded)	Area of moderate flood hazard, usually the area between the banks of the 100-year and 500-year floods. It does not also seem to designate severe inundations of lower lands, such as areas protected by levees from 100-year floods, or shallow flooding areas with average depths of less than one foot or average areas less than 1 square mile.
	Flood X (unshaded)	Area of moderate flood hazard, usually designated as Flood Insurance Rate Maps (FIRM) for the 500-year flood level. Zone X may also designate areas of shallow flooding and areas that do not contain a moderate or severe inundation of lower lands. Zone X is the area between the 100-year and 500-year flood and protection by levees from 100-year floods.
	A	Areas with a 1% annual chance of flooding with a 20% chance of flooding occurring in a 30-year recurrence. The area is not subject to severe inundation for moderate or deep water flood conditions are shown within these areas.
	AE	The area is shown as a flood hazard area, as provided. AE flood insurance rates are provided. FIRM for the 100-year flood. These are known as moderate A Zones (e.g., AE or A19). This is the most common zone in FIRM (e.g., AE or A19).
High-Risk Areas	A1-30	Areas with a 1% annual chance of shallow flooding, usually at the bottom of a pool, with an average depth ranging from 1 to 3 feet. These areas have a 20% chance of flooding over the life of a 30-year recurrence. Their flood elevation is determined by the average of the area's elevation and the elevation of the flood zone.
	AH	Areas with a 1% annual chance of flooding, usually at the bottom of a pool, with an average depth ranging from 1 to 3 feet. These areas have a 20% chance of flooding over the life of a 30-year recurrence. Their flood elevation is determined by the average of the area's elevation and the elevation of the flood zone.
	AO	Areas with a 1% annual chance of flooding, usually at the bottom of a pool, with an average depth ranging from 1 to 3 feet. These areas have a 20% chance of flooding over the life of a 30-year recurrence. Their flood elevation is determined by the average of the area's elevation and the elevation of the flood zone.
	AH	Areas with a 1% annual chance of flooding, usually at the bottom of a pool, with an average depth ranging from 1 to 3 feet. These areas have a 20% chance of flooding over the life of a 30-year recurrence. Their flood elevation is determined by the average of the area's elevation and the elevation of the flood zone.
High-Risk Coastal Areas	AO	Areas with a 1% annual chance of flooding, usually at the bottom of a pool, with an average depth ranging from 1 to 3 feet. These areas have a 20% chance of flooding over the life of a 30-year recurrence. Their flood elevation is determined by the average of the area's elevation and the elevation of the flood zone.
	AH	Areas with a 1% annual chance of flooding, usually at the bottom of a pool, with an average depth ranging from 1 to 3 feet. These areas have a 20% chance of flooding over the life of a 30-year recurrence. Their flood elevation is determined by the average of the area's elevation and the elevation of the flood zone.
Unincorporated Risk Areas	AO	Areas with a 1% annual chance of flooding, usually at the bottom of a pool, with an average depth ranging from 1 to 3 feet. These areas have a 20% chance of flooding over the life of a 30-year recurrence. Their flood elevation is determined by the average of the area's elevation and the elevation of the flood zone.
	AH	Areas with a 1% annual chance of flooding, usually at the bottom of a pool, with an average depth ranging from 1 to 3 feet. These areas have a 20% chance of flooding over the life of a 30-year recurrence. Their flood elevation is determined by the average of the area's elevation and the elevation of the flood zone.

Table 1. FEMA flood areas and zones

I selected only the zones that were designated as “hazardous flooding areas” from the FEMA layer (using the Structured Query Language selection FLD\_ZONE=’AE’ OR FLD\_ZONE=’AH’) and then converted that selection to a new layer (fig. 7). With the newly created layer of FEMA’s “hazardous flooding areas” flood zones and the vector layer of flooded areas derived from the photos in part A, I was able to run two sets of alternative combination of GIS operations (union-intersect and symmetrical difference overlay analysis) to select only the areas that were flooded and not accounted for by the FEMA layer. The union operation served to combine both of the layers and their attributes into a new union layer. From the union layer, I selected only the features where the FEMA flood zones and the zones I generated did not overlap. The last selection shows the areas of FEMA flood zones that I did not map and the flood zones that I generated but that FEMA did not take into account (fig. 8).



**Figure 7.** FEMA hazard zones AE and AH located in the selected “High-Risk Areas.”



**Figure 8.** Flooded area not accounted for by FEMA. It results from an overlay analysis using FEMA high-risk flood layers and the digitizing and interpolation derived layer of the 2008 flood event.

**Assessment of Potential Damage**

After obtaining a block population point layer containing data on the number of houses and people in a selected area from U.S. Census data, I clipped/removed some of the data from the population layer to fit the size of the selected Fond du Lac study area layer (fig. 9). Using the clipped block population layer and the union layer of flooded areas generated by FEMA and by photos, I ran an intersection overlay analysis to obtain only the block population layer’s point features of the flooded area (fig. 10). That operation also attached to each block point the attribute (information/description) of the corresponding flood features from the union layer. By computing some of the attribute data attached to the previously created flood-block intersection layer, I was able to determine the number of houses in the selected damage zone, the number of occupied houses, and the number of people who live within the area that are not accounted for by FEMA. The area has a population of 821,311 occupied households and 322 housing units (fig. 11).



**Figure 9.** Block population layer for Fond du Lac area.



**Figure 10.** Result of intersection overlay analysis using union layer and block population. The dots express the number of houses for the census block they represent.



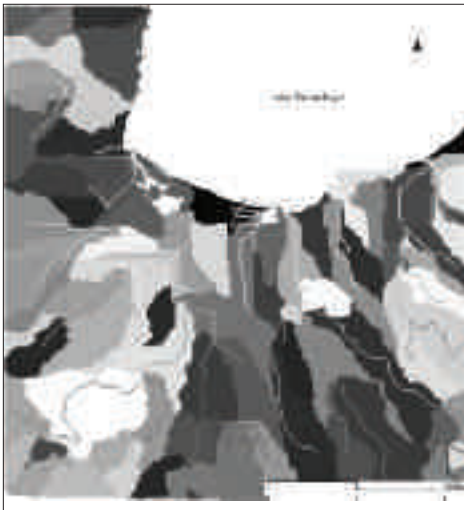
**Figure 11.** Statistics of individual areas and the sum of entire.



### **Determination of the Type of Flooding**

For the third aspect of the study, I created a digital elevation model to generate the *sub-watersheds* (a smaller basin within a larger drainage area where all of the surface water drains to a central point of the larger watershed) and stream networks of the selected Fond du Lac area to determine whether the flooding was due to the expansion of the river and lake waters or to inadequate storm drainage in that area. This assessment assumes that flooding caused by the river will stay in the river's sub-watershed and its vicinity, and that flooding caused by the lake will stay in the lake's sub-watershed and its vicinity.

After generating the sub-watershed of the entire Fond du Lac area, I selected only the sub-watersheds that are within the selected sample area to create a new layer. Overlaying the sample area's stream network layer onto the sub-watershed layer allows us to visually determine where the streams and watershed of each flooded area is connected to the river (fig. 12). The areas that contained flooding and that are not in a watershed related to a river or lake are likely to be caused from an inadequate storm drain system.



**Figure 12.** Sub-watershed and stream network of Fond du Lac.

### **Conclusion and Future Research**

The outcome thus far has shown that the number and distribution of photographs, as well as their obliqueness or aerial view, contributes greatly to the successful and accurate completion of this project as well as similar future projects. It also shows that the use of GIS allows for a reasonable estimate of locations that should be accounted for by FEMA. I have therefore concluded that the original approach involving georeferencing, rectification, and delineation of a flooded area based solely on aerial photos (no ground photos) is feasible (fig. 3) provided there are sufficient adjacent photos. This technique is being further refined by a forthcoming study Dr. Coulibaly and I will conduct, which will allow us to assess the efficacy of the current process as a measure of the amount of interpolated area with respect to the actual flooding mapped from aerial photographs. However, for the purpose of this study, it was necessary to supplement the aerial photos with ground photos.

### Notes

1. Ordinary Kriging: A kriging<sup>2</sup> method in which the weights of the values sum to unity. It uses an average of a subset of neighboring pairs of points to produce a particular interpolation point. It is the most commonly used kriging method.
2. Kriging: A geostatistical interpolation technique in which the surrounding measured values are weighted to derive a predicted value for an unmeasured location.

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## Communication Accommodation in Mixed Gender Dyads

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### *Abstract*

Men and women speak differently. That is, there are observable patterns of gender differences in communication. To reconcile differences and facilitate communication it is necessary to use accommodation, the process of adjusting patterns toward or away from a conversational partner. Past research on accommodation has been limited to laboratory settings, in which conversational topics are assigned or suggested and participants are put in an unfamiliar situation with unfamiliar conversational partners. This study extends research on gender accommodation by using unobtrusive observation of male-female dyads in conversation within the public domain. Consistent with the literature, I hypothesized that women would exhibit more convergent accommodation behaviors than men overall; that in conversations in which the topic is stereotypically feminine, men would exhibit more convergent accommodation behaviors than women; and that in high-stress conversations both partners would exhibit divergent accommodation behaviors. Results indicate strong support for the first hypothesis, but do not show support for the second and third hypotheses. Furthermore, the results indicate some deviation from past laboratory research within the factors affecting accommodation and in stereotypical conversational indicators in use during this study.

### *Introduction*

What is the difference between responding to an interruption by saying, “I’m not finished yet” and “Can I finish”? That difference in fact is quite valuable from a research perspective. The phrase “I’m not finished yet” is more likely uttered by a man; it shows concern with independence, it is direct, and it is goal-oriented. On the other hand, the phrase “Can I finish” is more likely uttered by a woman; it shows concern with interdependence (social approval), it is indirect, and it is emotion-oriented. Though these responses are similar, they represent some of the small fundamental differences in communication patterns moderated by gender differences. In a world in which men and women are constantly interacting socially and professionally, it is important to consider how they communicate with one another. It seems obvious that men and women converse differently, which represents an important area of investigation for researchers. Research that examines speech differences attempts to define speech in terms the other gender might understand in order to better facilitate relationships between men and women. From my understanding gender is defined as a social

construction. Gendered language, for the purposes of this study, would therefore be explained as learned behaviors supported by society's conceptions of gender. The effectiveness of communication between men and women is influenced by the gendered patterns of speech they follow. The research done on these gendered patterns is often difficult because gender differences tend to disappear in mixed gender dyads (male-female pairs). This issue can be addressed via research on the process of accommodation, which may be the cause of the decrease in gender differences.

### **Accommodation**

According to Communication Accommodation Theory (CAT), accommodation is the process by which people, regardless of gender, adjust their patterns of communication to accomplish social goals.<sup>1</sup> CAT suggests that people accommodate in a convergent manner (or toward one another) when they are concerned with social approval and in a divergent manner (or away from one another) when they are concerned with boundaries.<sup>2</sup> Convergent accommodation may be as simple as adopting the accent of a conversational partner, while divergent accommodation could be enunciating speech to avoid that conversational partner's accent. Furthermore, CAT describes accommodation in terms of symmetry in addition to direction; partners may accommodate equally or, as in most cases, unequally.<sup>3</sup> A 2002 study of 42 men and 42 women in a laboratory setting found that women tended to accommodate more than men, and that generally people accommodated more to male speech than to female speech. The study further suggested that women were more attentive and sensitive to accommodation than men; it also showed that, when listening to speech, women noticed and reacted to accommodation patterns more than men.<sup>4</sup> However, this study lacked conversational reality, as it was done via repeating individual words from a list. In addition, a 2005 study found that women were more likely to accommodate to men phonologically, or in terms of vocal sounds (e.g., pitch). This study also indicated that Northern women may be more advanced in the Northern Cities Chain Shift (or a shift of vowel sounds originating in Northern cities) due to accommodation, which accounts for a slight difference in the speech of women and men from the same region.<sup>5</sup> Another accommodation variation to consider may be the phenomenon of "mutual hyperconvergence," which is a form of overaccommodation, or convergence on the part of both male and female conversational partners.<sup>6</sup>

### **Factors Affecting Accommodation**

Much of the research on accommodation additionally cites several factors that could affect accommodation processes between genders. The setting of the conversation is an important factor that could affect accommodation. As stated above, much of the past research has been conducted in a laboratory. Studying conversations in more natural settings could result in different patterns of accommodation. Aside from setting, other factors identified in past research as influencing communication between men and women include: status (a lower status individual will accommodate more to a higher status individual); security in the individual's societal role; relationship with the conversational partner (shorter relationships exhibit higher gender differences); and perceptions of the self, partner, and the situation.<sup>7</sup> Most research dealing with status indicates that women accommodate more than men in conversation because they are perceived as having a lower status.<sup>8</sup> Specific factors studied in this research are listed in table 1. A 2003 study with children addressed the issue of perception in conversation. This study supported the idea that accommodation behavior in boys was mediated by their strong beliefs about gender roles. Specifically, boys with strong beliefs about

gender roles tended to accommodate less.<sup>9</sup> Research done suggested that the gender of a conversant influences the conversation more than the gender of the conversational partner; one's own gender perceptions more strongly influence what one is hearing, thereby influencing their response.<sup>10</sup> Furthermore, research on gender salience has suggested that stronger salience of one's own gender influences use of stereotypical masculine and feminine language characteristics as the situation or setting allows it.<sup>11</sup> In a 1988 study on conversational accommodation and male dominance roles, conversational patterns were observed via interruption rates. The study showed that women converged more than men in general (interrupted less and allowed interruption more), but accommodation varied over different factors such as utterance length, short and long pauses, back-channels (verbal or nonverbal communication facilitators used by the listener), and laughter.<sup>12</sup> Another factor of accommodation includes regional dialect (or accent), which may even differ between genders of similar regions as described by Clopper and colleagues (2005).<sup>13</sup> To better understand the process of accommodation, one must examine the gendered patterns males and females tend to follow.

### **Masculine and Feminine Language**

The gendered patterns of speech can be examined via features of language identified as either masculine or feminine. Features of language identified as feminine include intensive adverbs (e.g., *all, some, very*, etc.), emotion words, questions, hedges, longer sentences, minimal responses (e.g., *uh-huh, hmmm*, etc.), and qualifiers, while features of language identified as masculine include self-reference, directive or imperative statements, terms of quantity (e.g., *one, a dozen*, etc.), and judgment adjectives (e.g., *weird, unpleasant*, etc.).<sup>14</sup> In terms of self-reference, experiments show that men not only use the pronoun "I" more frequently but with shorter speech intervals between uses.<sup>15</sup> Masculine language is often described as direct, succinct, and instrumental, while feminine language is described as indirect, elaborative, and affective.<sup>16</sup> Women are also identified as having clearer speech and larger shifts in pitch within their speech.<sup>17</sup> Furthermore, men are said to use conversation as a means to negotiate or achieve, using "task-oriented language," while women are said to use conversation as a means to intimacy, using "emotion-oriented language."<sup>18</sup> In a 2008 study that utilized text samples and transcripts of conversations (though the gender of partners were not given) it was discovered that women used more psychological and social processes in language while men used more object properties and impersonal language.<sup>19</sup> These general descriptions place a firm divide between masculine and feminine communication, which makes one wonder how members of the opposite gender could tolerate speaking to one another. However, we know that women and men do manage to communicate somehow and sometimes very well. The question is, how do they do this? The answer appears to be accommodation. Further study of this process is necessary to better understand it.

### **Hypotheses**

Based on past research, I formed the following hypotheses:<sup>20</sup>

- H1. Women will exhibit more convergent accommodation behaviors and men will exhibit minimal accommodation.
- H2. In conversations with stereotypically feminine conversation topics (relationships, emotions, and feminine strengths), men will exhibit some convergent accommodation behaviors.
- H3. In high-stress conversations, both partners will exhibit divergent accommodation behaviors.



These hypotheses focus on how accommodation processes perform in male-female conversational pairs as a function of gender. The first hypothesis was intended to address, and possibly confirm, the conclusions of past research regarding general accommodation. The second and third hypotheses were intended to address specific factors affecting accommodation. The second hypothesis proposed in response to suggestions that conversations between male-male and female-female partners can in part be identified due to topic of conversation. A feminine topic could indicate that the female was the dominant conversational partner and may suggest convergent accommodation by the male partner. The third hypothesis tests the mood of conversation. The experience of emotional discomfort or stress may cause participants to become more entrenched in their opinions and thus more entrenched in their own gendered patterns of speech.

### **Method**

An important factor of this research is the method of data collection. The majority of the research completed on conversational accommodation has taken place in a lab setting in which the participants are unknown to each other, in a foreign situation, and/or in a situation in which conversational topics are assigned or suggested by the researcher.<sup>21</sup> The use of naturalistic observation is the key to offsetting the limitations of laboratory research. By studying accommodation patterns in a natural setting one can improve ecological validity, or generalizability to the real world. This study is a qualitative, or descriptive, research study. Unobtrusive observation techniques were used to collect data via observing participants without their knowledge and without interfering in the natural course of events.

### **Participants**

This study consisted of a sample, chosen via convenience (no participant recruitment), of 26 participants (13 dyads), in which 13 participants were perceived as male and 13 participants were perceived as female. The participants were selected based on the factors of proximity, volume, and talkativeness (quantity of speech); participants who were not close enough to hear, not loud enough to hear, and not communicative enough to warrant recording were not observed. No demographic information was verified by the participants themselves (a limitation of naturalistic observation) and is merely based on the researcher's observations. Participants were not aware of their participation in the study. Participants' perceived ages varied between 18 and 65 years ( $M = 28.0$ ). Based on their conversations and nonverbal cues, couples were described as having the relationship of friends ( $N = 7$ ), dating ( $N = 4$ ), or married ( $N = 2$ ).

### **Procedure**

After the Institutional Review Board approval was received on February 17, 2011, this study was executed as follows. Using a record sheet based on previous research, observations were recorded via pen and paper to allow the research to be done in as inconspicuous a method as possible. Recording of participants was completed using a self-designed record sheet based on information from past research and addressed the following: age, relationship, conversational mood, topics of conversation, location of conversation, time and length of conversation, incidence of feminine and masculine conversational indicators, and illustrative statements. The operational definitions of the recorded characteristics can be found in tables 1 and 2. Because the characteristics of masculine and feminine language were chosen based on past research they may unintentionally promote past stereotypes. While this method may be sufficient for the purposes of this study, a reevaluation of stereotypical language characteristics is

recommended for future research. The word *perceived* was used in the record sheet in an attempt to show that none of the information was verified by the participants themselves (a limitation of naturalistic observation) and was merely an interpretation by the researcher.

Locations were restricted to Oshkosh, Wisconsin, and De Pere, Wisconsin (cities in northeastern Wisconsin approximately 60 miles apart and both with high college student populations). Research was done in a variety of public locations categorized as dining ( $N = 6$ ), sporting event ( $N = 2$ ), or coffeehouse ( $N = 5$ ) as described in table 1. Specific locations were chosen based on the likelihood that male-female dyads would congregate.

## Results

Accommodation was calculated using the incidence of the conversational indicators. Individual accommodation was determined via the adherence (divergent accommodation) to or deviation (convergent accommodation) from gender stereotypical indicators. The incidence of an equal amount of masculine and feminine indicators (or slightly gender-adherent use of indicators) showed a lack of accommodation behaviors. Total accommodation was examined via a comparison of the total speech behaviors of the conversational partners in each conversation. The incidence of accommodation is shown in table 4.

Recorded conversations were mostly taken from a dining or coffeehouse location (84.6%) and recorded during the morning (38.5%) or afternoon (53.8%). It appeared that conversations that occurred in a more home-like atmosphere (e.g., university dining hall) were more relaxed and open. The time of day appeared to have no direct influence on accommodation processes. Length of conversation did not influence differences in conversational behavior.

The age of individual participants influenced the data in two distinct ways. In general, as age increased there was more adherence to gender stereotypes in the use of conversational indicators. In addition, a difference of age between partners in the same conversation accounted for more incidences of major accommodation when female partners were more youthful than their male counterparts. However, the small number of couples with this age difference might contest the significance of this result.

In general friendship couples showed less accommodation than dating couples; unfortunately the small number of married couples yielded no reliable conclusions from these results (see table 3). Results from this study (also shown in table 3) reveal that the majority of conversations were of a relaxed mood and had neutral topics (equal distribution of specific and variable conversations).

Conversational indicators (both feminine and masculine) were recorded for both the male and female participant; quantities of these indicators were compared in table 3. As can be seen in table 3, male participants did not deviate from the conversational norms suggested by past research (i.e., men did not use more feminine language than women). Also of interest is the high incidence of questions used by both male and female participants. As seen in table 3, however, female participants deviate from the conversational norms suggested by past research in the use of masculine language. Women in this study made more interruptions than men; moreover, it appeared that younger women made notably more interruptions than older women. In addition the use of self-reference by both men and women was similar.

### **Hypothesis 1**

*Women will exhibit more convergent accommodation behaviors and men will exhibit minimal accommodation.*

Results showed strong support for the first hypothesis. According to the results listed in table 4, convergent accommodation attributed to the female partner in conversation occurred in nine of the 13 couples studied. In addition, equal convergence occurred in two of the 13 couples, which is convergent behavior by women, although this finding does not indicate minimal accommodation by men because their behavior is equally convergent. Only one of the 13 couples contradicted this hypothesis, in which the man exhibited convergent accommodation.

### **Hypothesis 2**

*In conversations with stereotypically feminine conversation topics (relationships, emotions, and feminine strengths), men will exhibit some convergent accommodation behaviors.*

Results showed little support for the second hypothesis. Only one of the 13 couples used feminine conversational topics. In this conversation the woman exhibited minor convergent accommodation. In addition, in the four of 13 couples that used masculine conversational topics women also exhibited minor convergent accommodation. As shown by the results, the majority of conversations used neutral conversational topics (table 3). Lack of relevant conversations, due to the small sample overall, prevented any meaningful conclusions in this case.

### **Hypothesis 3**

*In high-stress conversations, both partners will exhibit divergent accommodation behaviors.*

Results, or lack thereof, made the evaluation of the third hypothesis impossible (no valuable conclusions could be reached). Only one of the 13 couples exhibited an intense emotional mood (or high-stress conversation). In direct contrast to hypothesis 3, the woman exhibited major convergent accommodation in this conversation. Again, lack of relevant conversations, due to the small sample overall, prevented any meaningful conclusions in this case.

## **Discussion**

### **Accommodation**

Consistent with past research, women accommodated convergently toward male partners in the majority of situations within this study. This confirms much of the past laboratory research within the natural setting.<sup>22</sup> In this study, men most often exhibited zero accommodation, while women exhibited minor convergence in most situations. As suggested by past research, this result may be caused by women's lower societal status (women, in general, are still considered to be socially inferior to men); a natural desire in women to facilitate communication;<sup>23</sup> or the fact that women are more attentive and thus more reactive toward accommodation patterns.<sup>24</sup>

### **Factors Affecting Accommodation**

The factors examined in this study included location, length and time of conversation, age, relationship between partners, conversational mood, and topic as listed in tables 3 and 5. While location did not immediately appear to influence accommodation behaviors, it did seem to influence conversational behavior in general. Within the more home-like setting of a university dining hall, participants seemed more likely to communicate openly. This phenomena would likely account for the single intense mood conversation occurring in such a setting.

Age was used in this study to examine two factors. First, age could be considered as a means of measuring status. Unfortunately, there were no pairs in which a male participant was younger than his female counterpart. However, in the two pairs in which a female participant was younger than her male counterpart, the woman was shown to exhibit convergent accommodation behaviors. This appears to be consistent with research suggesting that status influences accommodation behaviors.<sup>25</sup> Second, age can be examined from a more general perspective in terms of differences between different age groups. Past research has suggested that sex-role definitions and social order influence gender differences in conversations.<sup>26</sup> Overall, it appeared that as age increased, adherence to gender stereotypes in language use increased. This could be attributed to a change in social expectations; women are no longer expected to be as submissive to male partners as they once were.<sup>27</sup> In a recent study using Internet blogs, gender differences in language use had significantly decreased.<sup>28</sup> It has been suggested that women are more likely to be encouraged to use certain facets of stereotypically masculine language, specifically self-reference and interruptions. Research by Hannah et. al. (1999) suggested that women are more concerned with social approval and effective communication than adhering to social norms.<sup>29</sup> This causes uncertainty about categorizing these features of language as masculine or feminine. On the other hand, it appears men may be encouraged to use stereotypically feminine language to a lesser extent than women are encouraged to use stereotypically masculine language. However, it has been noted that emotion-oriented language and task-oriented language usage by men and women may be a manner of preference rather than a socialized process.<sup>30</sup> Research has found that women use emotion-oriented language because it is more useful to achieve their social goals, whereas for men, task-oriented language is more useful to achieve their social goals.<sup>31</sup>

As far as the relationship between partners, it seemed evident that more accommodation occurred between partners with stronger relationships. In comparing relationships between friends and dating couples, dating couples showed more accommodation than friendship pairs. As stated earlier, there were not enough married couples in this sample to make a significant comparison. It could be expected that more accommodation occurs in married couples because the success of a conversation is more important in longer relationships. Misunderstandings could potentially damage the relationship in which both partners have invested time and effort. This gives incentive to use accommodation to modify conversational behaviors.

Mood and topic were the final two factors of accommodation studied here. In addressing the question of mood, the one conversation in which there was an intense mood showed major accommodation by the aggrieved partner (in this case a woman). This suggests that the threatened or angry partner may accommodate more, perhaps in an attempt to create understanding in the other partner. This is in line with research done by Hannah et. al. (1999) that suggests style of speech (facilitative, willing to communicate, or nonfacilitative, unwilling to communicate) is a better predictor of accommodation behavior than gender alone.<sup>32</sup> Unfortunately, there was only one conversation in which this could be examined.

However, the topics of conversation offered an interesting result. In either the stereotypically masculine topics or stereotypically feminine topics, women exhibited minor accommodation. It appears, based on these results, that topics of conversation have little influence over accommodation behaviors, contrary to the suggestions of past research.<sup>33</sup> This finding could be attributed to differing operational definitions of masculine and feminine topics or the small sample size. However, this finding may also indicate a failure of laboratory research to successfully recreate natural conversation topics (and natural settings) resulting in unintentional bias in past research.

### **Masculine and Feminine Language**

In the realm of feminine language, participants in this study adhered to gender stereotypes. Within the area of emotion-oriented language, a 2008 study suggested that men and women may differ in the type and use of emotion rather than in the frequency alone. Men were found to use more negative emotions, whereas women were found to use more positive emotions.<sup>34</sup> In research done on Internet blogs, it was shown that men used more emotion references or emoticons in mixed-gender newsgroups, showing evidence of accommodation.<sup>35</sup> In the current study, however, men appeared to use significantly less emotion-oriented language; the specific use of this language was indeterminable based on the descriptive results. Because hedges and qualifiers were so similar in their definitions, they were combined in the analysis of the results. Qualifiers were more likely single words, which were more difficult to parse from conversations. This factor may account for the small number of hedges and qualifiers. Finally, questions accounted for the largest number of feminine conversational indicators for both male and female participants. In retrospect, questions may be divided into types more likely to be used by either men or women. It appears that men's questions are used in order to gain specific information, consistent with literature suggesting that men are more task-oriented.<sup>36</sup> On the other hand, women appear to use questions to facilitate conversation in general. These questions are often defined as "tag questions" (e.g., *isn't it?*, *don't you?*, *really?*, etc.) and are thought to express uncertainty and are used as a means of being polite.<sup>37</sup> This is consistent with research stating that women are more concerned about producing intimacy and gaining social approval in conversation.<sup>38</sup>

As far as masculine language, participants did not completely adhere to gender stereotypes. In the area of task-oriented language, there was strict adherence; thus, this appeared to be the top indicator for masculine language. This finding corresponds with past research on the topic.<sup>39</sup> However, this study found that women used interruptions more than men. This is contrary to previous findings by Helgeson (2009) that may suggest a shift in social or conversational norms.<sup>40</sup> In addition, the use of self-reference is shown as similar in both male and female participants. Again, this may suggest a shift in social or conversational norms and a necessity for future research to re-evaluate stereotypical conversational patterns. Finally, within direct or imperative statements there may be a great deal of overlap into task-oriented language. A command that directs the conversational partner toward a specific goal would fall into both categories (e.g., "Give me your fork, I want to taste your dessert"). Thus, the difference in quantity of usage in direct or imperative statements between male and female participants is similar to the difference in quantity of usage in task-oriented language.

Overall, the conversational indicators examined suggested masculine indicators were used more frequently than feminine indicators. This may be attributed in part to changing conversational norms, but is more likely attributed to the high rate of female accommodation.

### **Conclusion**

In conclusion, women, in general, exhibit more convergent accommodation behaviors in relation to male conversational counterparts. However, topic of conversation did not seem to affect accommodation behaviors and conversational mood affected accommodation behavior in direct contrast to expectation. Overall, men and women appeared to adhere to gender stereotypes, with the minor exception in the area of self-reference. Furthermore, as age of partners increased, adherence to stereotypes appeared to increase as well. In a comparison of the relationships between partners, friends appeared to accommodate less than dating couples; unfortunately, the number of married couples was too small to draw any meaningful conclusions. In a comparison



of couples (two couples in which the man appeared slightly older than the woman) with differing ages, again, the sample may be too small to draw any meaningful conclusions, but may indicate greater accommodation by the younger partner (in this case both women). In addition, conversational setting appeared to influence conversational behavior rather than directly affecting accommodation behaviors; more home-like or relaxed settings resulted in more relaxed and honest conversations. Length and time of conversation had more influence on the collection of data than on the object of study itself.

### **Limitations**

The limitations of this study are mainly focused in the method of data collection. Because of the sheer number of points of interest being recorded (in order to gain a better picture of the conversation as a whole) and method of collection (pen and paper) human error is likely. Information may have been misheard, misrecorded, or miscoded. In the future this could be avoided via use of a recording device and subsequent coding. In addition, the small sample size limits generalizability of this study. Furthermore, the sample came from two college communities in a small area of northeast Wisconsin, further limiting generalizability of this study. Larger and more varied samples would avoid these limitations.

This study was further limited by the use of category labels used in prior research. While these labels may be sufficient to describe masculine and feminine behavior in this case, they are severely lacking in accuracy. The description of masculine and feminine language must be reevaluated to avoid further promotion of inaccurate stereotypes in research.

### **Implications for Future Research**

This study has implications for future research. Research of this kind (naturalistic observation) is necessary to confirm or disconfirm laboratory results in experiments of a similar nature as well as to confirm results of the current study. A focus on nonverbal as well as verbal indicators in conversation may be valuable for future research. Laboratory research, specifically, may want to increase focus on many of the items this research has brought to light (e.g., topics of conversation, relationships, and changing social norms). Research of this kind may attempt to include a variety of relationships between partners (friends, dating, married); use specific task-oriented or emotion-oriented goals to direct conversations in a masculine or feminine manner; and/or enhance feelings of animosity or attraction prior to conversations in order to artificially create high- and low-stress conversations. In addition, it is important for future research to consider the accuracy of masculine and feminine characteristics of language as currently described. It could be more valuable to consider the circumstances and type of person likely to use these features of language rather than depend on gender as the sole organizing characteristic.

Overall, a more intense and thorough study of accommodation processes and influencing factors is necessary to reach definitive results. It remains a point of interest to study the way men and women communicate. Further research may offer greater understanding and thus lead to enhanced communication between members of opposite genders. The subtle differences between "I'm not finished" and "Can I finish" offer an important insight into these communicative differences and the fundamental differences between men and women.

## Notes

1. Namy, Nygaard, and Sauerteig, "Gender Differences in Vocal Accommodation: The Role of Perception."
2. Robertson and Murachver, "Children's Speech Accommodation to Gendered Language Styles."
3. Bilous and Krauss, "Dominance and Accommodation in the Conversational Behaviours of Same- and Mixed-Gender Dyads."
4. Namy, Nygaard, and Sauerteig, "Gender Differences in Vocal Accommodation: The Role of Perception."
5. Clopper, Conrey, and Pisoni, "Effects of Talker Gender on Dialect Categorization."
6. Bilous and Krauss, "Dominance and Accommodation in the Conversational Behaviours of Same- and Mixed-Gender Dyads."
7. Galliano, *Gender: Crossing Boundaries*.
8. Ibid.
9. Robertson and Murachver, "Children's Speech Accommodation to Gendered Language Styles."
10. Hannah and Murachver, "Gender and Conversational Style as Predictors of Conversational Behavior."
11. Palomares, "Explaining Gender-Based Language Use: Effects of Gender Identity Salience on References to Emotion and Tentative Language in Intra- and Intergroup Context."
12. Bilous and Krauss, "Dominance and Accommodation in the Conversational Behaviours of Same- and Mixed-Gender Dyads."
13. Clopper, Conrey, and Pisoni, "Effects of Talker Gender on Dialect Categorization."
14. Helgeson, *Psychology of Gender*.
15. Cohen, "Gender Differences in Speech Temporal Patterns Detected Using Lagged Co-occurrence Text-analysis of Personal Narratives."
16. Helgeson, *Psychology of Gender*.
17. Clopper, Conrey, and Pisoni, "Effects of Talker Gender on Dialect Categorization."
18. Galliano, *Gender: Crossing Boundaries*.
19. Newman, Groom, Handelman, and Pennebaker, "Gender Differences in Language Use: An Analysis of 14,000 Text Samples."
20. Galliano, *Gender: Crossing Boundaries*; Helgeson, *Psychology of Gender*; Nygaard, and Sauerteig, "Gender Differences in Vocal Accommodation: The Role of Perception"; and Palomares, "Explaining Gender-Based Language Use: Effects of Gender Identity Salience on References to Emotion and Tentative Language in Intra- and Intergroup Context."
21. Bilous and Krauss, "Dominance and Accommodation in the Conversational Behaviours of Same- and Mixed-Gender Dyads"; Clopper, Conrey, and Pisoni, "Effects of Talker Gender on Dialect Categorization"; Cohen, "Gender Differences in Speech Temporal Patterns Detected Using Lagged Co-occurrence Text-analysis of Personal Narratives"; Hannah and Murachver, "Gender and Conversational Style as Predictors of Conversational Behavior"; Huffaker and Calvert, "Gender, Identity, and Language Use in Teenage Blogs"; Namy, Nygaard, and Sauerteig, "Gender Differences in Vocal Accommodation: The Role of Perception"; Newman, Groom, Handelman, and Pennebaker, "Gender Differences in Language Use: An Analysis of 14,000 Text Samples"; Palomares, "Explaining Gender-Based Language Use: Effects of Gender Identity Salience on References to Emotion and Tentative Language in Intra- and Intergroup Context"; and Robertson and Murachver, "Children's Speech Accommodation to Gendered Language Styles."
22. Bilous and Krauss, "Dominance and Accommodation in the Conversational Behaviours of Same- and Mixed-Gender Dyads"; Galliano, *Gender: Crossing Boundaries*; and Namy, Nygaard, and Sauerteig, "Gender Differences in Vocal Accommodation: The Role of Perception."
23. Galliano, *Gender: Crossing Boundaries*.
24. Namy, Nygaard, and Sauerteig, "Gender Differences in Vocal Accommodation: The Role of Perception."
25. Galliano, *Gender: Crossing Boundaries*.
26. Hannah and Murachver, "Gender and Conversational Style as Predictors of Conversational Behavior."

27. Ibid.
28. Huffaker and Calvert, "Gender, Identity, and Language Use in Teenage Blogs."
29. Hannah and Murachver, "Gender and Conversational Style as Predictors of Conversational Behavior."
30. Deborah Tannen, *You Just Don't Understand: Women and Men in Conversation*.
31. Galliano, *Gender: Crossing Boundaries*; Palomares, "Explaining Gender-Based Language Use: Effects of Gender Identity Salience on References to Emotion and Tentative Language in Intra- and Intergroup Context"; and Deborah Tannen, *You Just Don't Understand: Women and Men in Conversation*.
32. Hannah and Murachver, "Gender and Conversational Style as Predictors of Conversational Behavior."
33. Galliano, *Gender: Crossing Boundaries*.
34. Newman, Groom, Handelman, and Pennebaker, "Gender Differences in Language Use: An Analysis of 14,000 Text Samples."
35. Huffaker and Calvert, "Gender, Identity, and Language Use in Teenage Blogs."
36. Helgeson, *Psychology of Gender* and Deborah Tannen, *You Just Don't Understand: Women and Men in Conversation*.
37. Hannah and Murachver, "Gender and Conversational Style as Predictors of Conversational Behavior."
38. Helgeson, *Psychology of Gender*; Robertson and Murachver, "Children's Speech Accommodation to Gendered Language Styles"; and Deborah Tannen, *You Just Don't Understand: Women and Men in Conversation*.
39. Galliano, *Gender: Crossing Boundaries*; Helgeson, *Psychology of Gender*; and Deborah Tannen, *You Just Don't Understand: Women and Men in Conversation*.
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## Appendix

**Table 1.** Conversational variable codes

Item	Code Type	Definition
Conversational Mood	Intense	Conversations in which either one or both participants are exhibiting outward signs of emotional discomfort.
	Relaxed	Conversations in which neither participant is exhibiting outward signs of emotional discomfort or excitement elicited by the topic.
	Focused	Conversations in which either one or both participants are exhibiting outward signs of emotional excitement as elicited by the topic of conversation.
Topic of Conversation	Neutral	Topics that are neither stereotypically masculine nor stereotypically feminine. Additionally, an equal distribution of stereotypically feminine and masculine topics throughout the conversation.
	Masculine	Topics that are considered stereotypically masculine (i.e., sports) or neutral topics geared toward the male party (i.e., the man's work or living situation).
	Feminine	Topics that are considered stereotypically feminine (i.e., childcare) or neutral topics geared toward the female party (i.e., the woman's work or living situation).
	Variable	Several topics occurring in succession throughout the conversation (three or more topics).
	Specific	Few topics occurring in succession throughout the conversation (one or two topics).
Location of Conversation	Dining	Locations in which the primary function is the service and consumption of food.
	Coffeehouse	Locations in which the primary function is the service and consumption of coffee products and related beverages as well as social interaction.
	Sporting Event	Locations in which the primary function is the viewing of and participation in a sport (defined as an organized activity resulting in physical exertion).
Time of Conversation	Morning	Conversations occurring after 6:00 a.m. and prior to 11:59 a.m.
	Afternoon	Conversations occurring after 12:00 p.m. and prior to 4:59 p.m.
	Evening	Conversations occurring after 5:00 p.m. and prior to 10:59 p.m.
	Late Evening	Conversations occurring after 11:00 p.m. and prior to 4:59 a.m.



**Table 2.** Masculine and feminine language codes

Item	Code Type	Definition	Examples
Feminine Conversational Indicators	Emotion-Oriented Language	Statements that direct toward an emotional goal or offer emotional support	"I'm not saying <i>it's</i> sensitive, <i>I'm</i> sensitive."
	Hedges	Words used to lessen the impact of certain language (such as euphemisms)	"I wish I could have done that differently."
	Qualifiers	"Weak Hedges" or words used to adjust absolute or certain phrases (such as: mostly, sometimes, and maybe)	"Eat this, it's <b>pretty</b> good." "He's <b>probably</b> the guy in blue."
	Questions	Statements made to elicit a reply from the conversational partner	"Has that happened to you?"
Masculine Conversational Indicators	Task-Oriented Language	Statements that implicitly or explicitly direct the conversational partner toward a goal	"Today is clearing a path and that's the main goal."
	Interruptions	Speaking before the conversational partner has finished speaking	N/A
	Direct or Imperative Statements	Statements made as directions, commands, or rigid advice	"Stop looking at me like that's weird."
	Self-Reference	Statements beginning or containing a strong "I" or "me" statement	" <i>I'm</i> not complaining about your stuff."

Table 3. Conversational indicators crosstab

Item	Code Type	Feminine Indicators						Masculine Indicators							
		Emotion		Hedges and Qualifiers		Questions		Task		Interruptions		Direct or Imperative		Self-Reference	
		M	F	M	F	M	F	M	F	M	F	M	F	M	F
Relationship	Friends	11	26	5	13	20	23	45	21	11	7	13	8	40	41
	Dating	10	8	3	3	14	13	15	7	3	12	17	8	20	7
	Married	2	5	0	1	3	3	6	4	0	0	1	0	3	3
Age I	Young Adult (18-25)	18	28	9	14	30	32	45	20	10	17	23	12	55	45
	Adult (26-45)	2	6	2	3	3	8	9	8	0	0	3	1	5	5
	Older Adult (46-65)	2	5	0	0	1	5	12	4	4	2	5	3	3	1
Age II	Older Male	5	5	0	3	7	6	9	4	2	0	3	1	8	15
	Older Female	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Partners the same	18	34	11	14	30	39	57	23	12	19	33	15	55	36
Mood	Relaxed	12	26	3	14	25	25	40	20	6	6	13	5	37	41
	Focused	2	6	2	2	1	10	15	8	4	2	7	4	5	3
	Intense	9	7	3	1	10	7	11	4	4	11	13	7	19	7
Topic	Neutral-Variable	12	17	5	9	13	15	24	11	9	13	22	10	42	32
	Neutral-Specific	3	3	3	3	8	7	9	4	0	1	3	1	3	0
	Masculine-Variable	4	8	0	0	3	7	17	7	4	2	5	3	5	1
	Masculine-Specific	2	4	2	2	3	9	7	5	1	0	3	1	5	6
	Feminine-Variable	2	7	1	4	4	6	9	5	0	3	3	1	8	9
	Feminine-Specific	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Location	Dining	13	18	3	9	24	25	30	13	5	16	24	11	42	25
	Coffeehouse	8	16	1	6	13	13	28	12	9	3	10	4	17	21
	Sporting Event	2	4	2	2	2	7	8	7	0	0	2	1	4	5
Time	Morning	12	17	4	2	15	15	26	12	8	13	22	10	26	12
	Afternoon	11	21	5	13	22	21	37	16	6	8	12	5	35	37
	Evening	0	1	2	2	0	5	3	4	0	0	2	1	2	2
	Late Evening	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL		23	39	11	17	37	45	66	32	14	19	36	16	63	51
		62		28		82		98		33		52		114	

Table 4. Incidence of individual and total accommodation

Category	Division	Frequency
Individual Accommodation	Zero Accommodation	12
	Minor Convergence	12
	Major Convergence	2
	Minor Divergence	0
	Major Divergence	0
Total Accommodation	Zero Accommodation	1
	Equal Convergence	2
	Unequal Female Convergence	9
	Unequal Male Convergence	1
	Equal Divergence	0
	Unequal Female Divergence	0
	Unequal Male Divergence	0

## **A Movement Without a Face: Anonymity and the Push for Women's Rights in 1800s America**

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### ***Abstract***

Despite the plethora of research compiled regarding the beginning of the women's rights movement in America in the mid-1800s, only a small number of historians have looked beyond the convention held in Seneca Falls, New York, in 1848. Although this convention brought the women's movement into the limelight for the first time, strides were being made in the decades prior. This study sheds light on the 20 years prior to the convention and the legal and social advances that had been made in regards to women's rights within marriage and society as a whole. Using newspapers and letters from the time, as well as secondary historical sources, my research details the hard work of lone liberators prior to the movement gaining a face in 1848.

"The rights of men, and the rights of women. . . . May the former never be infringed, nor the latter curtailed."<sup>1</sup> This toast, spoken by men in the years following the Revolution, reveals an air of optimism regarding gender equality. With hearts full of new-found nationalism and relief over victory in the Revolution, Americans of both genders were willing to cooperate with one another in the hopes of bettering the nation. However, after the dust had settled and normalcy resumed, the optimism that had once brought men and women together and inspired toasts throughout the country was now fleeting. Women began the decade with the hopes of advancing their status, having participated informally in the Revolution. Men, having just set in stone the new rules for the country, were eager to take their places in government and have women run the home front. While men struggled for normalcy and a sense of equilibrium, some women hoped to take advantage of the temporary chaos and break the ties that had bound them for so long. It was in the early 1800s, in the midst of the nation's fresh start, that the women's rights movement in America gained steam. Using anonymously written newspaper articles, group meeting synopses, court hearings, and secondary sources, this research focuses on the 20 years prior to Seneca Falls and provides a glimpse of a movement gaining steam in these decades.

The turn of the nineteenth century ushered in a new age of industrialization and a new sense of independence for women. Industrialization brought women from their sphere of the home into the gritty factory scene. While employment had the potential to liberate women from traditional gender roles, coverture laws of the time prevented the income from going into the pocketbook of its rightful owners. Under coverture laws, women and men became one when they married and all assets and legal power

went to the husband. As the century progressed, the coverture laws began to ease. The 1830s saw the passage of the first Married Women's Property Law, the pioneer issue of *Liberator* (an abolitionist newspaper), and the foundation of the Female Anti-Slavery Society. The following decade began with women being barred from the Anti-Slavery Convention in London but ended with the women's rights convention in Seneca Falls, New York.

The conference in Seneca Falls often is deemed the beginning of the women's rights movement in America. Katherine Sklar's *Women's Rights Emerges From the Anti-Slavery Movement in 1830-1870* has a chapter titled, "An Independent Women's Rights Movement is Born, 1840-1858." This book, like many others, puts all of the force behind the movement into the context of the 1840s. The difference between the 1848 convention and the decades prior lies in the organization of its participants. While the women who gathered in Seneca Falls had formed a semi-cohesive movement, women prior to this convention were acting in relatively local spheres, rather than on a national or international level. This is not to say that they did not empathize with the other women in similar situations; pre-Seneca Falls activists were simply lacking vocal leaders such as Lucretia Mott and the Grimke sisters, who would be seen in later decades. Despite their lack of national organization, pre-women's movement activists still fought for the cause and made substantial gains. Newspapers from the time show the change in public opinion regarding women's participation in the social sphere, from defiance of coverture to women-only organizations to collaborative efforts in the fight against slavery and for temperance. Prior to Seneca Falls, local court cases and anonymously written newspaper articles show support from average Americans, starting a grass roots movement supporting greater rights for women.

Other historians have tackled the issue of exactly when the women's rights movement in America started. Rosemarie Zagarri, author of "The Rights of Man and Woman in Post-Revolutionary America," believes that the movement started much earlier, "in the wake of the American Revolution and...after the publication of Mary Wollstonecraft's *Vindication of the Rights of Woman*"<sup>22</sup> in 1792. The success of Wollstonecraft's book translated into "discussions of women's rights long before there was an organized movement to mobilize their sentiments."<sup>23</sup> The publication of *Vindication of the Rights of Woman* introduced new terminology, such as "women's rights," that the American public could now use to discuss women. Although Wollstonecraft's book finally gave the American public the proper terminology, coverture laws were still too deeply embedded in American culture to spark the creation of a full-fledged movement. Zagarri points out that women even had the right to vote in New Jersey up through 1807 but "women apparently voiced no public protests"<sup>24</sup> when their voting abilities were stripped from them in that state. It wasn't until decades later, when the yoke of coverture began to slip, that American women finally reached the point of no return, when popular opinion began to sway in their favor and women's public speaking was met with slightly less indignation.

The nineteenth century started out, like the century before, with laws of coverture, including property and income rights that made women subordinate to their husbands. Under coverture, women could not own property, participate in the legal realm such as contracts, or sue or be sued. *Feme soles*, or single females, still retained the same property rights as men, but in most cases lacked the voting, jury, and military rights men had. If these single women married, they became *feme covert*s, or "covered women," and their rights passed to their husbands, who now held all of the legal rights for the family. Due to social stratification at the time, coverture laws only applied to middle-class white women. Lower-class women frequently entered into marriages that were not concerned with "his and hers" property, as there was not enough property to

go around. Women in these marriages frequently were employed, either as domestic workers or in factories, out of necessity, not out of a sense of female entitlement. In the case of married middle-class women, court cases such as *Cole v. Van Riper* stated, "It is simply impossible that a woman should be able to control and enjoy her property as if she were sole, without practically leaving her at liberty to annul the marriage."<sup>5</sup> Men within the government worried that if women were given the liberty of property rights and the ability to take possession of their own income, they would ruin the institution of marriage and chaos would erupt. According to Hendrik Hartog, "... to recognize a wife's capacity to represent herself was to imagine the end of marriage."<sup>6</sup> Without economic dependence on their husbands, what incentive would women have to stay?

Participation in the employment sector was met with similar uneasiness. Again, men feared that if women were working in factories or as domestic servants, their work within the domestic sphere would suffer and this would reflect badly upon their husbands. Representing a common view of the day, one man noted, "the two sexes are constructed and intended for different purposes. Man may enter a woman's and a woman man's, but 'revolting of the soul would attend this violence to nature; this abuse of physical and intellectual energy; while the beauty of social order would be defaced and the fountains of earth's felicity broken up.'"<sup>7</sup> Some saw the separate spheres as a religious notion, others as a social responsibility, and finally, some saw the women's sphere as a physical necessity. *The Southern Literary Messenger*, a Virginia-based periodical, stated in 1835 that women could never be physicians, lawyers, or statesmen because "to succeed at all, she would be obliged to desert the station and defeat the ends for which nature intended her."<sup>8</sup> This argument synthesizes all basic arguments in favor of separate spheres: if women are not in the home, not only are they neglecting their motherly duties, they will also be physically incapable of doing much else. The separate spheres mentality was the status quo for gender roles, and the defiance of it when women entered the labor force made many uneasy. *Godey's Lady's Book*, one of the most widely circulated magazines for women at the time, popularized the term "Cult of Domesticity" to refer to this widely held belief.<sup>9</sup>

Within the notion of separate spheres, women and men were expected to have certain characteristics representative of their genders. Just as working outside the home and receiving a higher education were deemed "manly," emotions, sentiments, and actions also had a gender. Men were materialistic, aggressive, vulgar, hard, and rational.<sup>10</sup> Women, on the other hand, were supposed to be moral and stable and provide a place of serenity for their husbands, so men could have a temporary break from the insanity of the cruel, dirty, and busy masculine world. As for aspirations in life, "Men have a thousand objectives in life—the professions, glory, ambition, the arts, authorship, advancement, and money getting . . ."<sup>11</sup> Women's aspirations consisted of providing a warm home full of leisure for their husbands and families. If she "succeed not in the one sole hope of her hazardous career, she is utterly lost to all the purposes of exertion of happiness, the past has been all thrown away, and the future presents nothing but cheerless desolation."<sup>12</sup> This outlook of doom and gloom was the result of an ingrained notion of separate spheres that dictated a lifestyle of servitude for women and pressure to succeed as mothers and wives. With the separate spheres mentality so pervasive in society, women felt as though their only hope to succeed was in their career as mothers. If they should fail, not only would society stigmatize them as failures, but their inability would carry on with them into the desolate future.

According to the *Independent Statesman*, love carried similar standards based on gender. "Love is only a luxury to men, but it may be termed a necessity to women, both by the constitution of society and the decrees of nature, for she has endowed them with superior susceptibility and overflowing affections, which, if they be not provided



with a vent, perpetually corrode and gnaw at the heart. And what are her feelings and chances in this fearful lottery? A constant sense of degradation, in being compelled to make her whole life a game, a maneuver, a speculation; while she is haunted with the fear and shame of ultimate failure.”<sup>13</sup> For men, love was optional. Since they had incomes but few expenditures while single, a wife was not a necessity. Women, on the other hand, earned little to no income, forcing them to be dependent on a male breadwinner. This, plus the societal expectation of marriage at a young age, forced women into marriage with the weight of the world on their shoulders. The author of this article, though his or her gender is unknown, has much to say regarding societal expectations for women versus men. Despite a lack of outward disapproval, woven into each sentence is a warning. Verbs such as “corrode” and “gnaw” foretell consequences for women if they did not properly maintain their households or sufficiently provide comforting homes for their husbands.

In the 1820s, men were still the sole authority regarding property rights. Although many felt that the nineteenth century was an “age of innovation; in which all the received notions of justice and government are to be supplanted,” a bill was being introduced in Georgia in 1827 that would “enable the husband, under any circumstances, to dispose of his real estate without consent of his wife, as far as regards the right of dower or thirds.”<sup>14</sup> Dowers, or morning gifts, traditionally could not be touched by the husband, as they were intended to provide for the wife should she outlive the husband. Since the laws of coverture gave all property and possessions the woman had prior to marriage to the husband, dowers were “intended as a kind of equivalent for those vested rights which the husband received in virtue of his marriage. Indeed, without the right of dower, the wife will be left without the least guaranty against the profligacy of the husband. . . .”<sup>15</sup> Although a lack of property rights for women was customary in this time period, this Georgian law hoped to take away further rights, including her security in widowhood and her right to one-third of her husband’s real estate. Even though this law had nothing to do with the women of Maryland, the author of the article in the *Baltimore Chronicle*, the original source, felt that the law was a “contagion [that] may be wafted within our borders, and we shall be obliged to use a curative, instead of a preventative.”<sup>16</sup> Sympathetic reporters worried that the new anti-property rights act would spread like a virus and would need to be dealt with as such.

Other states “were accepting the idea that a woman should be given the legal ability to support herself, particularly if her husband were a debtor.”<sup>17</sup> These supportive states and their decision in the 1820s began the slow movement toward liberation. Although some states’ ideologies reflected past notions of gender divisions and separate spheres, public opinion was beginning to show sympathy for women in loveless marriages that left them prey to reckless husbands. Several court cases ruled in favor of women having separate spheres, provided it did not throw off the power balance or threaten the unity of marriage. In New York, the case of *Kenny v. Udall and Kenny* ruled that due to the “dishonest behavior of her husband,” Mrs. Kenny’s property should be placed in a separate estate so as to protect her.<sup>18</sup> Regulations on wills and inheritance of property were slowly becoming more lax and allowing inheritance for women or with the help of appointed trustees. Courts began to rule in favor of women who were forced into unfortunate circumstances by debt-prone husbands, and then were left with little money. Women’s loss of property due to coverture made courts feel sympathetic to women and more apt to grant them settlements.

This new tide of sympathy left women with more control over property and less susceptibility to the whims of a drunken husband. Lending a helping hand to women’s property rights was the temperance movement, which gained steam alongside the new waves of religious fervor in the early 1800s. Both men and women were

involved in the temperance movement and though they joined for different reasons, both helped to boost the movement and bring attention to the rampant alcoholism that was both morally and monetarily draining families. Thanks to the efforts of the temperance movement, alcohol consumption was reduced from five gallons annually per capita in 1830 to less than two gallons just ten years later.<sup>19</sup>

While American courts were dealing with the ownership of properties within marriage, the House of Commons in Great Britain was discussing the legality of women signing political petitions. *The Commercial Advertiser*, a newspaper based in New York, reported the story, followed by its own interpretation of the Speakers' actions. The Speaker of the House ruled that he saw no reason or law that would prevent women from signing petitions for the House. The *Advertiser* then added in brackets, "[It may be remembered that during the recess the Speaker married.]"<sup>20</sup> The author of this article clearly thought that the Speaker's recent marriage had left him susceptible to the whims of a woman, thereby altering his judgment in favor of women's rights. At the time this article was published, Britain was in the process of passing the Representation of the People Act. This act, which finally passed in 1832, stated blatantly that voting rights would go to males, making it legally binding that only men could have suffrage. This terminology ignited the fire that started the women's rights movement in Britain and gave hope to women in America just beginning to assemble.

Although women in the 1820s were slowly being allowed to keep money and possessions after the deaths of their husbands or in light of unfortunate circumstances, little changed regarding their own possessions during marriage until the next decade. In an article published in the *Norfolk Advertiser*, a Massachusetts-based newspaper, the author of an article titled "The Rights of Woman" questions why women are paid so little and why so few men help to resolve their predicament. "The world is a scene of violence, where every man scrambles for his share of plunder; but weak woman is constrained by her physical inferiority to stand apart and gaze hopelessly, with little to sustain her or her little ones, but the stray fragments that may fall in her way."<sup>21</sup> The article focuses on the toil of women and the double standard that existed between male and female workers. "The widow may toil with superior assiduity and receive less than the tithes of the wages of man—and who strives for her? Is her labor less useful or necessary. [sic] By no means. Are her orphans any more ready [sic] or cheaply sustained than the children of the labourer [sic]? Of course they are not. Yet she is allowed to toil unnecessarily, and receives a pittance which, if quadrupled, would be spurned by a male labourer [sic] with spurn?"<sup>22</sup> The article asserts that while women's work is equally important and comparable to men's, women are still only paid a fraction of a man's wage. She is then expected to provide for the whole family with her low stipend from her husband and the pittance she earns, all while putting on a façade that the pittance is sufficient.

The author then questions why there is such a dichotomous nature between labor, representation, and gender. "But who, we ask again, who strikes for the lone widow? Who compassionates her wrongs and asserts her rights? Perhaps it may be asserted that women have no rights. Men are entitled to high wages, but women should not expect it! Men must not labor more than ten hours, but women may toil day and night! Might makes right, and the woman, being weak and unable to demand her fair share of the advantages that result from labor, must consent to be as she has been, the drudge and slave of those who prate about her beauty and their chivalry."<sup>23</sup> This article says two important things regarding the view of women at the time. First, it shows that people are seriously acknowledging all of the work that women do. The author clearly believes that women's work is of value and should receive adequate compensation.

His or her argument is this: how can a woman sustain herself and her family if she is paid only a mere pittance and forced to rely on her husband who enjoys all freedoms and earns a sustainable wage? Secondly, the article makes it clear that sexism remains. Although the author believes that women are capable of doing work and running a household, he or she does not hesitate to repeatedly refer to women as weak. Within the article, the author uses “weak,” “lone,” and “in need of defending” to describe women. Rather than asserting the strengths of women, the article focuses on how men are needed to step in and help women to initiate their own fight for rights. This article is both forward-thinking and stuck in sexism of the past. The reprinting of this article by other newspapers shows that the notion of weak women resonated throughout the United States.

The pre-women’s rights movement had been evolving for a decade, but was missing a vocal, unwavering spokesperson. In 1831, William Lloyd Garrison, the outspoken abolitionist, formed his influential newspaper *Liberator*. During this time, abolitionist groups, some open to both men and women, began springing up throughout the country. Garrison encouraged women to become involved in both his movement and the women’s rights movement. His belief in the involvement of women in both political movements shows that the spark had been ignited regarding women’s participation.

Much like Garrison’s intertwining of abolitionism and women’s rights, during the nineteenth century social change groups would often become enmeshed with one another. The same women who were fighting for increased property rights also often fought for the abolition of slavery and the prohibition of alcohol. Many women, fed up with scrounging for money for food while their husbands spent late nights at the local bar, retaliated in a variety of ways, often with violence toward their husbands or through joining the temperance movement. Many social organizations gave women a voice that had previously been silenced. Unfortunately, while Garrison believed in the cohesiveness of these groups because “he appreciated the substantial impact that women’s experiences, beliefs and work could have on public opinion, political issues, and the rehabilitation of nineteenth-century American culture,” many disagreed.<sup>24</sup> The *New York Spectator* recounted the minutes of a New England Anti-Slavery Society meeting in which the participation of women was being discussed. Miss Kelley, one of the female attendees, argued that “the creator has as much right to put a soul into a female frame as into a male frame, and that the abolitionists should take the yoke off the heads of females, before they break the chain from the negro’s heel.”<sup>25</sup> Although Kelley participated in both the abolition and women’s rights movements, she prioritized the rights of females. At the end of the article, the author predicts another split within the abolitionist movement, this time between those for and against the participation and rights of women.

One year later, in 1839, the participation of women within the Society was still being debated. The argument by the opposition this time was that “they [women] neither enrolled their names as members, nor did they sign the Declaration of Sentiments; that such a claim had never been made or recognized in the society before; that for women to take as active part in such an assembly was contrary to the generally received roles of propriety. . . .”<sup>26</sup> Members of the Society who supported the participation of women used the Constitution of the Society as evidence. According to their Constitution, the only requirements for membership were that the person “consent to the principles of the Constitution, . . . contribute[s] to the funds of the society and is not a slaveholder.”<sup>27</sup> The supporters of women’s participation argued that because women fit all of the qualifications, they should be able to vote within the Society. But even many forward-thinking abolitionists did not see the wealth of information and experience that women could bring to the table.

Although some groups allowed women, many men still felt that women were too emotional to participate in politics. At the time, women's voices in public extended only so far as speaking to other women or slaves, whom men considered to be at an equal or lower level than the women themselves. Abby Kelley, the abolitionist and feminist mentioned previously, toured with Frederick Douglass, an African American who shared her anti-slavery and pro-women's rights attitudes. Kelley took advantage of the rare opportunity to speak in public and kept the issue of women's rights out of her speeches so as not to anger her audience. The Grimke sisters also spoke in public regarding the anti-slavery movement. While Kelley and Douglass spoke solely of the abolitionist movement while on tour, the Grimkes combined their views and encountered problems. The Grimkes held the audience's attention, but when the notion of equality for women was addressed, abolitionists in the audience grew restless and discontented. As Angelina Grimke said in a letter to Theodore Weld, a fellow abolitionist and her future husband,

You seem greatly alarmed at the idea of our advocating the *rights of woman* . . . These letters have not been the means of *arousing* the public attention to the subject of Womans rights, it was the Pastoral Letter which did the mischief. The ministers seemed panic struck at once and commenced a most violent attack upon us . . . *This letter* then roused the attention of the whole country to enquire what *right* we have to open our mouths for the dumb; the people were continually told "it is a *shame* for a *woman* to speak in the churches." Paul suffered not a *woman* to *teach* but commanded *her* to be in silence.<sup>28</sup>

Clergy were outraged by Grimke's entrance into the public sphere. Her unwavering speech angered the clergy and abolitionists who thought that women should push for abolition but keep their feminist sentiments within the confines of feminist groups or, ideally, to themselves. Grimke grew angry toward the middle of her letter. Unlike Kelley, who was allowed to speak, Grimke had encountered men who told her that women were out of their sphere even when "we circulate petitions; out of our 'appropriate sphere' when we speak to women only; and out of them when we *sing* in the churches. Silence is *our* province, submission *our* duty."<sup>29</sup> Grimke argued in the post-script of her letter that "We never mention women's rights in our *lectures* except so far as is necessary to urge them to meet their responsibilities. We speak of their *responsibilities* and leave *them* to *infer* their *rights*."<sup>30</sup> The Grimkes' goal was to encourage women to acknowledge their lack of social rights and that the fight was their responsibility.

In the later half of the 1830s, while Garrison was publishing his newspaper and the Grimkes were sparking fury amongst fellow abolitionists, property rights laws began to make their way through the legal system. The first Married Women's Property Act was passed in Mississippi in 1839. This pioneer act reflected previous concerns regarding women's property being taken away because of their husbands' debts. The Married Women's Property Act protected women from having their property seized by creditors and gave them access to income gained from the property. This act was in the same vein as previous court cases, such as those in New York and Virginia, which had ruled in favor of dependent women. Despite these advances, the act still left men in charge of buying, selling, and managing any property, leaving much unchanged. The act protected women without granting them any rights that would detract from the rights of their husbands or other males.

The same year as the passage of the Mississippi Act, *The North American* copied an article from *The Bangor Whig*. In the same spirit as the Married Women's Property Act, the staff at *The Bangor Whig* "advocate[d]...the propriety of extending to women the privilege of making proposals in preliminary matter pertaining to matri-

monial engagements.”<sup>31</sup> While many of the Property Acts focused on women retaining property after marriage, the staff at *The Bangor Whig* was advocating rights for women prior to engaging in marriage. These rights would allow women to have more participation in marital arrangements, and women would have greater say in dowry, morning gifts, and life after the marriage had been initiated. When combined with the new rights gained in various property laws, women would have the opportunity to be more vocal and secure through every stage of marriage, from engagement to widowhood.

Mississippi’s Act stood alone until 1848 when New York followed suit. Even though the Act did not pass until 1848, articles as early as 1837 anxiously discussed its introduction. News regarding the introduction of the Act was published in many newspapers, including *The Philanthropist*, *Newport Mercury*, *The Cleveland Messenger*, and *The Patriot and Democrat*.<sup>32</sup> According to *The Patriot and Democrat*, the New York Property Act would work “for the promotion and preservation of the rights and property of married women!”<sup>33</sup> The first section of the act would give “...all estate, real and personal, belonging to a woman at the time of her marriage, who shall be married after the date of this law, and all the estate which she may afterwards acquire by inheritance, gift, bequest, or devise, shall continue vested in her after marriage; nor shall such estate, or the rents or process of it insure to the husband during the life of the wife, without her consent.”<sup>34</sup> The proposed version of the New York Married Women’s Property Act went above and beyond the act in Mississippi. The Married Women’s Property Act from Mississippi was mainly focused on slaveholding, a vital part of Southern economy, whereas the proposed act from New York allotted additional freedoms to women. Not only were they allowed to retain all property from before the marriage, which normally would belong to the husband under coverture laws, they were also allowed to keep any property they acquired after the marriage.

The major difference between the Mississippi Act and the first section of the New York Act was that in the proposed Act from New York men were not allowed to tamper with a woman’s portion of the estate without her consent. The Mississippi Act still granted males full control over buying and selling rights of the property. According to the second section, the husband was “entitled to so much of his wife’s property, at her death, as by the laws of the state the widow is now entitled to at the time of his demise—in other words, he shall have dower.”<sup>35</sup> As seen in the previous Georgia law, dowers were originally to protect women in widowhood and ensure their economic stability. The proposed New York Act would have enacted semi-equality regarding the loss of a spouse. Unlike the law in Georgia, this Act did not attempt to take the dower away from women. The final section of the proposed Act “prohibits married women from making conveyance to their husbands of any real or personal estate, except the income thereof, without the permission of the Chancellor.”<sup>36</sup> This section prohibited women from handing their property over to their husbands, most likely to protect women from unfair deals or debtors.

While many of the newspapers simply reported the sections of the Property Act that had been introduced, *The Philanthropist* took a more opinionated stance on the issue. Reprinted from *The Cleveland Messenger*, the article used religion to support the advancement of women’s rights, similar to Abby Kelley’s argument. “Though christianity [sic] has done much for the female sex, and restored them many lost rights and privileges, still it is a humiliating fact that in christian [sic] lands, woman has far less freedom than justice and humanity demands.”<sup>37</sup> The author of “Rights of Women” was clearly distressed that so little had changed for women even in civilized nations. According to the unnamed author, the new Act “commends itself to the common sense of and conscience of every enlightened citizen who will examine it.”<sup>38</sup> The author understands that men and women supposedly become one flesh when they are married,



but does not believe that this should “not in any such sense as to destroy the personal identity of each. . . .”<sup>39</sup> The author of “Rights of Women” believed that laws should ensure the protection of all women’s property and that the division of responsibilities by sex needed to end. It was the hope of *The Cleveland Messenger* that “such a law . . . will soon be enacted in every state in the Union, and in every nation on Earth.”<sup>40</sup> Although this was a lofty goal, the tide had been gradually turning toward women’s legal emancipation over the past decade, making these attitudes popular and their aims plausible.

Amidst the buzz of the newly proposed New York Property Act, a future fore-runner in the fight for women’s rights in America was gaining momentum. Lucretia Mott, a Hicksite Quaker born in Massachusetts, began her political participation as a part of the abolition movement. After being denied entrance into other anti-slavery societies due to gender, Mott founded the Philadelphia Female Anti-Slavery Society. Mott became friends with William Lloyd Garrison in the early 1830s, as Garrison was gaining fame for his organizations and newspaper. Their friendship would propel her to the forefront of the movement and make both of their names synonymous with radical change. Years later, Mott would challenge the sexism of abolitionist societies. After facing rejection and disappointment, Mott and others felt it was time for women to have their own convention, separate from the drama of the abolitionist movement.

In May 1837, Mott, along with 200 other women, helped organize the first female anti-slavery convention in New York. This so-called National Petticoat Convention was the topic of conversation in numerous newspapers. In an article published two months after the event, *The Commercial Advertiser* applauded the efforts of the women involved. The *Advertiser* was also impressed with the spread of women’s rights movements across the globe. “Europe is getting on right ground upon the subject. England has changed her gouty old king for a queen. Portugal has done the same; and Spain would follow the example, were it not for that obstinate old rusty-fusty, Don Carlos.”<sup>41</sup> In 1837, Queen Victoria was crowned and so began the Victorian Era in British history, marking female rule across the Atlantic. *The Commercial Advertiser* supported the efforts abroad and was happy to see this change in attitude being reflected in the United States.

It was in the late 1830s that women like Lucretia Mott and Elizabeth Cady Stanton began to make their presence known throughout the United States. Not surprisingly, many men opposed their participation within the public sphere and their activity within the movements. Unfortunately for the men, who opposed the participation, Mott, Stanton, and Kelley refused to be silenced by sexism. The 1840s ushered in a new decade that would see even greater gains in the domain of women’s rights. New York finally passed its Married Women’s Property Act, and in 1848 a conference was held in Seneca Falls, New York, that gathered hundreds of women and their supporters to bring suffrage and equality for women to be “laid before the public.”<sup>42</sup> Seneca Falls resulted in the culmination of efforts known as the Declaration of Sentiments, a woman-centered version of the Declaration of Independence devised by Elizabeth Cady Stanton. Naturally, the convention was met with a “torrent of sarcasm and ridicule from the press and pulpit.”<sup>43</sup> Seneca Falls, for the first time in the history of the movement, added the cohesiveness of a large group to the push for liberation. The group now had a solid following with one goal. Prior conventions had to deal with rifts between members and leaders as well as opposition between temperance, abolitionism, and women’s rights. Starting in 1840, the movement gained the momentum it needed thanks to vocal leaders that it had been lacking. The widespread recognition that was gained at Seneca Falls led many to believe that the women’s rights movement in America began in 1848.



Rosemarie Zagarri, in her book *Revolutionary Backlash: Women and Politics in the Early American Republic*, states that, "The period between the American Revolution and the Seneca Falls Convention of 1848 appears to be nothing more than a frustrating hiatus in the development of women's rights."<sup>44</sup> Although Zagarri agrees that women were actively seeking rights prior to 1848, she argues that women's ability to participate in the public sphere ended in the 1820s. The Revolution did open doors for women, allowing them to informally participate in the political scene; however, this foothold was lost shortly thereafter, as was seen in New Jersey. It was not until decades later, in the 20 years prior to the convention, that women began a larger push for a movement. These women, though nameless and unassembled, fought for the passage of laws and the lifting of coverture. The women of the late eighteenth century, those mentioned in Zagarri's article, were still too deeply embedded in a society not ready for women's equality. According to Nancy F. Cott, author of *The Bonds of Womanhood: "Woman's Sphere" in New England, 1780-1835*, the coverture system gave women one domain that they could feel proud of, the home, and as a result some sense of power. The quality of their work within the home could boost their esteem and lead to some comfort within the constraints of coverture.<sup>45</sup> Thirty years later, however, coverture laws had begun to ease and women found it less difficult to shake off the chains that bound them and finally became vocal in their quest for equal rights.

When the 1800s started, women were not present in the workplace or the political sphere, marriage transferred a woman's possessions from her father to husband, and property rights for women were almost non-existent. From the turn of the century until the convention in Seneca Falls, women made remarkable gains in almost every category. Mississippi women saw the passage of a property act almost a decade before any state in the North granted women such rights. Court cases in New York and Virginia granted women protection from debt-prone husbands, allowing them more financial security. Of course, in the latter half of the 1830s, famous abolitionists and women's rights proponents like William Lloyd Garrison and Lucretia Mott came on the scene. However, without the help of nameless women fighting for legal and social equality, the forward-thinking attitudes of people like Garrison and Mott would never have propelled the movement in the way that it did. The convention in Seneca Falls would not have been plausible if it had not been for the social gains that resulted in the collectivity of the movement.

Over the first half of the nineteenth century, the movement grew as the yoke of separate spheres was slowly removed from women's necks. This decay of the separate spheres mentality allowed women to come out of hiding and profess their desire for independence and enabled future proponents to come out and speak in favor of the movement, creating the propulsion that made Seneca Falls possible. The turning tide of public opinion, as vocalized through local newspapers, created an atmosphere welcoming enough to draw women out into the open and the issue to the headlines. The loosening of social restraints allowed women to leave the private domain and make their way into the political sphere, one organization at a time. This new freedom fostered the collectivity of men and women that resulted in Seneca Falls which, in the end, was the catalyst the movement needed to succeed.

## Notes

1. Rosemarie Zagarri, "The Rights of Man and Woman in Post-Revolutionary America," *William and Mary Quarterly* 55 (1998): 203.
2. Ibid., 203.
3. Ibid., 210.

4. Ibid., 206.
5. BZ Khan, "Married Women's Property Laws and Female Commercial Activity: Evidence from United States Patent Records 1790–1895," *Journal of Economic History* 56 (1996): 360.
6. Hendrik Hartog, *Man and wife in America: a history* (USA: President and Fellows of Harvard College, 2000), 118.
7. Cynthia Kinnard, *Antifeminism in American Thought: An Annotated Bibliography* (Massachusetts: GK Hall, 1986), 5.
8. Cynthia Kinnard, *Antifeminism in American Thought: An Annotated Bibliography*, 5.
9. Catherine Lavender, "True Womanhood and the Cult of Domesticity," teaching slides for History/Women's Studies, accessed August 3, 2011, <http://www.library.csi.cuny.edu/dept/history/lavender/286/08.pdf>.
10. Ibid.
11. From the New Monthly Magazine [Illegible] of Women—Chances of Female Happiness" *Independent Statesman*, January 2, 1823, 4.
12. Ibid., 4.
13. Ibid., 4.
14. "Female Rights," *Hallowell Gazette*, January 17, 1827, 1.
15. Ibid., 1.
16. Ibid., 1.
17. Marylynn Salmon, *Women and the Law of Property in Early America* (Chapel Hill: University of Northern Carolina Press, 1986), 91.
18. Ibid., 91.
19. "American Alcohol Consumption," accessed August 3, 2011, <http://dui.com/dui-library/studies/research/colonial-america>.
20. "Rights of Women," *Commercial Advertiser*, April 25, 1829, 2.
21. The Rights of Woman," *Norfolk Advertiser*, December 17, 1836, 1.
22. Ibid., 1.
23. Ibid., 1.
24. James Baker Stewart. *William Lloyd Garrison at Two Hundred* (New Haven: Yale University Press, 2008), 45.
25. "Rights of Women," *Spectator*, June 14, 1838, 3.
26. "The Woman Question," *Liberator*, May 31, 1839, 87.
27. Ibid., 87.
28. Angelina Grimke, Letter to Theodore Weld in J.G. Whittier, August 20, 1837.
29. Ibid.
30. Ibid.
31. "Rights of Women," *The Bangor Whig*, in *The North American*, December 5, 1839, 2.
32. Quoted in *The Philanthropist*, *Newport Mercury*, *The Cleveland Messenger*, and *The Patriot and Democrat*, 1837.
33. "Rights of Married Women," *The Patriot and Democrat*, April 8, 1837, 2.
34. "Rights of Women," *Newport Mercury*, March 25, 1837, 2.
35. Ibid., 2.
36. Ibid., 2.
37. "Rights of Women," *The Philanthropist*, June 30, 1837, 4.
38. Ibid., 4.
39. Ibid., 4.
40. Ibid., 4.
41. "Rights of Women," *New York Commercial Advertiser*, July 28, 1837, 2.
42. "The Seneca Falls Convention," accessed August 3, 2011, <http://www.npg.si.edu/col/seneca/senfalls1.htm>.
43. Ibid.
44. Rosemarie Zagarri, *Revolutionary Backlash: Women and Politics in the Early American Republic* (USA: University of Pennsylvania Press, 2007), 3.
45. Nancy F. Cott, *The Bonds of Womanhood: "Woman's Sphere" in New England, 1780–1835* (Yale University: Yale University Press, 1997), 205.

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## Effect of Text Messaging Bans on Fatal Accidents

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### *Abstract*

Do text messaging bans make roads safer? To determine the answer to this question, a multivariate regression model was developed to determine how fatal accidents by state were affected by the following variables: texting bans, cell phone bans, primary versus secondary enforcement, time since bans were passed, vehicle miles traveled per state, gas and beer tax per state, percentage of population under 25 years of age, population density, and unemployment rate. The results indicate that text messaging bans do decrease fatal accidents and also decrease the danger of driving as the vehicle miles driven increases.

### *Introduction*

In 2010, 2.1 trillion text messages were sent in the United States alone (CTIA 2011); that is more than 66,000 every second! Texting has become a staple of everyday life, and for many people not even driving in a car can stop their text messages from hitting the airwaves. Scientific studies have shown how dangerous texting is while driving, and many states have responded with bans on texting while driving. Washington was the first state to do so in 2007. Today 30 states and Washington, D.C., have texting bans on all drivers, and eight states have partial bans. With all these bans in place it is logical to question if these bans are doing what they were intended to do—are text messaging bans making roads safer? This is an important question because what is the purpose of a piece of legislation if it has no effect on the people it was made to protect?

This study is a cross-sectional comparison of states that have bans to states that do not. Variables considered include roadway fatalities by state, texting ban, other cell phone usage bans, primary versus secondary offence, population density, miles traveled on state roadways, blood alcohol content of drivers, beer and gas taxes, unemployment rate, and length of time the ban has been in effect. This data was collected from the U.S. Census Bureau (2011), the Fatality Analysis Reporting System (FARS; 2011), and the Insurance Institute of Highway Safety (2011).

### *Literature Review*

Since the cultural adoption of cell phones, there have been multiple studies on the effect of cell phone use on automobile accidents and distracted driving. Wilson and Stimpson (2010) examined trends in distracted driving fatalities and their relationship to cell phone use, specifically texting volume, between 1999 and 2008. In this study, data were obtained from the Fatality Analysis Reporting System (FARS), which records data on U.S. public road fatalities. Wilson and Stimpson (2010) looked specifi-

cally at distracted driving fatalities, which are accidents in which drivers were inattentive, careless, or using cell phones, computers, fax machines, onboard navigation, or heads-up display systems. This data was compared to cell phone subscriber data from the U.S. Federal Communications Commission's Wireline Competition Bureau as well as text messaging volume data from Commercial Mobile Radio Services Competition Reports. Wilson and Stimpson (2010) conducted a linear multivariate regression analysis to examine the relationship between state-level text messaging volumes and the number of distracted driving fatalities. They controlled for variables such as precipitation, temperature, percentage of vehicle miles traveled on urban roadways, total state vehicle miles, state unemployment rate, region, and year. Using this regression analysis they predicted the number of distracted driving fatalities if texting volume was zero. The results showed that the increase in cell phone subscriptions during this time did not correlate to the changes in distracted driving fatalities, but there was a strong relationship between the fatalities caused by distracted driving and the average monthly number of text messages sent in a state. Using their regression model, they predicted that the rapid increase in texting volumes resulted in more than 16,000 additional distracted driving fatalities from 2002 to 2007. Wilson and Stimpson (2010) also claimed that for the average state, an additional one million text messages sent per month would increase the distracted driving fatalities in that state by more than 75%.

Jacobson, Nikolaev, and Robbins (2010) studied the effect of cell phone bans on driver safety. They wanted to know if laws banning cell phone use while driving made roads safer, decreasing accident risk. They examined the accident rates in New York (the first state to have a statewide hand-held cell phone ban) by counties. Jacobson, Nikolaev, and Robbins (2010) compared counties' fatal automobile accidents and personal injury accidents before and after the cell phone ban took effect. Another important variable they looked at was driver density by county. They used a one-tailed t-test to analyze the data. The results showed that 46 out of 62 New York counties experienced a decrease in fatal automobile accidents, 10 of which were at a statistically significant level. All 62 counties experienced a decrease in personal injury automobile accidents, with 46 being at a statistically significant level. Overall, New York experienced a decrease in both accident categories at a significant level with the ban.

Clarke and Loeb (2009), on the other hand, were the first to study the effects of cell phones on pedestrian fatalities. Their data came from various U.S. sources and included census data, a National Highway Traffic Safety Administration (NHTSA) study, and Cellular Telecommunications and Internet Association (CTIA) data, all from 1975 to 2002. Clarke and Loeb (2009) used a mathematical model and regression analysis to conduct their study. The variables they included were unemployment rate, per capita ethanol consumption, vehicle miles driven, total interstate, urban and rule highway mileage, population, blood alcohol content, real GDP, year, and number of cell phone subscribers. The results of the study suggested an interesting nonlinear effect. Clarke and Loeb (2009) found that when cell phones first were adopted they had a negative effect on pedestrian fatalities; however, at a certain number of cell phone subscribers the life-saving effect of cell phones overtook the life-taking effect. Then, as cell phone subscriptions continued to increase, the life-taking effect again took over. As the number of cell phone subscriptions increases the number of pedestrian fatalities also increases.

All three articles agreed that despite numerous past studies and conflicting results, there is little statistical evidence that increasing cell phone use is directly related to increases in automobile accidents or fatalities. All three, however, suggested that cell phones in some way have a negative effect on automobile accidents and fatalities.

I believe that cell phones have a negative effect on driver safety. We need to look deeper into how people are using their cell phones rather than overall use, similar to Wilson and Stimpson's (2010) texting volume study. With the popularity of smart-phones and the ability to access the Internet and use applications, will we see a greater increase in auto accidents as more and more people adopt this technology? Or will future cell phone technology advance so that the life-saving effect found by Clarke and Loeb (2009) increases and extends to drivers as well as pedestrians?

### ***Economic Model and Data Description***

$$\text{Accid} = \alpha + \beta_1 \text{text} + \beta_2 \text{cell} + \beta_3 \text{primary} + \beta_4 \text{timepass} + \beta_5 \text{vmt} + \beta_6 \text{popdens} + \beta_7 \text{under25} + \beta_8 \text{ur} + \beta_9 \text{beertax} + \beta_{10} \text{gastax}$$

The above equation is the basic economic model for my research. I investigated the effect of text messaging bans on road fatalities by doing a cross-sectional study among U.S. states. The variables used in the study are defined in table 1.

**Table 1.** Variable definition

Variable	Definition	Expected Effect	Statistics
Accid	Total number of road fatalities in a state in a certain year	n/a	Mean: 154.47 Standard Deviation: 152.66
Anybac	Total number of road fatalities in a state in a certain year with the driver being under the influence	n/a	Mean: 56.50 Standard Deviation: 58.01
Text	Whether or not there is a texting ban in effect.	—	% With Ban: 25.49% % Without Ban: 74.51%
Cell	Whether or not there is a total cell phone ban	—	% With Ban: 11.76% % Without Ban: 88.24%
Primary	Whether the ban is a primary or secondary law	—	% Primary: 77.45% % Secondary: 22.55%
Timepass	The time in months that have passed since texting ban has been in effect	—	Mean: 3.67 Standard Deviation: 10.65
Vmt	The number of vehicle miles traveled in one year (in millions of miles)	+	Mean: 4864.15 Standard Deviation: 5041.24
Popdens	State population density (population per square mile)	+	Mean: 380.60 Standard Deviation: 1357.88
Under25	The percent of the population that is from 5 to 24 years old	+	Mean: 0.2721 Standard Deviation: 0.0159
Ur	State unemployment rate	-	Mean: 8.85 Standard Deviation: 2.15
Gastax	The state gas tax in dollars per gallon	-	Mean: 0.2493 Standard Deviation: 0.0728
Beertax	The state tax on beer in dollars per gallon	-	Mean: 0.2701 Standard Deviation: 0.2421

**Note:** Data for the above variables were collected from all 50 states plus Washington, D.C., for the third and fourth quarters of 2009.



The dependent variable is *fatalities*. This measures the total road fatalities in a state for a quarter (three months). I measured this variable in two different ways. First, I collected data on all fatal accidents for each state (*accid*). Then, I collected data on all fatal accidents involving drivers with any blood alcohol content for each state (*anybac*). Creating these two dependent variables helped me examine the effect of alcohol consumption on my research. The data for these variables came from the National Highway Traffic Safety Administration Fatality Analysis Reporting System (FARS). The mean number of total fatal accidents is 154.47, while the mean number of fatal accidents involving alcohol is 56.5. The standard deviations are large for both total fatal accidents and fatal accidents containing alcohol, 58.0 and 152.66, respectively. The highest number of total accidents in a quarter was 743 and the lowest was five.

The first independent variable, and the variable of interest in this study, is *text messaging bans while driving (text)*, specifically which states have them and which states do not. This is a dummy variable, so states with bans were coded as “1” and states without a ban were coded as “0.” As of today, 30 states plus Washington, D.C., have bans on texting while driving, which equates to 74.5% of the country with bans. These bans are on all drivers, regardless of age. This data is from the Insurance Institute of Highway Safety (2011), which keeps an updated list of laws restricting cell phone use for every state.

The second, third, and fourth independent variables deal with details of the text messaging bans. *Cell* is another dummy variable stating whether or not there is an all handheld cell phone ban in a state. This means that using a handheld cell phone in any way while driving is illegal. This is important because drivers in states with stricter laws for all cell phone use while driving will probably be less likely to use their cell phone while driving. The more laws there are, the less likely texting while driving will occur. Today, eight states plus Washington, D.C., enforce an all handheld cell phone ban (IIHS 2011). *Primary* is defined as the degree to which the ban can be enforced; that is, whether the law is primary or secondary. Primary means that a driver can be pulled over and cited just for texting while driving, whereas under a secondary law, the driver would have to be breaking another law in order to be cited for texting while driving. This variable helped determine the degree to which the ban is enforced, which has a direct link to the ban’s effectiveness. States with primary enforcement should have a lower number of fatalities; therefore, there should be a negative relationship between fatalities and the third independent variable. *Timepass* measures the number of months that have passed since the text messaging ban was established. The length of time a ban is in place will affect how well the ban is enforced and followed. I would expect that states with longer amounts of time with the ban in place will have lower fatalities, so this would be a negative relationship between the variables. Texting bans are new to a majority of the states so the mean of this variable is relatively small.

*Vmt* is the number of vehicle miles driven in a state in a given year. This is one of the most important control variables to include when conducting studies on traffic accidents and fatalities. After all, the number one cause for traffic accidents is simply driving. The average number of vehicle miles driven in the data set was 4,864.2 million. Due to the variety of state sizes, we see a wide range with this variable. The District of Columbia recorded the least number of miles at approximately 294 million, while California had the greatest number of miles with 27,975 million. This data was collected from the U.S. Department of Transportation Federal Highway Administration (2011).

The remaining variables include *state population density*, *population under the age of twenty five*, *state unemployment rate*, *state gas tax*, and *beer tax*. These are all common variables used in state-level studies dealing with traffic accidents and alcohol

consumption. These variables were collected from U.S. census data (2011) and data from the Tax Foundation (2011).

### **Regression Analysis and Results**

I ran several regressions to determine the best model. When running regressions to determine what combination of variables created the best fit regression, I used total fatal accidents (*accid*) as my dependent variable. Once the best model was determined, I ran the same regression on fatal accidents where alcohol was involved (*anybac*). My original regression with the 10 original variables produced the following results found in table 2:

**Table 2.** Total fatal accidents

<b>Variable name</b>	<b>Estimated coefficient</b>	<b>Standard error</b>	<b>T-ratio 91 DF</b>	<b>P-value</b>
<b>Text</b>	-38.843	20.63	-1.883	0.063
<b>Cell</b>	-48.258	15.49	-3.116	0.002
<b>Primary</b>	24.949	22.76	1.096	0.276
<b>Timepass</b>	0.28978	1.013	0.286	0.776
<b>Vmt</b>	3.09E-02	8.21E-04	37.64	0.000
<b>Gastax</b>	-115.66	58.13	-1.99	0.050
<b>Beertax</b>	26.628	14.64	1.818	0.072
<b>Under25</b>	-247.9	248.4	-0.9981	0.321
<b>Popdens</b>	1.02E-03	6.26E-03	0.1621	0.872
<b>Ur</b>	1.2074	1.89	0.6389	0.524
<b>Constant</b>	91.014	76.8	1.185	0.239

Note:  $R^2 = 0.9561$ ,  $R^2$  adjusted = 0.9512.

This regression had an adjusted  $R^2$  value of .9512, which shows that the variables included do a good job in explaining the variance in fatalities. However, not all the variables are statistically significant. This led me to run a variety of tests to create the best model possible. After running many regressions and econometric tests, I came up with my best model, displayed below:

$$\text{Accid} = \alpha + \beta_1 \text{text} + \beta_2 \text{cell} + \beta_3 \text{vmt} + \beta_4 \text{gastax} + \beta_5 \text{beertax} + \beta_6 \text{beertaxsq} + \beta_7 \text{textavgvmt}$$

In the final model some variables from the original regression were eliminated. There were also a few variables added. The most important variable added was *textavgvmt*, which is an interaction term between text and the deviation from the average vehicle miles traveled in a state. For example, this variable for Illinois in 2009 with a texting ban would be 3,328 (8192-4864), the difference in vehicle miles traveled from the mean multiplied by one. States with lower than average vehicle miles traveled, like Delaware, will have a negative number: -4,145 (719-4864). For states without a texting ban this variable will be zero. This variable made the final regression more significant and made the interpretation of the text ban variable easier to understand and

apply. The final regression was run twice, first with *accid* as the dependent variable and second with *anybac* as the dependent variable. The statistical results for both regressions are shown below in tables 3 and 4.

**Table 3.** Total fatal accidents final regression

Variable name	Estimated coefficient	Standard error	T-ratio 94 DF	P-value
<b>Text</b>	-14.95	8.745	-1.709	0.091
<b>Cell</b>	-27.986	10.11	-2.769	0.007
<b>Vmt</b>	3.24E-02	1.00E-03	32.39	0.000
<b>Gastax</b>	-100.02	47.26	-2.116	0.037
<b>Beertax</b>	111.65	44.2	2.526	0.013
<b>Beertaxs</b>	-87.545	37.09	-2.36	0.020
<b>Textavgv</b>	-4.60E-03	1.17E-03	-3.925	0.000
<b>Constant</b>	11.38	15.54	0.7325	0.466

Note:  $R^2 = 0.9600$ ,  $R^2$  adjusted = 0.9570.

**Table 4.** Fatal accidents including alcohol

Variable name	Estimated coefficient	Standard error	T-ratio 94 DF	P-value
<b>Text</b>	-10.038	4.702	-2.135	0.035
<b>Cell</b>	-8.9523	6.136	-1.459	0.148
<b>Vmt</b>	1.28E-02	8.63E-04	14.77	0.000
<b>Gastax</b>	-47.955	30.71	-1.562	0.122
<b>Beertax</b>	48.326	23.13	2.09	0.039
<b>Beertaxs</b>	-36.745	20.32	-1.808	0.074
<b>Textavgv</b>	-3.42E-03	8.53E-04	-4.003	0.000
<b>Constant</b>	2.7444	6.345	0.4325	0.666

Note:  $R^2 = 0.9217$ ,  $R^2$  adjusted = 0.9158.

The final regression output with *accid* as the dependent variable showed six out of the seven variables to be statistically significant. The variables *cell*, *vmt*, *gastax*, *beertax*, *beertaxsq*, and *textavgvmt* were all significant at the 95% level. The text variable had a p-value of 0.09 so it is significant at the 91% level. This regression provided the highest adjusted  $R^2$  value, 0.9570. This means that the variables included in my best regression account for 95.70% of the variation in total fatal accidents. This high number shows that the data is of high quality and the model is good.

The same regression run with *anybac* as the dependent variable showed four out of seven variables to be statistically significant. *Text*, *vmt*, *beertax*, and *textavgvmt* were all significant at the 95% level. *Cell* recorded a p-value of 0.148, *gastax* was 0.122, and *beertaxsq* was 0.074. This regression showed less explanatory power with an adjusted  $R^2$  of .9158.

Cell phone bans were shown to decrease total fatal accidents in a state by approximately 28 accidents per quarter (three months). Approximately nine of those

fatal accidents per quarter involved alcohol according to the *anybac* regression. However, this was not statistically significant.

The regressions showed a significant increase in fatal accidents as the vehicle miles traveled in that state increased. For every 100 million miles driven in a state per year, you can expect approximately 3.24 fatal accidents per quarter. From that same 100 million miles, approximately 1.28 out of the 3.24 fatal accidents per quarter would involve alcohol.

Gas tax only showed significance in the total accidents regression. If a state increases its gas tax by \$.01, you would expect to see a decrease in fatal accidents by approximately one per quarter. The effect on alcohol-related accidents was approximately half of the total, showing that a \$.01 increase on the gas tax would decrease fatal accidents involving alcohol by approximately 0.48 per quarter.

The regressions showed that beer taxes increase fatal accidents until the beer tax is nearly \$0.65 per gallon. This was not expected and may be the result of an omitted variable that beer tax rate is correlated with, such as drinking habits. However, when beer taxes become greater than \$0.65 per gallon there is a negative effect on fatal accidents. Therefore, a state that wanted to curb fatal accidents by increasing a beer tax would have to charge more than \$0.65.

In terms of the variable of interest, these results indicate that texting bans do in fact decrease fatal accidents. This is significant at the 90% level for total fatal accidents and at the 95% level for fatal accidents involving alcohol. When interpreting this variable in the regressions, we must interpret both text and the interaction term between texting bans and the deviation from the mean vehicle miles traveled at the same time. The regression shows that in terms of total fatal accidents, in states that drive the average vehicle miles traveled in a year ( $\approx 4,864$  million miles) a texting ban will decrease fatal accidents by 14.95 per quarter. Fatal accidents involving alcohol account for approximately 10.038 of those accidents per quarter. So we can conclude that texting bans only decrease non alcohol-related accidents by approximately 4.95 per quarter.

The beta on the interaction term tells us that as vehicle miles traveled in a state increases, states with texting bans will see less of an increase in fatal accidents. For example, a state with no texting ban that is one standard deviation above the mean vehicle miles traveled in a year will see an increase of approximately 163 total fatal accidents per quarter compared to the average state. If that same state had a texting ban, it would see a decrease of 14.95 fatal accidents per quarter, plus an additional 23.19 fewer fatal accidents per quarter. So a state one standard deviation above the mean in terms of vehicle miles traveled and a texting ban in place will only see a 124.86 increase in fatal accidents per quarter instead of the full 163 it would see without a texting ban. This shows that texting bans curb the effect of vehicle miles traveled on fatal accidents.

## **Conclusion**

Are text messaging bans making roads safer? Yes, based on the research above texting bans do in fact decrease the number of total fatal accidents and accidents involving alcohol. This study shows a significant relationship: as vehicle miles traveled increases, states with texting bans see a smaller increase in fatal accidents. This lessened effect of vehicle miles traveled on fatal accidents can be simply stated—texting bans make driving less dangerous on a mile-per-mile basis.

In conclusion, this research shows through multivariate regression analysis the effect of texting bans on fatal driving accidents. This research, although limited, did

produce significant results. Given the opportunity to continue this research, I would change a few aspects. First, I would collect more data over longer periods of time. This data only reflects two quarters of 2009; a wider range of data would provide more significant results. I would also include additional variables, such as percent of driving population under 25 and rural versus urban driving miles. A deeper look into this research would be required before making text messaging and driving policies based on this analysis.

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