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The Hinckley Journal of Politics is published annually by the Hinckley Institute of Politics for students, public officials, university officials, and the public. The opinions expressed herein are not necessarily those of the University of Utah, the Hinckley Institute of Politics, the Student Media Council, or the editorial board. Please direct your correspondence to the Journal Editors, Hinckley Institute of Politics, 260 S. Central Campus Drive, Gardner Commons, Room 2018, Salt Lake City, Utah 84112, (801) 581-8501, or email: info@hinckley.utah.edu.

Hinckley Journal of Politics — 2021 editorial board

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A WORD FROM THE DIRECTOR

As director of the Hinckley Institute of Politics, it is my honor to present the 2021 Hinckley Journal of Politics. This marks the 22nd edition of the Journal, showcasing the Hinckley Institute's continued pursuit of publishing exceptional academic research papers written by students at the University of Utah.

The 2020-21 academic year presented extraordinary challenges for our students and society. Our typically bustling campus was quiet as the majority of learning was moved online to avoid the spread of COVID-19. As our students studied from home, they learned to overcome significant challenges. For many, it became clear how important it is to understand the levers of government and to find ways to become politically engaged. The student contributions to this journal reflect that engagement.

This edition also features two articles written by distinguished members of our community: Dr. Richard Orlandi, Chief Medical Officer of Ambulatory Health at University of Utah Health, his co-authors RyLee Curtis, Director of Community Engagement at University of Utah Health, and Mikel Whittier, Senior Director of Equity, Diversity and Inclusion at University of Utah Health; and Representative Steve Handy, who represents House District 16 in the Utah Legislature. Their articles address the compelling issues surrounding COVID-19's impact on Utah and the politics of air quality in the state. We are grateful to our public officials for their thoughtful contributions.

This publication was made possible through the diligence of the 2021 Journal co-editors Sheely Edwards and Natalie Van Orden and their student editorial board members. We also recognize the University of Utah Political Science Department and the important contributions of our faculty editors and advisors Professor James Curry and Professor Laura Gamboa. I would also like to express my gratitude to the dedicated staff of the Hinckley Institute, particularly Brooke Doner, director of marketing, Kyle Tucker, program coordinator, and Morgan Lyon Cotti, associate director, for their commitment and supervision of the publication.

Through the Hinckley Institute of Politics, University of Utah students are able to apply the practical politics they learn in the classroom to real world experiences. To date, the Hinckley Institute has placed and supported over 8,800 interns in offices throughout the State of Utah, in Washington, D.C., and throughout the world.

The 2020-2021 academic year was truly distinct. The challenges and opportunities it presented were unlike any other in recent history. Through this lens, we hope you enjoy the work of our best and brightest students featured in this publication.

Sincerely,

Jason P. Perry
Hinckley Institute of Politics
Vice President, Government Relations

A LETTER FROM THE EDITORS

Dear Reader,

This past year has been a tumultuous time for our country. COVID-19 crept up on us without much warning and we have been picking up the pieces and learning how to take care of ourselves and our loved ones in an unfamiliar world.

Now having been through more than a year of the pandemic, we are beginning to see more clearly its effects and the lessons it has to offer us. COVID-19 has served as a magnifying glass, bringing greater awareness to underlying issues in our country. We are becoming increasingly aware of the health disparities in our communities and facing alarming numbers showing who is most likely to get sick, who is able to work remotely, and who loses jobs in times of crisis. We have witnessed flaws in our healthcare system, but have stretched our limits on what we can accomplish with science and technology.

Perhaps, more than anything, COVID-19 has shown us just how interconnected we truly are. Even the smallest and most seemingly innocuous actions have great impacts, and our actions affect people all around the world. With this in mind, as editors, we have deliberately selected articles that emphasize the interconnected and political nature of our smallest actions. From how we get to work to the water we drink, our actions have political consequences. It is our hope that the articles included in this edition of the Journal will inspire our readers to further research and discuss policy solutions that will shape our world for the better.

We are honored to serve as the editors of this journal, and we owe a debt of gratitude to everyone who participated in the creation of this edition. We would first like to thank our editorial board, who diligently solicited, discussed, and edited the following articles, managing to do so virtually due to pandemic constraints. We would also like to thank our faculty advisors, Dr. James Curry and Dr. Laura Gamboa, who provided their expertise in thoroughly editing and revising each student paper. Finally, we would like to thank the staff of the Hinckley Institute of Politics, who helped us every step of the way on this journey.

We hope that you enjoy reading the 22nd edition of the Hinckley Journal of Politics and that the ideas contained inside will live on in your own discourse and actions.

Sincerely,

Sheely Edwards
Co-Editor

Natalie Van Orden
Co-Editor

EDITORS' NOTES

HINCKLEY JOURNAL OF POLITICS' MISSION STATEMENT

The *Hinckley Journal of Politics* is one of the only undergraduate-run journal of politics in the nation and strives to publish scholarly papers of exceptional caliber from University of Utah students in the fields of politics and public policy as well as opinion essays from local, state, and national public officials. Contributing research articles and opinion essays should address relevant issues by explaining key problems and potential solutions. Student research papers should adhere to the highest standards of research and analysis. The *Journal* covers local, national, and global issues and embraces diverse political perspectives. With this publication, the Hinckley Institute hopes to encourage reader involvement in the world of politics.

STUDENT RESEARCH PAPER SUBMISSION GUIDELINES

The *Hinckley Journal of Politics* welcomes research paper submissions from University of Utah students of all academic disciplines, as well as opinion essays from Utah's public officials. Any political topic is acceptable. The scope can range from University issues to international issues. Research papers should adhere to submission guidelines found on the *Hinckley Journal* web site: hinckley.utah.edu/journal.

STUDENT RESEARCH PAPER REVIEW AND NOTIFICATION PROCEDURES

Research paper submissions will be reviewed by the *Journal* editors, members of the editorial board, and faculty advisors. Submission of a research paper does not guarantee publication. Papers that do not adhere to submission and style guidelines will not be considered for publication. Acceptance to the *Journal* is competitive. The co-editors will notify potential authors when the decision has been made regarding which papers have been selected for publication.

SUBMISSION GUIDELINES FOR PUBLIC OFFICIAL OPINION ESSAYS

The *Journal* will consider for publication opinion essays written by national, state, and local public officials and community leaders. The opinions expressed by public officials are not necessarily those of the University of Utah, the Hinckley Institute of Politics, the Student Media Council, the editors, faculty advisor, or the Editorial Board. Officials should contact the *Journal* editors for additional information.

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ABOUT THE HINCKLEY INSTITUTE OF POLITICS

The Hinckley Institute of Politics at the University of Utah is a nonpartisan institute dedicated to engaging students in governmental, civic, and political processes; promoting a better understanding and appreciation of politics; and training ethical and visionary students for service in the American political system. Robert H. Hinckley founded the Hinckley Institute of Politics in 1965 with the vision to "teach students respect for practical politics and the principle of citizen involvement in government." Since its founding, the Hinckley Institute has provided a wide range of programs for students, public school teachers, and the general public including: internships, courses, forums, scholarships, and mentoring. The Hinckley Institute places emphasis on providing opportunities for practical experience in politics.

INTERNSHIP PROGRAM

A nationally recognized program and the heart of the Hinckley Institute, the Hinckley internship program places more than 300 students every year in political and government offices, non-profits, campaigns, and think tanks. The Institute provides internships opportunities to students from all majors for academic credit in Washington, D.C., at the Utah Legislature, in local offices and campaigns, and in more than 50 countries.

CAMPAIGN MANAGEMENT MINOR

The Hinckley Institute of Politics is proud to offer one of the nation's only minors in Campaign Management. The program is designed to provide undergraduate students the opportunity to learn the theory and practices that will allow them to be effective participants in election and advocacy campaigns. Students are required to complete a political internship and an interdisciplinary series of courses in areas such as campaign management; interest groups and lobbying; voting, elections, and public opinion; media; and other practical politics.

PUBLIC FORUMS AND EVENTS

The Hinckley Institute hosts weekly Hinckley Forums where politicians, policy makers, activists, academics, and influencers address public audiences in the Hinckley Caucus Room. Hinckley Forums enable students, faculty, and community members to gain insight into and discuss a broad range of concepts on local, national, and international levels. Past guests include Presidents Bill Clinton and Gerald Ford; Senators Orrin Hatch, John McCain, Harry Reid, and Mitt Romney; Utah Governors Jon Huntsman, Jr., and Gary Herbert; Nobel Peace Prize Winner Suzi Snyder; Civil Rights Activist Dolores Huerta, and many other notable politicians and professionals. The forums are reaired on KUER 90.1 FM and video recordings are archived on the Hinckley Institute website.

SCHOLARSHIPS AND LOANS

The Hinckley Institute provides more than $600,000 in financial support to students annually. The Hinckley Institute is also the University of Utah's representative for the Harry S. Truman Congressional Scholarship – one of America's most prestigious scholarships.

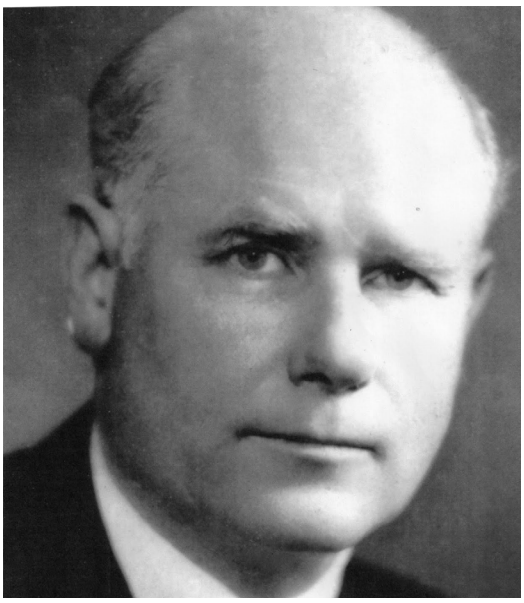
HUNTSMAN SEMINAR FOR TEACHERS

The Huntsman Seminar in Constitutional Government for Teachers is a week-long seminar sponsored by the Huntsman Corporation. The primary focus of the seminar is to improve the quality of civic education in Utah schools by bringing Utah educators together with political experts and visiting politicians to discuss current events in Utah and American politics. The Huntsman Seminar is truly a unique opportunity for teachers to gain an in-depth understanding of local and national political issues.

DEPARTMENT OF POLITICAL SCIENCE

The Hinckley Institue values its relationship with the Department of Political Science. The Institute's programs provide students the opportunity to enrich their academic studies with experiences in practical politics, which complement the academic offerings of the Political Science Department. Courses are available in five subfields of the discipline: American Politics, International Relations, Comparative Politics, Political Theory, and Public Administration. If you have questions about the Department and its programs, please visit poli-sci.utah.edu or call (801) 581-7031.

ROBERT H. HINCKLEY



A man of vision and foresight, a 20th-century pioneer, a philanthropist, an entrepreneur, and an untiring champion of education and of the American political system—all are apt descriptions of Robert H. Hinckley, a Utah native and tireless public servant. Robert H. Hinckley began his political career as a state legislator from Sanpete County and a mayor of Mount Pleasant. Hinckley then rose to serve as the Utah director for the New Deal program under President Franklin D. Roosevelt.

Hinckley went on to serve in various capacities in Washington, DC, from 1938 to 1946 and again in 1948. During those years he established and directed the Civilian Pilot Training Program, served as Assistant Secretary of Commerce for Air, and directed the Office of Contract Settlement after WWII. In these positions, Hinckley proved to be, as one of his colleagues stated, "One of the real heroes of the Second World War." Also in 1946, Hinckley and Edward Noble jointly founded the American Broadcasting Company (ABC), and over the next two decades helped to build this company into the major television network it is today.

Spurred by the adverse political climate of the '40s, '50s, and '60s, Hinckley recognized the need to demonstrate that politics was "honorable, decent, and necessary," and to encourage young people to get involved in the political process. After viewing programs at Harvard, Rutgers, and the University of Mississippi, Hinckley believed the time was right for an institute of politics at the University of Utah. So in 1965, through a major contribution of his own and a generous bequest from the Noble Foundation, Robert H. Hinckley established the Hinckley Institute of Politics to promote respect for practical politics and to teach the principle of citizen involvement in government.

Hinckley's dream was to make "Every student a politician." The Hinckley Institute of Politics strives to fulfill that dream by sponsoring internships, scholarships forums, mentoring, and a minor in Campaign Management. Today, over 55 years later, Hinckley's dream is a reality. More than 8,800 students have participated in programs he made possible through the Hinckley Institute of Politics. Many of these students have gone on to serve as legislators, members of Congress, government staffers, local officials, and judges. All participants have, in some measure, become informed, active citizens. Reflecting on all of his accomplishments, Robert H. Hinckley said, "The Hinckley Institute is one of the most important things I will have ever done."

STUDENT RESEARCH PAPERS

Demanding Water: Panel Analyses Examining Water Use in Utah

By Chad Barlow, Nick Halberg, Jack Markman, and Nelson Lotz
University of Utah

Abstract:

Water demand is a critical policy topic for Utah. While frequent polemics tend to indicate that a greater population will require greater use of water resources, the transition to more urban land use that accompanies population growth may actually decrease water needs. This paper details our panel analysis of water use over a period of 30+ years. Our findings indicate that Utah's population growth has decreased and will likely continue to decrease total water use, an effect driven by large reductions in agricultural water use as farmlands have shrunk. This indicates that the public intuition of increased water demands with increased population is likely flawed. As such, further research is required to examine the effect that Utah's growing population will have not only on how much total water it will use but also on how it will impact each category of water use.

Keywords: Water Use, Panel Analysis, Agricultural Water Use, Utah Population, Water Conservation, Urbanization

Introduction

Across the country, water managers are tasked with balancing their communites need for water with their communites desire for conservation. Divert too little water from a natural source, and a community may experience slowed economic growth (Barbier & Chaudhry, 2014). Divert too much water and a community may destroy a natural resource or create unnecessary and expensive infrastructure, the debt for which they will have to repay regardless of whether or not they are using additional water (Israel Academy of Sciences and Humanities et al., 1999). Given this, water managers continuously work to balance their communities' water interests.

As such, accurately determining a community's future need for water is vital for continued growth. This is not an easy task even with good data and information, and a nearly impossible one without it. Though a number of reports have been published looking at Utah's future water needs (Governor's Water Strategy Advisory Team, 2017), a few important studies have not yet been completed. Crucially, an examination of how population growth—which is expected to ramp up significantly through 2065 (Kem C. Gardner Policy Institute, 2017)—will affect Utah's water use patterns is needed.

This paper provides a starting point and provides a preliminary conclusion towards these ends. Using data from the United States Geological Survey (USGS) on county-level water use patterns, we were able to model how population growth has affected total water use from 1985-2015. From this, we were able to provide evidence to show that as populations grow, total water use decreases, and that this phenomenon is driven by large reductions in agricultural water.

These findings contain serious implications for policymakers in Utah. This research casts doubts on some of the underlying assumptions that dictate the current long-

We would like to thank Richard Fowles, our undergraduate research mentor, for his assistance in our research and analysis.

term planning for water resources in the state, namely that as the state's population grows and as Utah becomes more urbanized it will require more water for consumption. We posit that policymakers in the state should account for the effects that loss of rural characteristics will have on reducing water usage. Additionally, further research will be required to detail how increased population will impact agricultural water usage in rural areas of Utah, and how this will in turn affect Utah's future water needs.

Literature Review

The water landscape in Utah is set to face challenges and undergo changes in the next few decades. High rates of population growth and urban sprawl are poised to rewrite Utah's standard land use patterns, thereby shifting how water is used (Kem C. Gardner Policy Institute, 2017; Pratt et al., 2019). Meanwhile, rising average temperatures threaten Utah's snowpack and the security of its aquatic resources (Environmental Protection Agency, 2016).

To address these challenges, Governor Gary R. Herbert's Water Strategy Advisory Team compiled a series of recommendations regarding how Utah's water resources should be managed (Governor's Water Strategy Advisory Team, 2017). These include objectives like estimating how much water can be saved through conservation efforts and forecasting the effects climate change will have on Utah's water supply. While this document is thorough and expansive, it pays little attention to how Utah's growing sprawl will affect its overall water consumption.

A number of studies have explored this relationship in other states and found interesting results. Bigelow (2015), for example, examined how increased urbanization affects water consumption by applying fine-scale spatial analysis techniques to Oregon's Willamette Valley. He found that exogenous growth that converts farmland to residential properties tends to correspond with a decrease in total water use. Similarly, Runfola (2013) explored the relationship between population growth and water use. However, where Bigelow explored the effect of agricultural to suburban land conversion, Runfola explored the effect of suburban to urban land conversion. He found that the effect of growth in intensive areas depended on how strict conservation measures were. The more a municipality planned its growth and implemented conservation policies, the less water it consumed.

These studies, while insightful, are few and highly localized, and as such their results are difficult to generalize. None, so far as we know, have surveyed an entire state. Both studies cited previously were conducted in individual valleys or local suburban districts. While it is true that such limited studies allow for greater control of exogenous factors, they severely limit their predictive power in alternate geographies or localities. This is particularly difficult when we compare the semi-arid conditions of Utah to the more verdant locales of Boston or western Washington. The only study of this kind available was a memorandum produced by the Jordan Valley Water Conservancy District examining the effect of urbanization on water use in their district (Olsen & Schultz, 2019). While promising, the memo is purposely limited in its scope and did not take into account changes in non-residential water use categories like the industrial or agricultural sectors. As of yet, a statewide analysis of semi-arid geography has not been attempted in the current literature.

This portion of the paper addresses this hole in the literature by conducting a Utah-specific, county-level analysis that accounts for every category of water use. We test the effect of population growth on total water use and find evidence that suggests that this relationship is slightly negative. We find strong evidence to show that this effect is driven by a large decrease in agricultural water use. As a result, we find it likely that as Utah's population continues to grow, agricultural water use will continue to decrease. This in turn may result in a decrease in water use as the population increases, contrary to some water use predictions for the state.

Data

To determine the historical water use in Utah we used data from the United States Geographical Survey, which collects data from each county every five years (United States Geological Survey, 2019). Thus, we had data on water use, population, and the number of acres that are irrigated for each of Utah's 29 counties from 1985 to 2015. This resulted in a total of 203 observations on the county level as well as state aggregate measures for each of the seven years.

In addition to providing the total amount of water used in millions of gallons per day (Mg/d), the USGS provided the amount of water consumed in each category of water use. How the USGS has categorized these variables has not remained consistent over the years, which is likely to cause some level of inconsistency within our own analysis. However, as explained below, the changes among these categorizations remained relatively small and therefore are unlikely to have a great negative impact on our analysis. Table 1 provides the summary statistics for the state-level data surveyed across the seven survey years the USGS data covers. This summary gives us a glimpse into water distribution which we will expand upon below with our own descriptions of how this compares to county-level data.

Table 1: USGS State-Level Data, Utah 1985-2015

Statistics	Mean	St. Dev.	Min.	Pctl(25)	Pctl(75)	Max
Population	2266	518.48	1678	1854	2665	2982
Acres Irrigated	89.3	10.12	78.7	84.6	90.5	110.2
Total Water	377	52.33	299	361	396	458
Public Supply	103.2	43.66	67.3	76.8	102.6	196.6
Domestic	0.622	0.19	0.400	0.448	0.782	0.810
Industrial	11.68	6.2	1.87	9.06	13.93	21.97
ThermoElectric	0.87	1.53	0	0	1.16	3.75
Livestock	6.27	7.02	1.24	1.33	11.15	16.64
Irrigation	274	60.33	214	239	279	399
Commercial	0.17	0.16	0	0.09	0.25	0.32
Mining	0.436	0.65	0	0	0.8	1.45
AquaCulture	6.58	4.00	4.18	4.43	6.94	12.56

The first and largest of these categories is irrigation. Water used for crops, parks, and golf courses is all included under irrigation. Irrigation has always accounted for the vast majority of Utah's water use ranging from 85%-70% of the total water use in the state of Utah. There is a downward trend in the data with irrigation's share of total water use declining every five years. On the county level in 2015, irrigation made up the majority of water use in almost every single locale. Exceptions include Salt Lake county—the most urbanized county in the state—as well as Tooele and Weber counties, which see substantial water use for mining.

The second-largest category of water use in the state is public supply. Previously called municipal water use, public-supply water use does not refer to economic supply. Instead, it includes residential water connections and some water used for industrial and commercial purposes. Public supply has accounted for between 10%-15% of the total water use in Utah since 1985. While there is not as clear a trend with public supply water use as with irrigation, public-supply water use has consistently made up a larger percentage of total water use since 2000. Counties along the Wasatch Front and Washington County use more significant portions of their water for public supply than more rural counties. In general, the higher a county's population, the more water it uses for public supply, though some counties like Salt Lake have a much more efficient ratio of public supply water use to population. This compares to Utah County which, as of 2015, uses the most public supply water in the state.

Both mining and thermoelectric require high amounts of water use, but tend to be very localized and have small effects on the state's total water use. From 1985 to 2015, they made up between 3%-6.5% and 0.5%-2% of water use in the state respectively. Counties with significant mining operations, such as Weber, Tooele, and San Juan, use a sizable portion of their water use for mining—46%, 52%, and 23% in 2015, respectively. Beaver and Emery counties with hydroelectric operations both used about 15% of their water use for generating power in 2015. The mining and hydroelectric water usage in the remaining 24 counties is negligible.

Industrial water use represents industrial or fabrication processes that are not already counted under public supply. In the time frame, it has accounted for between 0.6%-3.2% of state-wide total water use with a general upward trend. In 2015, industrial water use was almost completely limited to Salt Lake County with another significant portion in Weber County. This seems to indicate that industrial water use is concentrated in areas of high population density, which would make intuitive sense.

Water used for livestock care and feed accounted for between 0.3%-2.5% of statewide water use in the time frame. In 1985, the USGS included water used for fish farming under livestock. USGS did not collect county-level data for livestock in the year 2000. Because of the near-zero levels of livestock water use in each county, we approximated the county-level livestock water uses for 200 as zero in our models.

Aquaculture has only existed as a USGS water use category since 2000. As a percent of statewide total water use, it has maintained a steady percentage between 1.7%-2.3%. There were only four counties in 2015 where it accounted for more than 5% of total water use.

Self-supplied domestic water use is water drawn from a private well for indoor residential use. It only has made up 0.1%-0.3% of statewide total water use from 1985 to 2015. Only in San Juan County—wherein 2015 it accounted for 7% of the water use—did it make up more than 5% of a county's total water use.

Commercial was a category of water use only used from 1985 to 1995 that included water used for commercial buildings and institutions. It sometimes included off-stream fish hatcheries. It never accounted for more than 0.1% of the total water use in the state from 1985 to 1995.

A few patterns immediately become apparent. First, irrigation accounts for the vast majority of water usage in the state, meaning that changes to the amount of water used for irrigation have the greatest impact on the total amount of water used in Utah. Second, public supply is the second-largest category and, along with irrigation, accounts for over 90% of statewide water usage. Public supply is most often associated with municipal use and we expect that the growing populations would lead to increased public supply demand.

Third, while mining and thermoelectric do make up a significant portion of some counties' water usages, it is limited to only those counties which have significant mining or thermoelectric activity. Finally, industrial water use seems to be associated with only very high population densities,

such as those found in Salt Lake County. The effects of all other water are so small they are negligible.

Model and Results

This section presents the various models used to analyze the effect of population on water use in Utah.

Main Model

The important relationship for this analysis is between population and water use. As such, the main model for this section is:

$$\hat{y}_{i,t} = \beta_o + \beta_1 X_{i,t} + \alpha_i + \alpha_t + \varepsilon_{i,t}$$

Where $\hat{y}_{i,t}$ is total water use in county i and year t measured in Mg/d, $X_{i,t}$ is population in county i and year t measured in thousands of people, α_i is a county fixed effect, and α_t is a year fixed effect.

This model fails to reject the null hypothesis in a Hausman test, indicating that a fixed effect model is the correct specification (Hausman, 1978). However, two different time fixed effect specification tests give different results (one for including αt and one against it) (Croissant & Millo, 2008). Ultimately, time fixed effects were included in the model because they make theoretical sense in the context of this research. It is likely that some event, such as a drought, affects all counties in Utah in one year but not in other years (Hsiao, 2014).

The results of this model can be found in Table 2. Initially, the model shows a statistically significant inverse relationship between population and total water use. These results indicate that an increase in a county's population by 1,000 people will correspond with a decrease of that county's water usage by 141,000 gallons per day. Furthermore, we are confident that the size of a county's population has a negative effect on the amount of water used by that county.

It passes a Breush-Pagan test for heteroscedasticity, thereby affirming that it is homoscedastic (Breusch & Pagan, 1980). However, this model suffers from autocorrelation. The model was rerun using heteroscedasticity and autocorrelation robust standard errors.

The results for the robust model are also in Table 2.

Table 2: Effect of Population on Total Water Use

	Dependent Variable:	
	Total Water	
	Default (1)	Robust (2)
Population	-0.141*	-0.141
(se)	(0.078)	(0.160)
(90% ci)	(-0.269, -0.012)	(-0.405, -0.123)
Observations	203	203
R^2	0.019	0.019
F Statistic (df = 1; 167)	3.250*	3.250*

Note: *p<0.1; **p<0.05; ***p<0.01

These robust standard errors correct for autocorrelation and heteroscedasticity, a problem that is not present in this model. As a result, this solution over-inflates the standard errors of this homoscedastic model and over-penalizes inference capabilities (Zeileis, 2006). Given this, we conclude that the true significance of this model lies somewhere between these confidence extremes. In both cases, however, the 90% confidence intervals lean heavily negative, indicating that it is more likely that there is an inverse relationship between population growth and total water use.

Water Use Category Models

A series of secondary models were run to explore which sectors are driving the inverse relationship between population growth and total water use. All of these models take the form:

$$\hat{y}_{i,t} = \beta_o + \beta_1 X_{i,t} + \alpha_i + \alpha_t + \varepsilon_{i,t}$$

Where $\hat{y}_{i,t}$ is water used in each water use category (e.g. agriculture, municipal, etc.) in county i and year t, $X_{i,t}$ is population in county i and year t, α_i is a county fixed effect, and α_t is a year fixed effect. Notice this is the same model specification used for the main model. The difference is the data used for $\hat{y}_{i,t}$.

The results for these models can be found in Table 3. Each of the secondary models failed a Breush Pagan test for heteroscedasticity and a test for autocorrelation, meaning that every model was autocorrelated and heteroscedastic. As such, heteroscedasticity and autocorrelation robust standard errors were used to generate all the results found in Table 3.

Table 3: Summary of Regression Models				
Dep. Variable	β_{pop}	**95% CI**	**SE.**	**p-value**
Irrigation	-0.302**	(-0.521, -0.082)	0.112	0.008
Public Suppy	0.111	(-0.041, 0.263)	0.775	0.155
Industrial	0.054**	(0.015, 0.094)	0.020	0.008
ThermoElectric	0.003	(-0.003, 0.011)	0.003	0.307
Mining	0.013	(-0.023, 0.048)	0.018	0.484
Livestock	-0.013	(-0.037, 0.010)	0.012	0.270
Domestic	-0.001**	(-0.003, -0.0002)	0.001	0.024
Note: *p<0.1; **p<0.05; ***p<0.01				

Table 3 shows that the only significant use categories are irrigation (agricultural), industrial, and self-supplied domestic. A direct comparison of coefficients from separate regressions against each other to determine net effects is difficult, on account of the variations in different regression models. This would require additional technical models which are beyond the scope of this paper. While we are not able to directly compare these coefficients for net effects, we can note a few interesting findings.

First, these models predict that a 1,000 person population increase leads to a 54,000 gallon per day increase in the amount of industrial water used. This finding makes sense, as the majority of industrial water is used in urbanized areas. As cities grow larger and industrialization increases, we should expect that water used for these purposes also increases.

Second, these models predict a statistically significant decrease in the amount of domestic water used as a result of population growth. This result is intuitive. The domestic category covers self-supplied water used for residential purposes (i.e. water from an on-property well used for indoor and outdoor home purposes). We suspect that the majority of these sources are in rural locations where it may not be reasonable to link up to the public supply network. Increasing population and urbanization should decrease the number of domestic sources and, therefore, decrease the amount of water used in the domestic category.

Finally, these models predict that a 1,000 person increase in a county population leads to a 302,000 gallon per day decrease in agricultural water use. The magnitude of this result is much greater than the results from the other models and so deserves additional exploration.

Effect of Population on Agriculture

As Table 3 shows, our models predict a significant decrease in the amount of water used for agricultural purposes as the population increases. The intuitive explanation for this is that the amount of farmland in Utah decreases as the population increases. To test if this is the case, the following model was run:

$$\hat{y}_{i,t} = \beta_o + \beta_1 X_{i,t} + \alpha_i + \alpha_t + \varepsilon_{i,t}$$

Where $\hat{y}_{i,t}$ is the number of irrigated acres in county i and year t, $X_{i,t}$ is population in county i and year t, α_i is a county fixed effect, and α_t is a year fixed effect. Again, this is the same model specification used in the models above. The results of this model, both with and without robust standard errors, are in Table 4.

Table 4: Effect of Population on Irrigated Land		
	Dependent Variable:	
	Irrigated Acres	
	Default (1)	Robust (2)
Population (se)	-0.031* (0.015)	-0.031** (0.015)
Observations	203	203
R^2	0.024	0.024
Adjusted R^2	-0.181	-0.181*
F Statistic (df = 1; 167)	4.072**	4.072**
Note: *p<0.1; **p<0.05; ***p<0.01		

This statistically significant model predicts that a 1,000 person increase in population leads to a 30-acre decrease in the number of irrigated acres in a county. This result nicely explains the finding above that population and irrigated water use are inversely related. As Bigelow (2015) found, exogenous population growth and urbanization tend to decrease water use. So, as the population increases in Utah's counties, the number of irrigated acres decreases, driving a large decrease in the amount of water used for irrigation.

Conclusion

Of our three models, the first is the most startling, with uniformly negative confidence intervals suggesting a negative relationship between total water use and population growth. Of our three main models used to explore relationships between population and water use in Utah, our main model seemed most promising. Subsequent models suggest that these decreases can be attributed to decreases in irrigated water use and total irrigated acres. This finding aligns with previous literature, which finds that increasing urbanization decreases the prevalence of water-demanding agriculture (Bigelow, 2015). Further research into this finding to verify and better understand the relationship agricultural changes have on total water use would be beneficial particularly for policymakers.

This analysis indicates that counties in Utah will likely

see a decrease in irrigated water usage as they continue to grow, which may contribute to a decrease in total water use. As a result, when policymakers attempt to examine and plan for the future water demand in Utah they should take care to examine how the effects of a growing population may actually decrease the demand for new sources of freshwater.

The importance of these findings should not be minimized as they challenge many assumptions about Utah's future water use needs. Planners need to reassess their evaluations for how much total water Utahns will use in the future. Furthermore, policymakers should adapt their plans to account for the shift in water use categories between less and more populous counties which we identified in our main model. Utahns will ultimately pay the price—whether that be insufficient access to water resources or the over-exploitation of Utah's wetlands—if Utah policymakers do not plan for how decreased agricultural water use will impact Utah's future needs as the population grows.

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How Great is the Salt Lake? Utah Willingness to Pay Survey Analysis for the Great Salt Lake

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Abstract:

Water conservation policy is an important democratic and economic issue in Utah. Any understanding of the future of Utah's water policy requires an understanding of Utahns' attitudes towards water availability. This is because public perception of water informs citizens' willingness to pay more to conserve water and their willingness to politically support conservation initiatives. As such, surveying public demands for conservation provides insight into Utah's water policy future. We selected the most prominent water body in Utah–the Great Salt Lake–and conducted a contingent value willingness to pay (WTP) survey from a sample of the Utah population. This economic metric is a standard industry measure to gauge the public value of natural resources. Our results indicated that Utahns' average aggregate economic value for the Great Salt Lake is $98.4 million. This is a preliminary figure, but it suggests that the WTP of Utahns for the Great Salt Lake and other water resources may be significant.

Keywords: Willingness to Pay Survey, Conservation, Great Salt Lake, Natural Resource Value

Introduction

Across the nation, one of the most difficult tasks of water managers is to align their water policy with public attitudes. With many water resources being managed by democratic appointees, decisions about a community's water future are determined by community preferences as much as their needs. Large-scale conservation efforts and water diversion projects can be divisive and difficult to implement without public approval. Given this, it is vital for water managers and policymakers to be aware of public valuation for available water resources.

This sort of evaluation is best done by assigning a price to available water in the form of a willingness to pay contingent valuation survey (WTP). This practice gives us an economic estimate of the value a community places on water resources by providing a concrete dollar value. It is most often used when considering conservation efforts, and the amount of money a community would be willing to pay to preserve natural resources. As such, it is an important tool for water managers and policy writers in their efforts to manage these resources.

Few of these studies have been conducted for Utah water resources, and none have attempted to understand Utahn's general WTP for state water resources. Recognizing a sweeping WTP survey of Utahns would be impractical, this paper sets a starting point by examining the value placed on Utah's most prominent aquatic resource, the Great Salt Lake. The conservation of this famous resource has become an important issue in recent decades, with environmental concerns and projected water needs raising serious concerns for the future health of the Lake (Great Salt Lake Advisory Council, 2019a; Great Salt Lake Advisory Council, 2019b; Great Salt Lake Advisory Council; 2019c Environmental Protection Agency, 2016). Our goal is to provide an initial study of Utahn's WTP for the Lake's conservation to determine public attitudes towards the Lake and towards water conservation.

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Our paper is divided into three parts: a literature review of the willingness to pay contingent valuation method, our data collection methodology, and the results of our survey analysis. In each section, the limitations of our work are highlighted to underscore this as a preliminary analysis. Concerns about our use of WTP contingent studies are addressed in our literature review, while our data collection methodology attempts to address concerns on representative random sampling. Despite its limitations, our study provides a compelling initial picture of Utahns' attitudes towards water conservation and the Great Salt Lake.

Literature Review

Of all the natural resource data metrics available to policymakers, none are more democratic than contingent valuation studies. These types of willingness to pay (WTP) surveys are standard practice within both the policy and academic fields. However, most professionals acknowledge the practice is liable to a range of biases. How to compensate for these problems remains a topic of lively debate, with some researchers advocating for small changes in survey question composition, and others arguing the method is so prone to bias it is practically unusable. These published positions and their implications for our work are reviewed below, in addition to the economic study which serves as the inspiration for this project.

In 2012, the Great Salt Lake Advisory Council commissioned a report on the economic value of the Great Salt Lake and its surrounding ecosystem (Bioeconomics, 2021). The topics of their report were exploring output, income, and employment directly resulting from this natural resource. Their findings indicated there were significant economic resources that the Great Salt Lake contributed to the local Utah economy. These contributions came from diverse sources, including substantial industrial output, recreational services, aquaculture development, as well as indirect contributions by way of snowmelt and other smaller sources. An acknowledged deficiency in this study was the absence of "possible passive use values associated with the Great Salt Lake," known to us as WTP contingent values (Bioeconomics, 2021). Estimations for the value of this resource were generated using previous WTP contingent value studies commissioned in other states for other water resources. However, the authors indicated how these values can range "from $10 to $125 per household." They chose to make use of the maximum value of California's Mono Lake study, which estimated a valuation of $125 per household for the resource in question. Calculating this out to "the approximately 830,000 Utah households...suggests the passive use value associated with preservation of the Great Salt Lake Ecosystem could be in the range of $100 million annually for Utah households" (Bioeconomics, 2021).

This extrapolation used from California's Mono Lake study is problematic for several reasons. While both Mono Lake and the Great Salt Lake are saline bodies, Mono Lake is less than a tenth of the size of the Great Salt Lake. This added size gives greater prominence to the Great Salt Lake, reinforcing why the Great Salt Lake Advisory Council selected the highest range value from the Mono Lake study. This belies the fact their estimate is still an estimate with a value, using the lowest valuation as well as the highest, between $8.3 and $100 million. It would seem to us to be more prudent to generate a new WTP contingent survey for the Great Salt Lake specifically to ensure the Advisory Council estimates are legitimate.

Notwithstanding this concern, a review of surveys performed by other studies is valuable when estimating water contingent value. Brown and Duffield's study of contingent values of Montana rivers provided us with a point of reference for our own work (Duffield et al., 1994). The researchers attempted to discover accurate estimates and avoid bias by employing a process of diversification. Specifically, they surveyed different sample groups, employed different WTP question methods, and asked about different water bodies. One sample group included those who were randomly mailed survey questions, another was surveyed at recreation sites along the two rivers in question, and the final involved a phone survey. All sources had a substantial sample size, totaling approximately 1,700 responses. While sampling on-site may have introduced bias, it could be balanced by the random mail and phone surveys, and it would have addressed the relative ignorance many respondents feel in accurately predicting their preferred contingent value. The survey question asked respondents about their preferred water flow level for either the Big Hole river or the Bitterroot river, further diversifying their results. As a final precaution, they introduced two different WTP-type questions, one open-ended approach allowing individuals to select their own preferred payment level, and the other soliciting a yes or no response to a previously selected dollar amount, ranging from $1 to $1,000. Both approaches described a one-time payment to a trust fund set aside for Montana river conservation. These measures gave the researchers a great degree of confidence in their results, which estimated individuals' contingent valuation (their economic value of a non-economic, environmental good) between $10 and $25 (Duffield et al., 1994). The general approach of these researchers is that extensive diversification of methods and samples will prevent any introduction of bias into responses. This appears to be confirmed by their findings, as they found their generated models were consistent with consumption theory.

Another limitation of the Great Salt Lake Advisory

Council's report was its focus on direct local economic benefits of the Great Salt Lake, as opposed to larger statewide economic value. Our research intended to fill this gap by estimating contingent valuation from across the state. As a result, a review of research exploring the effect of distance on contingent valuation was merited.

Similar to Brown & Duffield, Sutherland & Walsh (1985) explored this relationship using two rivers in Montana. While their sample size was low, with a mailed survey response total of only 171 households, their multivariate regression analysis indicated a strong inverse relationship between distance and willingness to pay. While their work was useful, there are features of this analysis that do not obviously hold in our analysis. The thesis of the researchers was that contingent valuation was connected to recreational use; a greater distance from a water source would reduce the WTP for the resource. However, the Great Salt Lake is a unique state landmark that has merit apart from recreational use, and so their observed trends may not hold for our own surveyed resource.

An attempt to compensate for this was made with a Utah-specific wilderness preservation study conducted by Keith, Fawson, & Johnson. As many Utahns may both use public lands for recreation, but also appreciate their existence value, this would perhaps be a more accurate representation of attitudes than Sutherland & Walsh. Additionally, their surveying of public lands would be consistent with Utahns' perceptions of the Great Salt Lake. They studied what Utahns' WTP would be for certain wilderness spaces which were being considered for development. They received 700 responses from phone surveys from 1263 contacted. Their results indicated a very high contingent value for land designations, with different calculated averages ranging between $70 to $400 annually (Keith et al., 1996).

Despite these studies' thorough efforts to correct for potential bias in their surveys, there remains a substantial population of researchers who argue that the method is so biased as to surrender any claim to scientific credibility. A compilation of these arguments was edited by McFadden & Train in 2017 at a substantial 307 pages. Their arguments are built around an overview of contingent value surveys, and their findings are difficult to ignore. They found contingent value surveys are unresponsive to cost, payment frequency, and scope; that respondents consistently have difficulty answering questions; and that contingent value surveys consistently resist corrections (Mcfadden & Train, 2017). What this means in practice is individuals are so inexperienced in consistently estimating the monetary value of environmental goods that their reported WTP contingent values are wildly inconsistent. Features such as the cost prompts provided by the surveyors or the frequency of payments change respondents' preferences in disproportionate ways. Scope, too, presents a problem, as they found that "[contingent value] estimates of WTP to protect birds were essentially the same whether respondents were told that 2,000 birds would be saved or 200,000 birds" (Mcfadden & Train, 2017). Individuals just have too little experience placing a dollar amount on such things. Corrections to these problems further demonstrate the flawed character of these responses. The researchers found that "out of a sample of 1,224, only two respondents are not eliminated" (Mcfadden & Train, 2017). These are only the most basic descriptions of their exhaustive arguments critiquing this common policy practice.

While the scope of the problem is contested among experts, the general literature consensus is that contingent value surveys are subject to bias. However, professional disagreements in the scale of this bias make it difficult to accurately predict the necessary measures to correct for this bias. Mc Fadden & Train's arguments against contingent value surveys are persuasive, but fail to provide an alternative method for estimating economic value. In the absence of generally accepted industry alternatives, we decided to proceed with the use of WTP contingent value surveys. Our goal was to be both cautious in our administrative procedure, as well as in the conclusions we draw from our results.

Data

We began our survey research by distributing our surveys to multiple respondent sources. This was one method to avoid unintentional bias in our research. These sources included Amazon's Mechanical Turk program (MTurk), university connections, and personal distribution of our survey link to friends and family. Our purpose behind pursuing multiple sources for survey respondents was to increase the diversity of our sample population and therefore attempt to decrease and offset any existing unintentional bias.

One concern we encountered early on in our study was the potential for selection bias from our inclusion of personal contacts in our sample pool. This is certainly a credible objection. Our use of personal connections resulted from our limited time frame and resources available for random, anonymous state polling. This also resulted in the polling of our fellow University students in different departments and venues. While including personal relations may provide negative optics, the vagueness previously mentioned in contingent valuation, coupled with the apolitical nature of our WTP question, suggested that any bias would be minimal. As section 4.2 will detail, any divergences from state demographics overwhelmingly resulted from our University polling rather than our personal connections. This was reassurance that our connections, while not ideal for a random WTP survey, were not detrimental to our results. These more

personal respondents only accounted for 13% of those polled, so we believe that any biases introduced were balanced by our other respondents.

Before being able to run tests and analysis on our data set, we had to ensure that the data was clean. One way to do this with the MTurk respondents—the highest percentage of our total population at 62%—was to exclude any and all duplicate Worker IDs. Each user on MTurk's platform has a unique worker ID attached to their profile. Any duplicate worker IDs were removed to ensure that each survey response was unique.

Once our respondents were collected, we had to properly code our data to allow for regression analysis. Several of our survey questions were formatted as multiple choice or dropdown, formats that would be more difficult to analyze. For each one of these questions, we created dummy variable values corresponding to each of the available options to replace the original question. This allowed us to perform straightforward multivariate regressions with a longer series of dummy variables. Additionally, due to the low response rates in many Utah counties, a new variable was created named UrbnCty, making use of an FDA classification of rural and urban counties to label the source as either rural or urban. Following the survey distribution, response gathering, and data cleaning portion of our research, we were able to establish a final data set containing all survey responses. This final data set contained our entire sample population made up of 221 adult Utah residents.

Our testing and analysis work for our final data set were done using R and Tableau. By importing our data set into these tools, we were able to easily run tests and develop visualization objects to help with our research.

Model and Results

This section details the survey and analysis methodology employed to obtain willingness to pay estimates for the Great Salt Lake. For more details on our regression models, see Appendix 6.3.

Willingness to Pay Methodology

In conducting this research, we decided to conduct a contingent value willingness to pay (WTP) survey. This would allow individual Utahns to self-report their utility preference by placing a monetary value on the conservation of the Great Salt Lake. We then generalized our individual responses to the entire population of Utah for a rough estimate of the state-wide value of this natural landmark.

When clicking on the link to our survey, the first page takes the respondent to a short introduction meant to inform about the Great Salt Lake and its economic and ecological benefits to the state of Utah. We were careful and tactful with our verbiage to avoid imposing any bias on the reader (see Appendix 6.2 for the language of our introduction). We intentionally constructed the survey to be quick and simple in hopes that it would attract more respondents, keep them attentive while filling out the survey, and produce more accurate and honest responses. We also made almost every question multiple-choice to ensure discretion of information by respondents to answer the questions. These questions included the following:

- Gender
- Age
- Annual Income Bracket
- Primary Occupation
- Highest Education Obtained
- Environmentalist Self-Identification (yes/no)
- County of Residence

Our willingness to pay question stated, "How much more would you be willing to pay on your monthly water bill to maintain the Great Salt Lake at its current level? " We formulated the question in this manner to 1) convey that these payments would be continuous, rather than one-time sums, and 2) to provide concrete context for respondents to visualize their payments. We included a prompt at the end of our WTP survey for the average monthly water bill of Salt Lake County for those who may not be aware of their monthly water bill rates. The hope was that this verbiage corrected for the vagueness problem mentioned in the literature.

Our main source for survey responses was MTurk. MTurk is an online crowd-sourcing marketplace that gives individuals and businesses the ability to virtually outsource tasks to individuals. These tasks can be anything from data validation to survey participation, as in our survey. We posted our survey as a job with a requirement that the survey responders be over eighteen years old and be Utah residents. We offered a standard payment rate for completion of the survey, increasing the payout price by 50% after several weeks to incentivize more respondents.

Another source that we used in pursuit of survey respondents was the personal distribution of our survey link. As mentioned in section 3, the use of personal connections was not ideal for our study, but presented minimal concerns of bias. Distribution to these personal connections was simple, involving direct messaging of the survey link.

The final source of responses was students and faculty within the campus community. While surveying a population within a similar age range, income bracket, and with similar political sensibilities involved potential bias, surveying

college students has become a standard practice within the academic community. The relative ease of surveying and intellectual diversity present on college campuses makes it an attractive sample population, even considering potential bias. As such, we concluded we would include respondents from the campus community, balanced with more state-representative respondents from our personal circles and from MTurk. To do so, we solicited responses from our research course classmates and college connections, as well as distributing the survey to the economics department at large and other departments within the college of social and behavioral science. This large sampling from campus presents the most credible concern for the generalization of our results to the larger state. We believe the mix of campus sources with random ones helps compensate for this bias.

The various sample sources were combined into various datasets for analysis–'All' aggregated all sources with 221 responses, 'Other' aggregated our non-campus personal connections and our MTurk responses for a more state-representative demographic sample with 168 responses, and 'Campus' used only those responses collected on the University of Utah campus.

Our analysis made use of basic multi-variable regression models, with WTP as the y-variable and all other variables being expressed in various combinations as x-variables. Regressions were run with all variables for each data set, substituting our urban county dummy variable for all county dummies. Subsequently, additional regressions were run with the statistically significant variables from the previous regressions attempting to produce models with greater predictive power. Variable Importance Frame (VIF) tests were conducted for the 'All' data set regression to check for multicollinearity, as all the statistically significant variables fell under the income bracket dummy variables. Finally, the 'All' data set was used to generate a random forest model demonstrating the importance of each variable in question.

Demographic Review

Our results, while preliminary, demonstrate the relative difficulty in predicting the WTP of Utahns. A demographic overview of our results is an excellent example of this challenge. To obtain the most accurate information and results from the survey research, ideally, the demographic information from Utah's total population would match up with our sample population. Because our sample population was 221 individuals, disproportionately drawn from a university campus, there are inevitably differences between our sample demographics and the larger state demographics. However, as Appendix figure 6.1 shows, our survey did a reasonable job in approximating the demographics of Utah. It is reassuring to see that the majority of the demographic information from our sample population are within 5% of the total Utah percentages. Nearly all are within 10%, and only 6 exceed a 10% difference. We would suggest that the inclusion of university students as their own dedicated survey group likely contributed to the larger number of those in Salt Lake City, as well as the greater number of respondents either age 18-24 or age 25-34. Future surveys should aim to reduce the number of respondents in these age limits, as well as those with Bachelor's degrees to a more representative level, as these differences suggest there are holes in our representation of the Utah populace.

Results

Our findings suggested that Utahns' willingness to pay may be substantial. The average monthly WTP was $11.69. To put this amount into context, our survey suggested that the average monthly water bill for a household in Salt Lake City was $17, suggesting that respondents on average were willing to pay an approximately 70% increase on their water bill to preserve the Great Salt Lake.

This translates to an average extra $140.28 paid yearly by each household in Utah. Multiplying these monthly and yearly values by the number of households in Utah, an extra $11.69 on top of each home's water bill would yield $8.2 million per month and $98.4 million per year (Utah Census Data, 2007). This value is roughly equal to the Great Salt Lake Advisory Council's estimate using data from the Mono Lake WTP study. This reinforces that the respondents' average WTP is substantial, as it is close to the upper bound of values derived from the California study. If the increase in average WTP between Mono Lake and the Great Salt Lake is commensurate to the increase in size and relevance is not as clear. Such a relationship would require additional study.

In addition to the overall WTP amount that was produced from the research, we were able to examine relationships between respondents' identity metrics (i.e. age, gender) and their reported WTP. One of these was proximity to the Great Salt Lake. Before conducting our survey, we challenge the notion that people residing near the Great Salt Lake would be willing to pay more toward its conservation. Our skepticism was justified by the data, as we found no clear relationship between proximity to the Great Salt Lake and WTP. On the contrary, two of the counties with the closest proximity to the Great Salt Lake–Weber County and Davis County–had some of the lowest average WTP amounts. Less surprising was the strong negative relationship between age and reported WTP. Our youngest age bracket at 18-24 years recorded an average WTP of $11.00. Our third age bracket at 45-54 years recorded an average WTP of $9.00, and our sixth and final age bracket at 65+ years recorded an average WTP of $8.00.

Distance from the Great Salt Lake turned was not the only metric that had a negligible relationship to average reported WTP. Neither gender nor education level had clear relationships to WTP, with the exception that those with GED-level education, had by far the highest WTP amount. More surprisingly was the lack of a clear relationship between WTP and salary. Of our six salary brackets, ranging from less than $25,000 a year to greater than $100,000 a year, all average WTP amounts were within $2.08 of each other. While the highest WTP amount at $12.32 was the respondents with salaries greater than $100,000, the lowest of the six WTP amounts was $10.24, recorded by the respondents with salaries from $75,000-$100,000, which was the second to highest salary bracket. There was no clear relationship between these variables.

One of the more interesting findings from our data analysis is the average WTP relationships with self-identified environmentalism. We assumed that environmentalists would be more invested in the conservation of the Great Salt Lake and, in turn, be willing to pay significantly more than those who do not self-identify as environmentalists. The actual relationship was less clear. Those who self-identified as non-environmentalists had an average WTP amount of $10.21, while those who self-identified as environmentalists had an average WTP amount of $11.81. While the environmentalists had a higher willingness to pay, the difference between the two was comparatively small.

All of these findings should be qualified by considering the small sample size of our study. Industry standards for WTP studies are often triple our respondent size. This limitation is the unfortunate reality of our limited resources and time available for our study. Our results, as indicated at various points throughout this paper, are preliminary and give us an idea of the WTP of Utahns. Further research in the form of more substantial WTP surveys can build upon our findings.

Conclusion

Though the literature provides reason for skepticism when it comes to willingness to pay studies, the framework provided useful and compelling results. Our analysis of over two hundred individuals reveals that each Utah household would be willing to pay on average an additional $11.69 per month, on top of each home's water bill to conserve the Great Salt Lake. This yields a total of $8.2 million per month and $98.4 million per year. This number suggests a substantial WTP for the state. While our small sample size and patchwork survey population make our results far from comprehensive, this number is consistent with estimates projected from other water resource WTP surveys (Bioeconomics, 2021). Further, more substantial studies should be conducted to clarify these results and to explore if these findings can be generalized to other natural water resources in Utah.

The importance of these findings should not be minimized. If Utahn's attitudes towards conservation are as substantial as our survey results indicate, public policymakers could enact more aggressive conservation efforts for the lake with public support. As indicated by the Great Salt Lake Advisory Council, the economic losses to the state if the Great Salt Lake were to dry up would be vast, and the public appears to agree. That these attitudes may extend beyond the Great Salt Lake to other natural bodies of water suggests the public are more sensitive to the costs, and economic value, of our water than we often give them credit. Water managers and voters in Utah would both benefit from future water planning which makes use of these findings.

Appendix

Demographic Review Figure

Gender			
Female	90/221	41%	49.60%
Male	129/221	58%	51.40%
Other	2/221	1%	

Income			
< $25,000	58/221	26%	35%
$26,000-$39,999	40/221	18%	19.70%
$40,000-$59,999	42/221	19%	19.18%
$60,000-$74,999	27/221	12%	9%
$75,000-$99,999	33/221	15%	8%
Over $100,000	21/221	10%	9.52%

Max Education			
Associate's Degree	27/221	12%	9.75%
Bachelor's Degree	87/221	40%	21.95%
GED	3/221	1%	
Graduate Degree	32/221	15%	11.30%
High School Diploma	14/221	6%	22.86%
Some College	47/221	21%	26.09%
Some High School	4/221	2%	5.27%
Technical College	7/221	3%	

Age			
18-24 Years	56/221	25%	~12%
25-34 Years	89/221	40%	14.60%
35-44 Years	41/221	19%	13.40%
45-54 Years	20/221	9%	10.60%
55-64 Years	11/221	5%	6.40%
65+ Years	4/221	2%	8.50%

Primary Classification			
Full-Time Worker	117/221	53%	
Part-Time Worker	17/221	8%	
Stay-at-Home Parent	23/221	10%	
Student	53/221	24%	
Retired	5/221	2%	
Unemployed	6/221	3%	2.50%

County			
Box Elder	1/221	1%	1.70%
Cahce	5/221	2%	3.90%
Carbon	1/221	1%	0.60%
Davis	36/221	16%	11.00%
Duschesne	1/221	1%	0.60%
Iron	5/221	2%	1.60%
Morgan	1/221	1%	0.40%
Rich	1/221	1%	0.08%
Salt Lake	109/221	49%	35.00%
San Juan	1/221	1%	0.50%
Sanpete	1/221	1%	0.90%
Sevier	2/221	1%	0.70%
Summit	3/221	2%	1.30%
Tooele	2/221	1%	2.10%
Uintah	1/221	1%	1.10%
Utah	25/221	11%	19.00%
Wasatch	2/221	1%	1%
Washington	9/221	4%	5.20%
Weber	15/221	7%	7.80%

Survey Great Salt Lake Summary Information

The Great Salt Lake is the largest wetland area in the American West. Its 400,000 acres of wetlands provide habitat for over 230 bird species traveling from the tip of South America, north to the Northwest Territories and as far west as Siberia. These wetlands and surrounding mudflats are habitats for 8-10 million individual migratory birds with many species gathering at the Lake in larger populations than seen in other locations.

In addition to the Lake's ecosystem and biological diversity, the specific characteristics of the Lake have given rise to a number of industrial operations, including extraction of salts and minerals, and support commercial use in the annual aquaculture harvest of brine shrimp eggs. It also has fostered recreational use including birding and other wildlife observation, duck hunting, boating, and direct contact recreation. Together these industrial and aquaculture uses of the lake ecosystem, along with recreational use of the Lake, constitute an estimated 1.32 billion in total economic output, 375 million in total labor income, and 7,700 full and part-time jobs annually within Utah.

In recent years the size of the Great Salt Lake has declined, with a recorded 2016 volume at less than 50% historic averages and an elevation drop of 11 feet. Reductions in snowmelt and rainfall runoff are a large factor in the decline in the Lake volume. Additionally, Utah has proposed water projects in the last two decades to divert water from the Great Salt Lake's main tributaries to provide municipal water to the Wasatch Front. This diversion will also lower the level of the Lake, dropping its elevation potentially an additional 2 – 4 feet. The impact of these decreased lake levels on wetlands, migratory bird populations, and industry is uncertain. More recent studies have found lower lake levels will contribute to reduced Wasatch air quality as dry lake sediments are exposed to wind circulation.

Further Model Analysis

Our models are less clear than our demographic data and main observations. Table 1 shows a summary of the linear regression performed with our 'All' data. While the variables selected for this model all remain statistically significant, the predictive value of the model appears to be very low, with the variable coefficients only appearing to differ from each other by .70, or 70 cents, with very large confidence intervals increasing the uncertainty of our results. More importantly, the R2 and adjusted R2 of our model are extremely low, indicating there appears to be no clear relationship that can be drawn from the given model. This is not entirely surprising, as the sample size of our model–221 samples for 'All'–is much lower than other similar WTP surveys (Duffield et al., 1994). This appears to be substantiated as our other models do not perform much better. Removing the campus responses for 'Other' only serves to reduce both R2 values from our 'All' model, and the two coefficients selected for their statistical significance have very little difference from one another–only .13, or 13 cents–and lose their significance when used as the only model coefficients.

Table 2 shows how our campus data set performs on its own. 'Campus1' shows a model using the variables selected for their significance from the others. There are features of

this model which are preferable to our 'All' results. There are large differences between the different variables, while these do come at the cost of very large confidence intervals similar to our previous models. The R2 values are also higher. The greatest difficulty with this model is the small sample size, with only 54 responses. As previously discussed, these results may also be subject to bias, as they all come from campus responses, where the age range and income are likely to be very similar.

A new model, 'Campus2', attempts to use only the statistically significant variables from 'Campus1', with the resulting model having solely significant variables, but ones with less difference between each other, as well as a lower R2. Looking at the differences between these model results, we concluded that our 'All' model, while having low predictive value with very low R2 values, remained the most accurate of our models, with strong statistical significance for all of our variables, as well as the largest sample size. A lack of predictive power only indicates the relative difficulty in predicting WTP values, a finding which is supported by the literature.

To further study these resources and their effect, we generated a random forest for our 'All' model to see the variable importance. The results are illustrated with table 5 showing that AnIn0K, the variable for $0-$25K income brackets, was the most important variable, with a p-value of 0.103, appearing in 402 nodes and 142 times as the root node. However, this may be deceptive, as this is the income range of our campus responses, potentially explaining the preference for this variable.

Table 1: Willingness to Pay Statistics 1

	Dependent Variable:	
	WTP	
	All (1)	Other (2)
AnIn0K	-8.980*** (-15.200, -2.750)	
AnIn25K	-8.450** (-15.000, -1.860)	-2.690 (-6.910, 1.540)
AnIn40K	-7.790** (-14.300, -1.250)	
AnIn60K	-8.550** (-15,700, -1.430)	-2.560 (-7.100, 1.990)
AnIn75K	-9.230*** (-16.100, -2.410)	
Constant	19.500*** (14.100, 24.800)	11.500*** (9.580, 13.500)
Observations	221	167
R^2	0.042	0.014
Adjusted R^2	0.019	0.002
Residual Std. Error	12.500 (df = 215)	10.500 (df = 164)
F Statistic	1.870 (df = 5; 215)	1.160 (df = 2;164)
Note: *p<0.1; **p<0.05; ***p<0.01		

Table 2: Willingness to Pay Statistics 2

	Dependent Variable:	
	WTP	
	Campus1 (1)	Campus2 (2)
Ag18	-14.800*** (-25.600, -4.050)	-12.100** (-21.300, -2.900)
Ag35	-8.700 (-26.400, 9.050)	
AnIn0K	-9.860* (-20.400, 0.644)	
AnIn40K	-12.400 (-28.600, 3.900)	
AnIn75K	-19.500** (-34.000, -4.980)	-14.400** (-28.000, -0.727)
EdSC	8.050 (-1.550, 17.700)	
Constant	28.900*** (19.400, 38.400)	23.300*** (16.000, 30.500)
Observations	54	54
R^2	0.264	0.124
Adjusted R^2	0.170	0.108
Residual Std. Error	15.800 (df = 47)	16.400 (df = 51)
F Statistic	2.810** (df = 6; 47)	4.220** (df = 2; 51)
Note: *p<0.1; **p<0.05; ***p<0.01		

The next variable may not be viable to the same bias. This variable is AnIn40K, the variable for $40-$60K income brackets, with a mean minimum depth and number of nodes very similar to AnIn0K. The p-value is higher at 0.163, removing it from the 90% confidence interval of AnIn0K, but its credibility is still attested by its much smaller p-value in comparison to every other variable.

Table 3: Variable Importance Frame

	mean_min_depth	no_of_nodes	times_a_root	p_value
AnIn0K	1.30	402	142	0.103
AnIn25K	1.99	356	61	0.916
AnIn40K	1.47	397	99	0.163
AnIn60K	1.79	360	96	0.874
AnIn75K	1.63	382	102	0.450

A concern with 'All' is the potential for multicollinearity, with the only statistically significant variables being five of the dummy variables for income brackets. Selecting one income bracket would necessarily mean the omission of all others, and this presents a potential challenge. However, Table 6 shows our variance inflation factor, and it appears that this is not a problem, with scores well below the 5 point level. This may be because one of the income bracket variables, AnIn100K, the variable for $100K+, was not statistically significant.

Table 4: Variance Inflation Factor					
	AnIn0K	AnIn25K	AnIn40K	AnIn60K	AnIn75K
VIF Score	2.77	2.38	2.43	2.01	2.19

Overall, while 'All' is likely the most credible of the models we produced, it provides very little in the way of insight into predictive factors for another's contingent value willingness to pay. Potentially a future survey could have employed a much larger sample size to magnify the study and the results. We anticipate that income would still be a significant factor for preferred value, though, as is demonstrated in this example, it is difficult to predict how large this would be.

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COVID-19 and Public Transportation in Utah: Analyzing the Nexus of Virus Outbreaks, Public Policy, and Ridership

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Abstract:

Since the onset of the coronavirus pandemic in March 2020, telecommuting to avoid exposure to COVID-19 has been a luxury. This study used secondary data in an observational research design to examine how the COVID-19 pandemic crisis has impacted public transit ridership in Utah. This study examined this research question by comparing ridership numbers between 2019 and 2020, the association between ridership changes across modes and COVID-19 data, and the differences in ridership as they correspond to state and county COVID-19 policy responses. During the first few months of the crisis, ridership on Utah Transit Authority (UTA) systems declined by over 92%. At the beginning of the crisis, shutdown policies corresponded with declines in ridership, and a phasing out of restrictions corresponds with an increase in ridership. However, a state reissuance of a state of emergency in August was followed by a surge in ridership, and a drop in ridership occurred after Salt Lake County downgraded the COVID-19 threat level in September. The findings collectively indicate that other factors likely held more sway over UTA ridership than COVID-19 outbreaks or local lockdown policies.

Keywords: COVID-19, Coronavirus, Transportation, Public Transit

Introduction

The novel coronavirus fundamentally changed collective societal behaviors. While working from home was considered a luxury that only those in some fields could afford before the pandemic, it became even more significant at the advent of the crisis (Valentino-DeVries, Lu, & Dance, 2020). For those who could not work from home, transportation became an important consideration. Public transportation is critical for many people to get to work, buy groceries, go shopping, go to school, and access education when they do not have access to personal vehicles (Jansuwan, Christensen, & Chen, 2013).

In this empirical study, we seek to understand whether or not the novel coronavirus changed how people use public transportation along Utah's Wasatch Front. Our approach assessed the relationship between public transportation ridership and coronavirus prevalence through Utah Transit Authority (UTA) and Utah Department of Health data. This study is of interest to public administrators because of its potential implications for policy formulation and implementation, especially as it pertains to public transportation during a public health crisis.

Literature Review

At the beginning of 2020, COVID-19 spread globally from its first outbreak in China, negatively impacting economies worldwide. The rapid spread of the coronavirus has largely been attributed to the globalization and hypermobility of the modern lifestyle (Tirachini & Cats, 2020). Pandemics are public health, socio-economic, and political concerns (Chakraborty & Maity, 2020). Nearly nine out of ten American adults said that the coronavirus outbreak impacts their personal lives, and 44% of those adults say that their life changed in a major way (Pew Research Center, 2020). People changed their behavior by reducing their out-of-home

activities by more than 50% during the pandemic (Fatmi, 2020). Utah's 2020 public transit ridership trends are lower than normal, and the extant literature suggests this is because of fear of exposure to the virus (Reed, 2020).

Before the pandemic, the motivation behind taking public transportation was thought to be two-fold: self-interest and eco-friendliness. Hoang-Tung, Kojima, and Kubota report that while both are important, self-interest was the driving concern (2015). This distinction is important especially in the face of a pandemic, as those with alternative transportation options may avoid the perceived health risk of taking transportation despite the desire to be eco-friendly.

The pandemic exacerbated existing demographic trends in public transit use. Different types of transit attract people of different socio-economic statuses. Research suggests that those who take the rail tend to be similar in wealth to private vehicle owners, while bus patrons have far lower incomes, with the income gap growing over time (Taylor & Morris, 2014). A local study that interviewed 218 northern Utah public transit users showed similar trends, with roughly two in three (68%) respondents earning less than $15,000 per year (Jansuwan, 2013). Unsurprisingly, as the coronavirus spread, differences in mobility adaptations have emerged between people of different resource levels: people in the top decile of wealth reduced their mobility up to twice as much as those in the bottom decile (Fraiberger, et. al., 2020). Many lower-income individuals are reliant upon friends and family for access to flexible modes of transportation (e.g. automobiles), which puts them at a disadvantage when other modes of transportation are reduced. Limited transportation options isolate the poor from government services and programs designed to lift them out of poverty (Jansuwan, Christensen, & Chen, 2013).

National public transit trends show notable ridership declines as people choose to stay home or use other transportation methods. Transit agencies across the country saw dramatic drops in ridership including an 88% loss of ridership for New Jersey Transit, a loss of 60% of subway ridership in New York's Metropolitan Transportation Authority, a 60% loss for Denver's Regional Transportation District, and a 90% loss for the Bay Area Rapid Transit in San Francisco (Mallet, 2020). In this study, we seek to understand how public transportation ridership in and around Salt Lake City, Utah, has been impacted during the COVID-19 pandemic.

Research Design

We use secondary data in an observational research design to examine how the COVID-19 pandemic may have impacted public transit ridership in Utah. We used statewide data from the UTA that covers 2016 to 2020 and overall coronavirus infection rates/ positivity data from the Utah Department of Health. Additionally, by choosing five critical policy decisions relating to COVID-19 (such as state of emergency orders and county-level phasing restrictions) and comparing the average ridership the week prior to and after the policy change, we examine the relationship between ridership and COVID-19 policies. Although the data do not allow us to examine which populations' ridership has been most affected by the downturn, we separate ridership data by transit mode to make inferences about which riders the pandemic most impacted. We summarized our descriptive analysis findings in a series of figures and tables in the following section.

Findings

This study aims to understand how the COVID-19 pandemic crisis and policy responses may have impacted how people use public transportation along Utah's Wasatch Front. We examine the question by first comparing daily ridership (total riders in Utah on selected transportation modes) numbers between 2019-2020. We then examine the association between ridership changes and COVID-19 data. Finally, we examine differences in ridership as they correspond to state and county COVID-19 policy responses.

Before presenting the findings of the aforementioned analyses, we present descriptive data of how UTA ridership has changed since the beginning of the year. Figure 1 shows this ridership by mode. All bus ridership data is presented in aggregate, alongside FrontRunner (a commuter train that connects Salt Lake City with surrounding municipalities) and TRAX (a light rail system primarily within Salt Lake City). As seen in the figure, there is a massive downturn in ridership across all modes beginning in March, which begins a slow but steady recovery from May through September.

Figure 1: 2020 UTA Ridership by Mode

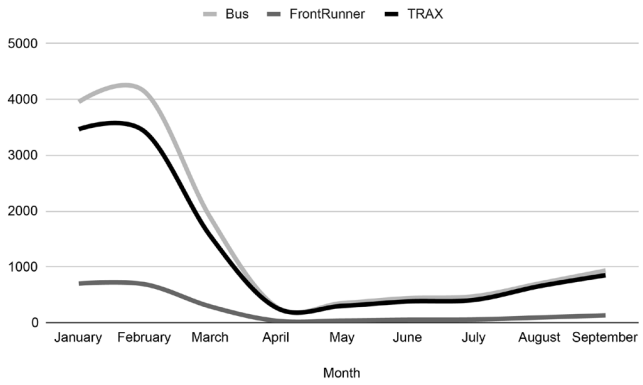
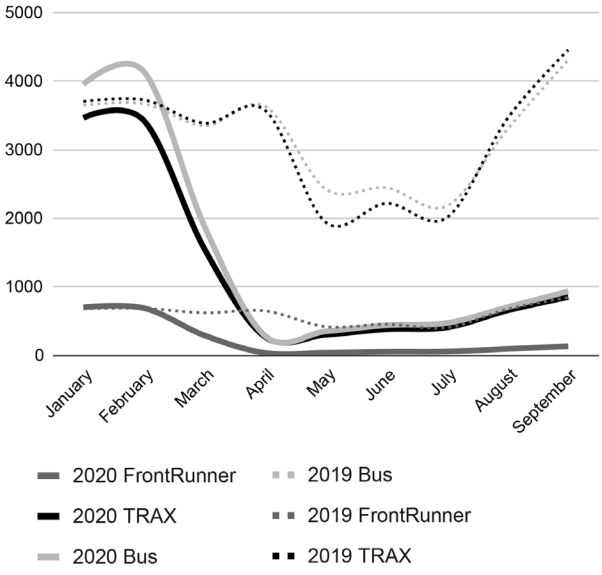


Figure 2 shows the same data but compares it with 2019 ridership data by mode. The figure illustrates a likely annual trend of ridership dipping in summer months and an incline in ridership towards the end of the summer and early fall. It is worth noting that, while not depicted, the trend holds up across all four years of ridership data that we analyzed.

Figure 2: UTA Ridership by Mode, 2019 and 2020



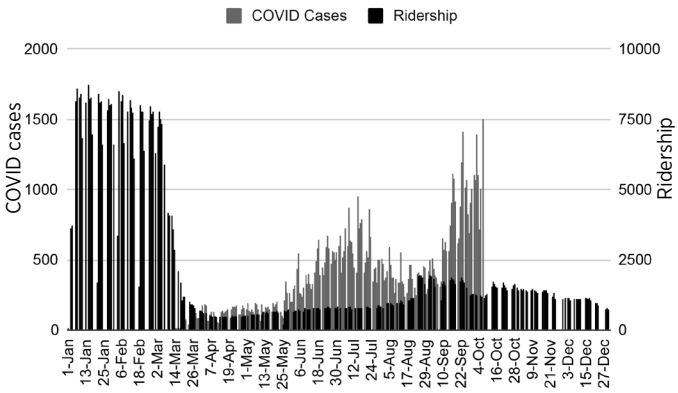
We next move from illustrative figures to basic descriptive analyses of comparative ridership data. The findings in Table 1 present the scale of the 2020 drop in ridership by mode in comparison with the prior year. Not only did bus ridership not dip as low as FrontRunner, but it also recovered at a much faster rate. By July, bus ridership had bounced back to 21% of the prior year's ridership, while FrontRunner recovered to just 14% over the same period.

Table 1: Percent change in UTA ridership in 2020 from the same month in 2019, by Mode

	Buses	FrontRunner (commuter rail)	TRAX (light rail)
January	+8%	+3%	-6%
February	+13%	-1%	-8%
March	-46%	-54%	-54%
April	-92%	-95%	-93%
May	-86%	-91%	-85%
June	-82%	-89%	-83%
July	-79%	-86%	-79%
August	-78%	-86%	-81%
September	-78%	-85%	-81%

To examine a possible relationship between COVID-19 prevalence in Utah and UTA ridership, we plot the two on a dual-axis graph, as displayed in Figure 3. After the initial dip at the onset of COVID-19 in March, ridership slowly increased throughout the year, with a notable spike beginning in August. The trend in COVID-19, in contrast, shows a "wave" of positive cases in June and July, followed by a possible second wave (comprised of multiple spikes) which began in early September.

Figure 3: Utah COVID-19 Cases and 2020 UTA Ridership



To further examine the relationship, we ran a Pearson's R correlation test as a measure of linear association. The correlation coefficient between COVID-19 data and ridership numbers was 0.3 and 0.7, depending on whether positivity rate or case count (respectively) was used in the analysis. The findings indicate a moderate-to-strong, positive bi-variate relationship between COVID-19 testing/incidence and UTA ridership (Johnson, 2015). Importantly, we suspect the relationship between COVID-19 incidence and ridership is more complicated than the findings seem to indicate, as at least one-third variable—the passage of time and the lockdown fatigue associated with it—likely accounts for much of the positive relationship(s), as discussed further below.

Tables 2 and 3 show the relationship between state and county COVID-19-related policy changes and UTA ridership. The findings indicate there may be an association between policies and ridership changes, particularly in the first three months of the COVID-19 crisis. As one might expect, the first two shutdown policies correspond with steep declines in ridership (this was particularly the case when we used the two-week window that is shown in Table 3), and a phasing out of restrictions corresponds with an increase in ridership. However, as Table 2 shows, ridership data one week before/after the policy change shows a more mixed result than Table 3. A state reissuance of a state of emergency in August was (counterintuitively) followed by a surge in ridership, and a drop in ridership occurred after Salt Lake County downgraded the COVID-19 threat level in September.

Table 2: Change in average ridership in the week before and after policy changes

Policy	Date	Jurisdiction	Average Ridership Change One Week Before/After
State of Emergency declared	6-Mar	State	(-56%)
Stay-at-home order declared	27-Mar	State	(-48%)
Restrictions begin phasing out for most businesses	1-May	State and County	(+20%)
State of emergency reissued	21-Aug	State	(+74%)
Salt Lake County moves from orange to yellow	4-Sep	County	(-10%)

Table 3: Change in average ridership in a two-week window before and after policy changes

Policy	Date	Jurisdiction	Average Ridership Change Two Weeks Before/After
State of Emergency declared	6-Mar	State	(-70%)
Stay-at-home order declared	27-Mar	State	(-75%)
Restrictions begin phasing out for most businesses	1-May	State and County	(+23%)
State of emergency reissued	21-Aug	State	(+74%)
Salt Lake County moves from orange to yellow	4-Sep	County	(+5%)

Discussion

Lifestyle and habit changes caused by the coronavirus crisis seem to be reflected in the number of people riding public transportation across municipalities, the country, and the globe. With the onset of the Coronavirus, there were dramatic drops in public transportation ridership numbers internationally – and we show a similar trend in Utah (Mallet, 2020). Corresponding with the onset of Utah COVID-19 cases in March, UTA ridership decreased markedly. While Utah generally sees a downward trend of ridership in the summer – which we postulate is due to a lack of school attendance – the March 2020 fall in ridership is earlier, sharper, and more prolonged than in prior years.

Data from prior years indicates that UTA ridership tends to exhibit an upswing around the end of summer or the beginning of fall. We did not expect this in 2020, as the time frame corresponded with a dramatic increase in COVID-19 cases. Our expectation was wrong, and instead, our findings indicate a positive correlation between COVID-19 incidence data and late-summer UTA ridership. We suspect the unanticipated finding may be partially explained by the usual uptick in ridership exhibited when school starts along the Wasatch Front. A second, perhaps complementary, explanation occurs to us: it could be that unemployment services are a possible cause of increased ridership. More specifically, the federal Coronavirus Aid, Relief, and Economic Security (CARES) Act's expanded unemployment benefits ended around the same time that we see a 2020 ridership increase. It is possible that the end of expanded benefits forced some people back out to public transit to get to and from their workplace (Smith, 2020).

Our findings shed light on the relationship between state and local COVID-19 mandates and UTA ridership. We were surprised to find that while ridership went down with the initial three months of policies, there was a counterintuitive surge of ridership despite a state of emergency issued in August. Similarly, we witness a counterintuitive decrease in ridership after Salt Lake County downgraded their threat level. Collectively, the findings indicate that other factors – such as school operations, individuals specific employment situations, and factors associated with the passage of time (e.g. "lockdown fatigue") – likely hold greater sway over UTA ridership than state and county COVID-19 policies.

Finally, when considering ridership changes across different public transportation modes, we find ourselves referring back to Taylor and Morris's 2014 study regarding who rides what types of public transportation. Their study, if generalized, would suggest that people who ride the FrontRunner commuter train are likely wealthier than other transit users. This might help explain why FrontRunner ridership numbers have not recovered at the same rate as those of UTA buses or TRAX light rail. It is possible that people who rely on buses or the TRAX system have (1) either had to return to work at a greater rate than FrontRunner riders, or (2) lack alternatives to public transit that are available to FrontRunner riders – e.g private vehicles.

A limitation of this study is that we cannot definitively identify what factors lead to the ridership increase. Another limitation of this study is that the dataset we used does not include ridership by stop, so we are unable to tell which places saw the steepest declines in ridership.

Conclusion

Our aim in this study was to understand how use of public transportation along Utah's Wasatch Front changed during the novel coronavirus pandemic. Our descriptive analysis indicates a steep downturn in ridership in the early months of the crisis, and that the decline in ridership differed by mode of transportation. We used UTA data on ridership and Utah Department of Health data on COVID-19 cases to explore the relationship between COVID-19 prevalence and ridership

changes. We found that ridership recovered a portion of the losses, despite rising COVID-19 cases and positive test rates.

We further found that state and county policy responses to COVID-19 likely affected UTA ridership – but that effect appeared to fade after the first few months of the pandemic. During the late summer and fall, policy changes may have had the opposite effect of what was intended. For example, the week after Governor Herbert reissued a State of Emergency in August, public transit ridership increased by 74%. We posit two possible reasons for the increase: 1.) some people may have had to return to work (possibly due to the end of CARES Act benefits), and 2.) the increase coincides with a standard ridership uptick as school starts along the Wasatch Front. Finally, we highlighted that bus ridership didn't bottom out as hard at the onset of the pandemic – and recovered more quickly – than FrontRunner commuter train ridership. The findings align with existing literature, which suggests FrontRunner riders are more likely to be wealthier, white-collar workers (Taylor & Morris, 2014).

Our findings could help public administrators understand the downturn in ridership and relationships between public health indicators in a crisis, public policy responses, and public transportation demand. Future avenues of research could shed more light on which areas along the Wasatch Front have been most impacted, when, and why. By using ridership data that includes data by stop or region, new research could examine in greater depth for whom ridership has changed the most since the onset of the COVID-19 crisis.

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The Justification of Nonprofit Hospitals' Tax Exemption Through Community Benefit

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For decades, nonprofit hospitals in the United States have been given a tax exemption from the Internal Revenue Service (IRS) while their for-profit counterparts have not. The assumption supporting this exemption implies that nonprofit hospitals are more charitable and benefit the community to a greater extent than for-profit hospitals. However, more recently this tax exemption has come under increased scrutiny as many people question the idea that nonprofit hospitals do more for their communities than for-profits. There is a lack of empirical evidence that nonprofit hospitals benefit communities through uncompensated or charitable medical care more than other hospitals. In response to this controversy, the IRS has required hospitals since 2012 to file an analysis of the needs of the community and a plan to implement solutions. A lack of federal accountability requiring hospitals to report results leads to a shortage of data available on the outcomes of these reports. Though this lack of data inhibits studies on the overall impact of the reports across the nation, there are reports demonstrating promising impact at the individual hospital level. Important indirect effects of the tax exemption on society exist as well, such as collaboration with public health departments and incentives to maintain important clinical services. This article seeks to add to the conversation on whether the nonprofit hospital tax exemption is justified. It analyzes the tax exemption and peer-reviewed studies regarding hospital charity care. Other factors are considered that impact community benefit, including analyses of community needs and financial incentives to provide less lucrative clinical services.

Keywords: Hospital, Tax Exemption, Nonprofit, Healthcare, Community Benefit

Introduction

In 2010, the Illinois Supreme Court ruled that Provena Medical Center, a nonprofit hospital in Urbana County, Illinois, did not provide enough benefit to the community to justify a property tax exemption (State of Illinois Supreme Court, 2010). The ruling was based on the finding that the value of the hospital's tax exemption was $268,276 more than the value of the charity care provided by the hospital to the community. More recently in 2017, the Internal Revenue Service (IRS) revoked the tax exemption of an undisclosed nonprofit hospital. The IRS cited the hospital's inability to prove significant community benefit to justify the exemption (Ellison, 2017). These two incidents are reflective of the controversy prevalent in the last few decades regarding nonprofit hospital tax exemptions. Many question whether nonprofit hospitals provide enough additional benefit to their communities compared to for-profits to justify a tax exemption.

Of the more than 6,000 hospitals in the nation, 62% of them are listed as nonprofit (Cheney, 2017). Despite the nonprofit title, many of these institutions report large sums of profit. These profits, representing the financial sum generated when revenues exceed business expenses, are used differently between nonprofit and for-profit hospitals. For-profit hospitals issue returns to investors. Their nonprofit counterparts instead reinvest the excess returns back into hospital operations, often used for expansions and improvements. The other difference between the types of ownership is that for-profit hospitals pay property, income, and sales taxes. All nonprofit hospitals have a tax exemption from the IRS, and do not pay these taxes. Both designations of hospitals serve the healthcare needs of their communities, participate in medical research, and provide teaching opportunities for medical students and professionals. Both must provide charity care, or treatment subsidized for those in need. Both designations are legally obligated to provide the same standard of care and aim for the same quality outcomes defined by the federal government

(Centers for Medicare and Medicaid Services, 2020).

As healthcare costs have exploded, causing hospital profitability to skyrocket, questions have arisen regarding the responsibilities of hospitals. Are they responsible to provide solutions to the public health issues in their communities? Should they be required to commit resources to impactful programs and outreach? Many argue that if nonprofit hospitals cannot demonstrate that the good they do for society is sufficient to warrant special tax considerations from the IRS through uncompensated care, social benefit programs, and an alignment of financial incentives with the community, the tax exemption should not be justified.

This paper seeks to add to this conversation on the exemption's justification. It is common to use the financial metric of charity care to demonstrate the level of community benefit provided by a hospital. This paper analyzes the current research on charity care and introduces additional points of community benefit such as Community Health Needs Assessments and financial incentive alignment. These points are important considerations when determining if the exemption is justified. The paper also suggests possible legislative actions that would strengthen the justification of the exemption. The paper adds to this discussion through the following sections: necessary background on the exemption, current relevant research, a discussion on hospital reports addressing community needs, and the exemption's positive impact of financial incentive alignment.

The Pathway to Today's Tax Exemption

In 1956, the United States Internal Revenue Service (IRS) issued Revenue Ruling 56-185 allowing hospitals specifically to be exempt from income and property taxes (Masseo, 2019). These original IRS regulations exempted hospitals for reasons not related to the medical care given, but to the affiliation of hospitals with religious institutions, despite the regulations being unrelated to those governing religious institutions. Still today, many hospitals continue the tradition of this affiliation through religious names and benefactors. Even though the majority of hospitals are now run as businesses, compared to the early 20th century centers for the needy, their tax-exempt status remains. The IRS continues to uphold the exemption as long as hospitals claim an otherwise defined charitable purpose.

According to the IRS, a tax exemption is given to nonprofit entities that are charitable in purpose and comply with guidelines in section 501(c)(3). The term charitable is defined by the IRS as:

> "Including relief of the poor, the distressed, or the underprivileged; advancement of religion; advancement of education or science; erecting or maintaining public buildings, monuments, or works; lessening the burdens of government; lessening neighborhood tensions; eliminating prejudice and discrimination; defending human and civil rights secured by law; and combating community deterioration and juvenile delinquency (Internal Revenue Service, 2021)."

Though many organizations do charitable work or have a positive impact on society, the tax exemption comes when the hospital is organized with a charitable purpose. The IRS has specified that this purpose for hospitals should be to promote health within the community in order to justify the tax exemption (Internal Revenue Service, 2020). Many raise concerns that nonprofit hospitals do not promote community health to a greater extent than nonprofits, yet are rewarded with a tax exemption. Others point to community benefit activities as a justification for the exemption.

Over the past century, the IRS has begun to introduce regulatory language to allow for more profitable practices in nonprofit hospitals while still holding the exemption. The 1956 Revenue Ruling 56-185 requiring hospitals to offer care to everyone was replaced by Ruling 69-545 in 1969 that permitted some restriction of care based on ability to pay and insurance coverage. This protects hospitals that do not provide complete care to those without health insurance. In 1971, Marilyn G. Rose wrote in the Catholic University Law Review that "most importantly, this tax policy [Revenue Ruling 69-545] operates as unwise health policy by perpetuating and enlarging the gulf between the health care available to the rich and that available to the poor," (Masseo, 2019). In 1983, Revenue Ruling 83-157 was passed, allowing states to discontinue emergency services in select hospitals, further allowing for low-income and uninsured patients to be denied care. One by one, these three revenue rulings allowed for hospitals to pull away from the previous expectation of caring for everyone to becoming payment-oriented and profitable organizations.

Currently, some of the most profitable hospitals in the nation are nonprofit, despite their charitable purpose, and they receive extremely large tax exemptions. A Health Affairs study found that seven of the ten most profitable hospitals are listed as nonprofit. Nonprofit hospital Gundersen Lutheran in La Crosse, Wisconsin posted profits of over $300 million in 2016, listed as the most profitable United States hospital (Lee, 2016). Gunderson Lutheran's profit margin, the percent of revenue that remains as profits, has risen dramatically from 6.1% in 2014 to over 30% in 2018 (Torch Insight, n.d.). This is well above the average margin of 8%, meaning that this nonprofit hospital is much more profitable than average, despite the nonprofit designation (Belk, 2018). This hospital,

though not representative of all nonprofit hospitals in the United States, is an example of how nonprofit status does not inhibit a hospital from making large sums of profit. The ability of nonprofit hospitals to make profits is not necessarily negative. It does, however, demonstrate further that nonprofit hospitals are not significantly different than for-profit hospitals. Additionally, this level of profitability indicates that nonprofit hospitals have the financial ability to invest more into their communities, spending more money on community benefit activities.

The exemption is a significant issue for hospitals, governments, and other stakeholders, as its value has been estimated at over $11 million per hospital on average. These large sums are a major source of potential revenue for federal and state governments, and of current savings to healthcare administrators. The tax exemption in the United States has been valued at over $24 billion annually (Bruch, Bellamy, 2020). Many believe that this exemption is too large to not require a strong justification of significant community benefit.

Community Benefit

One metric used to determine the level of community benefit provided is charity care. Charity care is an expense that occurs when a patient is underinsured and has no means to pay for necessary treatments. In 2019 alone, hospitals in the United States reported $41.6 billion in charity care (American Hospital Association, 2021). The institutions are not compensated for this treatment but are incentivized to provide it to prove a community benefit. At times, this value may be inflated when bad debt, an expense occurring when hospitals expect a payment that never comes, is included. Both nonprofit and for-profit hospitals provide this charity care.

An argument pushing for the removal of the exemption is the lack of differentiation in charitable medical services. Charity care, or uncompensated care, does not differ significantly between nonprofit and for-profit hospitals. In 2018, nonprofit hospitals spent on average 2.95% of their total expenses on charity care, compared to 2.62% of for-profit hospitals' total expenses. However, this difference is not statistically significant. It is important to note that charity care varies by institution and geography (Bruch, Bellamy, 2020).

A gap of over $800 million exists between the value of the tax exemption and the value of charity care provided by private, nonprofit hospitals. Most hospitals actually provide a level of charity care beneath the level of the tax exemption. This held true even when 50% of the hospital's bad debt was included in the charity care value in a 2002 study. However, this gap is not consistent across all communities. In areas with lower incomes and greater poverty rates, hospitals provided more charitable care than the tax exemption. The opposite is true of hospitals in wealthy areas that provide much less charity care than their tax exemption (Kane, Wubbenhorst, 2002).

Researchers have also quantified the efforts made by nonprofit hospitals in their communities, including hospital services, access to emergency care, involvement in health professionals' education, and price discounts, among other measures. They found that there is about a 20% deficit in community benefits by nonprofit hospitals compared to the value of the tax exemption. Even in hospitals displaying a larger contribution of uncompensated care, it is often apparent after a deeper inspection that the prices or services provided are exorbitantly marked up, making the dollar amount of uncompensated care inflated. They state that without more regulation, nonprofit hospitals will continue to fall short in helping their communities enough to justify a tax exemption (Nicholson et al, 2000).

These studies conclude that nonprofit hospitals are not supplying enough charity care to their communities to match the value of the tax exemption. Though several of these studies were conducted before the Affordable Care Act was passed, adding more requirements for these hospitals, it can be reasonably assumed that the general conclusions still stand as more recent studies align with their findings. These findings present a barrier to nonprofit hospitals justifying their tax exemption based solely on their level of charity care. However, proponents of the tax exemption point out that charity care is not the only means by which nonprofit hospitals serve their communities.

To further regulate the social good done by nonprofit hospitals, the IRS began looking at "community benefit activities." In 2009, an IRS report found "considerable diversity" in hospitals' definition of these activities (Rosenbaum, Margulies, 2011). These benefit activities ranged from a select few pro bono cases to, in some cases, significant effort on the part of the hospital to do good. The disparity between these activities led to the push of section 501(r) in the Affordable Care Act in 2010 in order to create a standard for nonprofit community benefit activities. This section required hospitals filing for nonprofit status to present a Community Health Needs Assessment, or CHNA, every 3 years (American Lung Association, 2020).

A CHNA evaluates specific needs of a community and then holds hospitals accountable for acting on them. The hospital must describe what resources they will allocate to resolve the issue. Failure to file a CHNA will result in a nonprofit hospital losing its tax-exempt status. The Affordable Care Act's new requirements aimed to standardize the contributions that hospitals make to society and pushed for larger community

benefit. However, objections remain regarding the level of accountability in implementing these benefit activities.

Since the Affordable Care Act was passed and hospitals are required to report Community Health Needs Assessments, the definition of community benefit has broadened. The goals of nonprofit hospitals have become more aligned with the goals of the community, as they are expected to involve community members and leaders in the process of identifying issues to be addressed. These community members are then brought back to reevaluate the progress made. These steps are important progressions in incentivizing hospitals to contribute to society more than an average amount of uncompensated care. This incentive alignment is thought to be important as "even a small shift in focus by hospitals towards prevention and health promotion has the potential to improve population health and reduce healthcare demand" in a hospital's community (Graham, 2016).

As hospitals are required to report how they plan to benefit a community, many proposed solutions have been highlighted in the most recent reports for Utah nonprofit hospitals from 2018 and 2019. Intermountain Healthcare at LDS Hospital in Salt Lake City identified air pollution as an emerging health issue, with less than 50% of days in Salt Lake County qualifying as "good" air quality. Their report discusses how poor air quality affects the mental health of residents and how the health system plans to work with government officials on the issue (Intermountain Healthcare, 2019). Shriners Hospital for Children in Salt Lake City identified pediatric mental health as a priority for the hospital and is planning to organize efforts to reduce bullying in this age group (Shriners Hospital, 2018). University of Utah Health highlights that the state is ranked #15 in the nation for opioid prescribing, and therefore is focusing on reducing substance abuse (University of Utah Health, 2018). These initiatives are detailed in each hospital's Community Health Needs Assessment and Implementation Plans as a direct result of section 501(r) which requires these reports to be completed every three years. The requirement of community benefit activities has pushed these healthcare systems to address the issues of air quality, mental health, and substance abuse. Programs such as these are implemented by hospitals across the United States and the tax exemption provides incentives for these impactful programs to continue.

Opponents point out that there currently is no standardized process through which CHNA's impact is measured. They assert that hospitals inventory issues every three years and create an annual implementation plan to enact changes, but there is little incentive to follow through on these plans. The IRS does not require any follow-up documentation and does not investigate the results of these CHNAs. Though three-year CHNAs must be publicly available, the implementation plans are not, decreasing transparency (Healthcare Value Hub, 2016). This lack of accountability prevents community members from evaluating whether these CHNAs in fact do benefit the communities that hospitals serve.

However, there are hospitals that do demonstrate their community benefit by evaluating CHNA outcomes despite the lack of federal follow-up. Intermountain Healthcare has included in their statewide reports an evaluation of the impact made by the previous CHNA. The 2016 CHNAs identified prevention of chronic disease as a needed focus in the community. The 2019 report follows up on the actions taken in the past three years to address this need, including the establishment of a Diabetes Operations Council to align diabetes prevention efforts across the health system (Intermountain Healthcare, 2019). Shriner's Hospital detailed its efforts to increase access to specialists in underserved regions. Since 2015, hospital representatives have attended job fairs in rural areas, encouraging students to study in the medical profession in hopes that they stay in the region to serve the communities (Shriners Hospital, 2018). Other hospitals, such as University of Utah Health, do not directly include an evaluation of impact in their CHNAs, but an analysis may have been conducted privately.

A study by Carlton and Singh (2018) analyzed the ancillary impacts of Community Health Needs Assessments soon after they became broadly implemented. They found that the CHNAs had a positive impact on the communities by increasing collaboration between hospitals and local health departments. When a hospital conducts a CHNA once every three years, it evaluates the broad issues within the community. This is often done with the assistance of a health department. This collaboration between the entities was found to increase investments in the community by the hospital. This increased investment has the potential to increase impact as well as call attention to the issues and efforts being made to resolve them.

In the issue of the tax exemption justification, it is important that hospitals' CHNA reports do have an impact on the community. The reports are a significant step towards elevating the community benefit provided by hospitals to a level equal to or higher than the value of the tax exemption. Currently, though hospitals are required to file these reports, they are not required to demonstrate significant results from the reports. Legislators should consider implementing policies that create more accountability at the hospital level. This paper has highlighted several nonprofit hospitals in the state of Utah that have worked to provide results of their community benefit activities in their CHNAs. Many other hospitals across the country have made similar efforts. If there were policies in place across the United States that required all nonprofit hospitals to demonstrate results in a way comparable to these hospitals, the argument that the exemption is justified would be strengthened.

Indirect Impacts of the Tax Exemption

There are positive indirect impacts of the exemption on society as well, due to improved incentive alignment. When for-profit hospitals face pressure from shareholders to increase profitability, they often eliminate important, yet less profitable, clinical services or departments. Because of the tax-exempt status of nonprofit hospitals, healthcare administrators face less of a financial pressure to eliminate these services. The medical journal "Health Affairs" explains the following:

> "The bad news for health policymakers is that the cuts [conducted by for-profit hospitals] raise difficult issues about access to healthcare services for the poor, as well as growth of costly high-margin services that may be unneeded… programs that deal with poor, difficult, complicated people, and illness are at risk." (Mcleod, 2012).

Hospitals across the nation have often decreased access to needs in times of financial downturn. A survey of more than 1,000 hospital executives by the American Hospital Association found that in times of economic trouble, 20% of hospitals reduced services that lost money, including behavioral health, post-acute care, and patient education services (Evans, 2012). These unprofitable services are replaced by neurosurgery, plastic surgery, and interventional cardiology suites. These more profitable services may help some patients, but issues arise when a community is lacking access to mental health clinics or other less profitable practices. In 2012, Los Angeles hospital Cedars-Sinai Medical Center reevaluated its resources and over the next few years phased out its psychiatry services (Evans, 2012). The released statement preceding the move suggested that the psychiatry practice was draining the hospital resources, implying that other more profitable services would be considered. If the tax exemption is revoked, hospitals will face increased financial pressure and there may be even more cases like the one in Los Angeles.

Legislators may further protect communities from these service reductions through increased financial incentives. If hospitals providing these less profitable, necessary services are given heavier tax exemptions than those that do not, there may be fewer hospitals choosing to cut services. This would ensure that communities have the care they need, such as behavioral health or post-acute treatment. Regardless, it is likely that the current tax exemption is protecting communities across the United States to some extent from a loss of important clinical services.

Conclusion

With large sums of profit at stake, parties in both government and hospital administration are incentivized to address the issue of the tax exemption justification. Community Health Needs Assessments work as a demonstration of efforts made by hospitals to benefit their communities over the coming years. Though there is a lack of accountability at the national level, there are some reports at the individual hospital level of demonstrated impact. Legislators could implement policies that standardize this impact, requiring hospitals across the country to demonstrate the results of their efforts to resolve the issues reported in the CHNAs. These results, along with reduced financial incentives to eliminate less profitable services, strengthen the justification of the tax exemption. This justification is a complex issue, and more research is required to understand the full extent of the tax exemption justification. If policies are put in place requiring hospitals to evaluate the results of their CHNAs and further incentivizing hospitals to provide needed services, this justification would be strengthened. The value of the exemption should be compared to both charity care, indirect impacts of the exemption, and the value of these CHNA results. Analyzing all benefits of the exemption, not only the charity care provided, is promising for the future of the nonprofit hospital tax exemption.

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The Green Bond Revolution: Is It Sustainable?

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Green bonds, innovative financial instruments that have entered the bond market in recent years, sparked a revolution for activists, investors, and issuers with their use of proceeds models. I examine the success of corporate green bonds through historical research, investigation of the certification process, and quantitative analysis of pollution and ESG (environmental, social, & governance) data. My research concludes that green bonds do influence pollution released and ESG scores for participating companies and that ultimately, the growth, impact, and success of green bonds are sustainable. Green bonds have experienced rapid progress in their short lifetime, and due to the robust market certification process, ambitious market standards, and commitment to green projects; these bonds will continue to experience noteworthy acceleration in the market that will inspire similar socially-conscious labeled bonds to succeed in the future.

Keywords: Green Bonds, Social Bonds, Bond Certification, Sustainability, Finance, Bond Market

Introduction

As the world becomes increasingly aware of looming environmental deterioration and climate change, corporations and municipalities are turning to a recent innovation in the bond market: green bonds. A bond is a financial instrument that consists of a loan of money from an investor to a borrower (usually municipal or corporate) that pays the investor a fixed rate of return throughout a defined window of time. A green bond (also commonly referred to as a climate bond) is a "use of proceeds" or asset-linked bond that has the same credit profile as any other plain-vanilla bond[1], but discloses to the investor that proceeds of the bond are used to finance a "green" project. These green bonds sparked a so-called revolution in the bond market due to their innovative model of project transparency that is accelerating towards a future in which investors may be able to rely on this format of investing to better understand where their money is allocated (CBI, 2019).

Corporations are a major contributor to the global climate change crisis. According to a recent report from the Carbon Majors Database, 71% of all industrial emissions since human-driven climate change was recognized have come from a group of 100 energy companies. A study by Ceres, a sustainability nonprofit organization that works with investors and companies to combat pollution and climate change, reveals that the top 15 U.S. food and beverage

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1 A plain-vanilla bond is a bond in its most basic form, without any added features or options.

companies generate nearly 630 million metric tons of greenhouse gasses (GHG) every year—more than the yearly GHG emissions of the entire continent of Australia (Axelrod, 2019). Understanding corporate efforts to reduce pollution and invest in green projects is timely and central to finding a global solution. I argue that green bonds are contributing to solving this issue and transitioning society towards a future in which corporations effectively mitigate global pollution and climate change. For green bonds to continue revolutionizing the bond market and sustain their evident success, it is critical to understand what they are, how they are certified, and how they are actually impacting the environment. The green bond market has experienced significant success in recent years. Morgan Stanley refers to this momentum as the "green bond boom" which is not just a fad, but a "market that is sustainable in every sense of the word" (Morgan Stanley, 2017). This paper aims to investigate whether or not green bonds are sustainable environmentally, ethically, and financially.

In this paper, I examine green bonds first by exploring the history and relevant information regarding the bonds and how they are growing in the market. Next, I examine the certification process of green bonds to better understand the current methodology using interviews with industry experts. I then observe how green bonds are impacting the environment post-issuance through quantitative analysis of data on companies from the Bloomberg Terminal, pollution data, and ESG score data. Finally, drawing from my analysis, I conclude that green bonds are making a significant environmental impact, and I explore the exciting possibilities that similar revolutionary bond market tools can potentially have in the future.

Green Bonds - What Are They?

A corporate green bond works in the following manner: a corporation issues a green bond much like any other plain-vanilla bond to raise capital to finance a particular project. The issuer typically gets certified through an external entity that can confirm the bond's green commitments and provide assurance to investors that the bond is a verified green investment. Once issued, the bond's proceeds are earmarked (set aside for a specific purpose) for funding projects that work to improve the environment such as reducing CO2 emissions or water pollution for the company for example, but the bonds are also backed by the issuer's entire balance sheet (Tang & Zhang, 2018). As time goes on, investors receive returns on their investment in the bond (known as the bond yield) as the issuer slowly pays back the principal bond amount and interest payments (known as coupons) throughout time until the maturity date.

Since the green bond market was born in 2007, its rapid growth of >50% compound annual growth rate (CAGR) proves a significant and recent shift in how investors think about their fixed-income security investments. Though there are several types of issuers of these innovative bonds, I focus this paper primarily on corporate green bonds and how their path to success has impacted the green bond market.

In 2007 and 2008, the first green bonds were issued by the European Investment Bank (EIB) and the World Bank, both AAA-rated institutions (CBI, 2019). Since these first green bond issuances, the green bond market has exploded and accumulated the attention of investors, activists, and corporations (Reichelt, 2018). The green bond market spiked in 2014 when a record-setting USD37bn was issued globally (CBI, 2019). Since then, the market has seen consistent and record-breaking growth as investors understand the intrigue of investing in environmentally conscious projects. According to the Climate Bonds Initiative (CBI), a global organization that works to promote and certify climate bonds internationally, in 2019 the global green bond and Green Loan issuance reached an adjusted USD257.7bn, a staggering 51% increase from the 2018 ending figure of USD170.6bn (CBI, 2020).

This amassing growth in the climate bond market is expanding outside of the initial countries with the most issuances (the United States, France, and China) to other global issuers including Germany, the Netherlands, Sweden, Japan, Italy, Spain, and more. In 2019, the market saw debut green bond issuances from Panama, Greece, Ukraine, Ecuador, Russia, Barbados, Kenya, and Saudi Arabia—yet another testament to the impressive global interest in green investments (CBI, 2019). In participating countries, green bonds can be issued by corporations, banks, or municipalities. In the United States, the biggest issuer of ABS (Asset-Backed Securities) green bonds is Fannie Mae. Notable large corporate green bond issuers globally include SNCF[2], Berlin Hyp, Apple, Engie, ICBC[3], and Credit Agricole (CBI, 2019).

The noteworthy and rapid success of green bonds in international markets in recent years alludes to a possible future of increased transparency within the bond market; however, for this growth to be sustained, and the bonds to be effective, the certification and verification process must be strong enough to support such expansion and welcome the trust of investors. Since climate bonds are so new to issuers and investors, the only path to success must include a way for the market to feel confident that labeled bonds are honest and

2 SNCF is France's national state-owned railway company.

3 ICBC is the Industrial and Commerical Bank of China

contribute to the environment in a positive way. My research finds that green bonds are, in fact, a sustainable solution and one of the most significant indicators of this is the efficacy of the certification process.

Green Bond Certification

One of the key elements of my argument that green bonds are working to impact the environment is the validity of the certification process. The certification process of green bonds is a sustainable system that will provide opportunities for growth and acceleration in the future. To best analyze the ability of green bonds to sustain their recent and rapid growth, it is critical to confront certification as an important component of their success. In order for the green bond market to continue to remain a symbol of hope that mitigating climate change on a corporate level is possible, certification must be robust, extensive, and trustworthy. The following evidence from my investigation of this procedure eliminated my doubts and questions about the reliability of green certification and strengthened my argument that green bonds are a significant and notable innovation that is environmentally and economically sustainable.

To begin my investigation into the climate bond certification process, I familiarized myself with two of the most experienced market entities when it comes to climate bond standards: The International Capital Market Association (ICMA) and the Climate Bonds Initiative (CBI). The International Capital Market Association is the world's leading association of local government professionals dedicated to creating and sustaining thriving communities. ICMA is a non-profit that provides resources, research, programs, and assistance to global communities to improve lifestyle and society (ICMA, 2020). As the social and labeled bond market began to grow, ICMA identified a need for a set of global market standards to provide guidance and expectations for such financial tools. ICMA created The Green Bond Principles (GBP), the Social Bond Principles (SBP), and the Sustainability Bond Guidelines (SBG), referred to as the "Principles" in response to the new and unique market growth. Specifically relevant to my research are the Green Bond Principles, which clearly define green bonds and give market standards for issuers to abide by (ICMA, 2020). The Green Bond Principles are not a certification scheme, but rather a broad set of market-accepted guidelines that each issuer is expected to closely follow (ICMA, 2020).

The other significant organization I focused my research on is the Climate Bonds Initiative (CBI). The Climate Bonds Initiative stands out as a global leader in green bonds research, standards, and resources. CBI is a non-profit that seeks to encourage the global climate bond market to grow via the three following workstreams: market intelligence, developing a trusted standard and providing policy models and advice. As part of the "developing a trusted standard" segment of CBI's responsibilities, the non-profit focuses heavily on green bond certification and provides extensive resources for issuers and investors including the Climate Bonds Standard, Certification Scheme, and Climate Bonds Taxonomy (See Figures 1 & 2). The Climate Bonds Standard is compiled of rigorous scientific research from industry experts and carefully considers the 2 degrees Celsius global warming limit outlined in the 2015 Paris Agreement[4](CBI, 2020).

For a green bond to get certified, through CBI's certification scheme, the issuer must go through an external party Approved Verifier (listed on CBI's website) that will perform extensive research and due diligence on the green project being proposed by the issuer (See Figure 3). There are 44 Approved Verifiers that have each been approved by the Climate Bonds Standards Board. When it is time for an issuer to select an Approved Verifier, they can select from the list based on factors like geographic area and sector criteria to find an appropriate match. Once the Approved Verifier assures that the bond is in alignment with CBI's Climate Bonds Standard, the Climate Bonds Standard Board confirms all final decisions on whether or not bonds receive the Climate Bond Certification Mark. The Climate Bonds Standard Board is composed of representatives of seven distinguished international non-profit organizations[5] who work collectively to mobilize the green bond market and promote climate investments.

Through CBI's Climate Bonds Taxonomy, there are currently eight main categories that encompass the areas in which a climate bond can be certified. These categories are energy, transport, water, buildings, land use & marine resources, industry, waste, and ICT (information & communications technology). Each category has sub-categories that have specific scientific criteria required to be

4 The Paris Agreement is an agreement with the United Nations Framework Convention on Climate Change that focuses on combating climate change and taking actions to establish a low-carbon future. The agreement's central aim is to keep this century's global temperature rise below 2 degrees Celsius. (UNFCC, 2020).

5 Non-Profit organizations represented in the Climate Bonds Standard Board are: California State Teachers Retirement System (CalSTRS), California State Treasurer Fiona Ma, CPA, Institutional Investors Group on Climate Change (IIGCC), The International Cooperative and Mutual Insurance Federation (ICMIF), Investor Group on Climate Change, Ceres Investor Network, and The Natural Resources Defense Council. (CBI, 2020)

certified. This information is laid out in detail in the taxonomy, which identifies assets and projects that are necessary to improve the environment and coincide with the goals of the COP 21 Paris Agreement and is updated regularly to contain relevant and current scientific information (CBI, 2020).

To better understand this certification scheme, I interviewed two industry experts on the green bond certification process. I reached out to CBI's head of certification, Matteo Bigoni, who spoke to me on the phone from the U.K. on July 23rd, 2020. I also spoke with Paramjot Kaur, a Senior Associate for Sustainable Finance Solutions at Sustainalytics, the leading independent global provider of ESG (environmental, social, & governance) and corporate governance research and ratings to investors, over the phone from her office in New York City on August 20th, 2020. The following section details ways in which Matteo Bigoni and Paramjot Kaur prove that the certification process of green bonds is successful, sustainable, and optimistic.

From the beginning of my conversation with Matteo Bigoni, he made a point of emphasizing that green bonds are for investors because they function as a signal to the market that the bond is a reliable "green" investment. In many ways, the green bond certification process is similar to a brand, it allows people to trust the label of a product. For example, Matteo Bigoni notes the following:

> "…think about yourself when you want to go to Whole Foods and buy organic coffee or chocolate right? You basically trust the label of, perhaps the rainforest alliance or another fair-trade labeling system because you believe that label—that there is somebody behind that label that has conducted a due diligence process for you…so you as a customer trust that the coffee is organic or that the chocolate is fair-trade. The concept is the same…so replace you as a consumer with investors and the fair-trade label with the climate bond certification label and the product itself—so the chocolate bar or the coffee—with bonds. You as an investor believe that behind the climate bond certification logo, there has been a due diligence process that somebody else has conducted for you..."

This emphasis on investor assurance is a critical part of how green bonds work. If there is no confidence that behind a CBI (or other organization) green bond certification label there is a significant and honest due diligence process, then the integrity of the bond collapses, and the market would cease to succeed. This structure, explained via Matteo Bigoni's organic grocery consumer metaphor, simplified the need for clear certification standards and validated my interest in understanding the process to acknowledge green bonds as meaningful sustainable instruments. Paramjot Kaur emphasized this concept as well, noting that generally, the green bond market is largely driven by disclosures because investors who invest in green bonds need to be confident that the project is honest and verified. These disclosures can come from different sources: disclosures directly from the issuer, disclosures from CBI if the bond is CBI certified, or disclosures from an external party verifier like Sustainalytics.

External-party Approved Verifiers, according to Matteo Bigoni, are a very important part of the certification process for several reasons. Though CBI itself works tirelessly to research, organize, publish, educate, and certify green bonds across the globe, the Approved Verifiers alleviate some of the complicated due diligence steps and liability for CBI. Keeping track of the work that these 44 Approved Verifiers do is busy, but simpler than trying to conduct all of the research and opinion-giving within CBI itself. Though the workload is substantial for CBI and the verifiers, they don't certify just any bond. The number of green bonds available for certification is limited to 12 sector criteria[6] (and soon some additional sectors that are currently being developed). For example, if an issuer wanted to certify a hydropower bond through CBI, it would not be possible because hydropower doesn't currently fall under any of the sector criteria, so it would automatically get rejected. If an issuer presents a bond to get certified and it does meet sector criteria, then the issuer would select an Approved Verifier to conduct research and provide an external party assurance report back to CBI. In Matteo Bigoni's words, CBI basically exercises an "oversight regime" on the work of verifying.

From the perspective of Paramjot Kaur as someone who works for an Approved Verifier, CBI is not the only important certifying entity in the certification process. Essentially, a green bond issuer is first expected to align with market standards, which are outlined in the Green Bond Principles. Issuers produce a framework that outlines details about the bond and how it aligns with the Green Bond Principles' four main segments: use of proceeds, project selection process, management of proceeds, and reporting. Issuer frameworks are also expected to be extremely clear on how their bond funds a "green" or "social" project. Companies like Sustainalytics who are external-party verifiers then evaluate the framework to confirm whether or not the bond aligns with market standards and the Green Bond Principles and conduct research to offer their opinion about the bond. At Sustainalytics, they refer to this verification as a "Second-Party Opinion" or "SPO."

6 Current CBI sector criteria: agriculture, bioenergy, buildings, forestry, geothermal energy, land conservation & restoration, low carbon transport, marine renewable energy, solar energy, shipping, wind energy, waste management, and water infrastructure.

Issuers can create a green bond framework and obtain an SPO from companies like Sustainalytics without getting certified through CBI. CBI provides an ambitious certification scheme that only approves bonds that fit within the 12 sector criteria. If a green bond does not fall within CBI's sector criteria, it cannot be certified, but that does not mean it is not "green." A bond that is outside of CBI's sector criteria can obtain an SPO from a verifier that still confirms its validity. If a green bond does fall within CBI's sector criteria and tries to get certified through CBI, verifiers like Sustainalytics still play a critical role in that process, providing a letter that confirms a green bond's legitimacy after detailed research and due diligence.

Many issuers decide to go with the framework/SPO method for disclosing information on their green bonds because it is less ambitious and broader than CBI. Green bonds outside of CBI's certification scope can gain verification and still succeed in the market using an SPO for their external opinion. An SPO offers investors a narrative that gives insight into what project the bond will fund. The SPO output details specifically how the bond meets the Green Bond Principles' guidelines. This report is usually available during the issuer's roadshow[7], so prospective investors have additional information to speak to the overall credibility of the labeled bond.

The role that external-party verifiers play in offering SPOs that are well-respected and thorough, yet less ambitious than CBI provides more options for issuers who would like to issue a green bond and perhaps more accessibility into the green bond market for first-time issuers unable to meet CBI's rigorous standards. Because only approximately 40-50% of green bonds seeking certification through CBI actually get certified, according to Matteo Bigoni, approved verifiers offering their own SPO processes fills an important gap to help offer issuers ways to certify a wide variety of green bonds. If a green bond certification label is issued via CBI or an approved verifier like Sustainalytics and the bond does not follow through on its obligations, there are quite serious consequences according to Matteo Bigoni and Paramjot Kaur. The bond's certification would get withdrawn or the SPO would be revoked and the verifier could get suspended from the CBI certification scheme—an immense risk for the reputation of both the issuer and the verifier. This scenario, while important because it requires issuers to follow the guidelines, is rare because most of the time the issuers can clearly follow through on their labeled bond project commitments. Paramjot Kaur emphasized that the way Sustainalytics verifies bonds is binary—there are no shades of grey when issuing their opinions, it is either credible or it is not. If a certain project is controversial or too risky, Sustainalytics simply does not issue an SPO for that bond. In some cases, if there is a project that is unique but requires deeper analysis and discussion, Sustainalytics could issue an SPO with certain limitations in the document; but overall, the process is typically straightforward and binary, and the same applies for CBI and their high standards of certification.

In Matteo Bigoni's opinion, the largest challenge facing CBI and its certification scheme is providing resources for issuers and verifiers. Though CBI currently provides thorough guides along with the taxonomy, sector criteria, Climate Bonds Standard, and overall certification scheme, he expressed a strong desire to develop the capacity to provide even more resources such as templates, calculation tools, and more detailed guides to contribute to the process as the market continues to grow. Because the climate bond market is still so new in many parts of the world, education for issuers and verifiers is imperative for sustained progress, and CBI's goals to expand resources for that purpose imply a bright future for the growth and trajectory of the certification process. As far as challenges with conducting research to produce SPOs and verifications, the biggest obstacle is market maturity. In Paramjot Kaur's experience, some bonds are much easier to review (like solar or wind projects) than others that are more innovative and obscure environmental ideas. In the case of a more difficult and innovative project, Sustainalytics' taxonomy team is required to put in extra time and effort to formulate a researched stance. As the green bond market matures, verifiers, issuers, and investors will all be more familiar with these innovative ideas after they have spent more time in the market, thus eliminating ambiguity and confusion surrounding their issuances and verifications. Additionally, the green bond market is more mature in some areas of the world than others. In Europe, for example, the market is much larger and more educated than the labeled bond market in the United States. This disparity requires time and resources devoted to market education that will be eliminated once the market is more developed and familiar with green bonds.

The success of green bonds has led to market expansion already, with budding innovations inspired by the amplitude of green bond issuances. An example of this innovation is transition bonds. Transition bonds are bonds that do not qualify as fully green bonds, yet contribute in some way to a lower-carbon future. An example of this is cars. Fossil-fuel cars do not contribute to a zero-carbon future because they emit CO2 and greenhouse gasses in general. The solution is electric cars, but the problem is that the global transition to electric cars won't happen overnight. Hybrid cars, while not fully "green" assets, will help contribute to the issue because they help mobilize the automobile industry towards adopting

7 A roadshow is a series of presentations an issuer makes to try to accumulate interest in their upcoming bond issuance.

more eco-friendly solutions like fully electric cars. Because of this, hybrid cars can be considered "transition assets" since they allow movement towards the 2050 Paris Agreement CO2 goal, and contribute to building the necessary infrastructure to fully electrify the car industry someday. As this idea is gaining traction in the market, there is a possibility that transition bonds will soon gain their own momentum and potentially have their own labeling system that differentiates them from green bonds, yet still confirms their contribution to zero-carbon goals.

Ultimately, according to Matteo Bigoni and the evidence provided by his insights, the green bond market is going to continue to thrive and experience significant growth in the future. Since he started at CBI in 2016, the volume of CBI certified bonds has increased seven-fold due to market demand. Based on the success of the Climate Bonds Standard, the European Union has adopted the TEG[8], China has created the China Green Bond Catalog, and Canada, Colombia, Brazil, Japan, and Australia are all coming up with their own green definitions, also known as taxonomies[9]. CBI, as a global entity, inspires these international taxonomies and standards, but always aims to be the most ambitious certification standard in the market. By remaining the highest standard for green bond certification, CBI attracts bonds from all over the world seeking their certification label. Since CBI operates internationally, its standards are not influenced by the political pressure of individual governments.

Similarly, my conversation with Paramjot Kaur ended on a hopeful note, as she also attested to the strength of the certification process and Sustainalytics' role in that process as an Approved Verifier. As the green bond market accelerates, more prospective issuers are noticing the clear benefits of entering the market. There is a growing appetite from investors for investing in green bonds which have created a large pool of increasingly diverse interest in the market. Additionally, many companies already have environmental policies and projects in place, so issuing a green bond is a great way to communicate that on a wider scale and attract more attention towards their long-term strategies and goals. As shown in historical data on green bonds, the market is growing on a yearly basis, and it will continue to grow rapidly each coming year with the introduction of new instruments such as Sustainability Linked Loans[10], Sustainability Linked Bonds[11], and transition bonds. Sustainalytics is already able to issue SPOs for transition bonds, a sign of their anticipation of growth in that area of the market. These combined innovations will create a more diverse group of issuers and instruments in the market that will promote and sustain growth for labeled investments.

Paramjot Kaur's reassurance that the market was strong and on an upward trajectory reinforced Matteo Bigoni's optimism from his interview. I exited both of these conversations having a renewed sense of assurance that green bonds are the beginning of an incredible future for transparent and social bonds. It is clear that currently, the issuers have straightforward and specific guidelines available for issuing climate bonds. An SPO from a verifier like Sustainalytics confirms an issuer's commitment to adhering to the Green Bond Principles' criteria after detailed due diligence and research. Certification from CBI is an additional level of labeling that is more ambitious and only applies to 12 specific sector criteria globally. There are consequences when a climate bond ceases to follow through on its commitments including loss of the SPO or certification, which incentivizes issuers and external-party verifiers to be thorough and confident that the project will positively impact the environment. There is little room for error and controversy, and as the market continues to flourish, certification and verification will become increasingly refined and well-known. The insights produced by these industry experts from a global certifying entity as well as an Approved Verifier strengthened my argument that green bonds do work and will continue to grow.

Empirical Analysis Of Green Bonds

The early success and robust certification process of green bonds both prove that there is an exciting and rapidly accelerating future for the green bond market, but it is also relevant to focus on the impact of green bonds on companies and the environment. If green bonds truly are mitigating climate change and pollution, there should be significant data showing that companies issuing green bonds are recognizing positive results. To complement my qualitative research of green bonds and certification processes, I gathered some data to numerically analyze whether or not the bonds were making

8 The TEG (Technical Expert Group on sustainable finance) is a committee mandated by the European Commission to develop recommendations for criteria for green financial investments. (TEG Report on EU Standard, 2019).

9 Matteo Bigoni defined a taxonomy as green definitions that are a categorization of green assets.

10 "Sustainability Linked Loans or ESG Linked Loans are general corporate purpose loans used to incentivize borrowers' commitment to sustainability and to support environmentally and socially sustainable economic activity and growth." (Sustainalytics, 2020)

11 "Sustainability-Linked Bonds ("SLBs") are any type of bond instrument for which the financial and/or structural characteristics can vary depending on whether the issuer achieves predefined Sustainability/ ESG objectives. (Sustainability Linked Bond Principles, 2020)

their implied impact. To begin this analysis, I first gathered a list of companies in the United States who had issued green bonds from a Bloomberg Terminal. Upon gathering this list, I compiled a list of additional company data points[12] from the Center for Research in Security Prices (CRSP). I also had access to data used in Heath et al. (2020) including company ESG score[13] data from Thomson-Reuters ASSET4[14] ESG and pollution data from the Environmental Protection Agency (EPA)[15].

Pollution Data Analysis

The purpose of my research on pollution data was to investigate whether or not the issuance of a green bond decreased the amount of pollution released for a company. If green bonds truly are effective, I expected to see a noticeable reflection of that in the form of decreased pollution numbers after a green bond issuance. The variables I worked with were water, air, land, and total on-site (the combined total of pollution released) pounds of pollution released. Figure 4 shows a table with the summary statistics of each pollution variable. By examining the mean of each variable, it is evident that while the on-site total release is the clear leader of pounds of pollution, land pollution follows on-site total pollution as a runner-up in the volume of pollution expelled, followed by air and water pollution, respectively.

To best understand how the pollution variables changed surrounding the event of a green bond issuance for a company, I used an ordinary least squares regression to investigate the relationship between the variables and such an event, with the pollution output variables as the dependent variable and a green bond indicator as the independent variable. To narrow my data down to an appropriate window, I only included companies that had issued a green bond in this regression analysis and excluded any companies without a green bond indicator. Next, I normalized the pollution data by firm size in Stata by dividing pollution by the market capitalization variable to control for the size of the companies that issue a green bond. This scaling step helps account for the fact that larger companies will pollute more than smaller companies, and in the interest of my research, I wanted to best understand company pollution by unit. Once the data was scaled accordingly by firm size, I ran a regression that included a firm fixed effect, so it examined pollution within a company (i.e., for companies that issued a green bond, it compared their pollution output before versus after the issuance date).

As shown in Tables 1-4, some of the pollution variables prove a stronger relationship to green bond issuance than others. By examining the t-statistic in each regression output table, it is clear that there is some level of connection between each type of pollution and green bond issuance. The air pollution variable proves to have the strongest relationship to green bond issuance for a company, with an absolute t-statistic of 1.84. Following air pollution is total onsite pollution with an absolute t-statistic value of 1.17. Both land and water pollution, with absolute t-statistic values of .16 and .05, respectively, are less correlated with green bond issuance according to the regression output; but their lower t-statistic values communicate a lower confidence level that the null hypothesis is rejected, and therefore don't rule out the possible relationship between the independent and dependent variables.

To visualize the volume of pollution expelled by companies surrounding green bond issuance, I created a graphical analysis using the mean amount of pollution released in pounds and months prior to and after a company issues a green bond. The resulting visualizations of the data, found in Figures 5-8, show a significant drop in average pounds of pollution released in each variable in the months following the issuance of a green bond. Average pollution rates for corporations fluctuate and depend on many factors including company growth throughout time, the introduction of new projects, lines of business, factory operations, etc. but the data shows a clear drop in pollution output following a green bond issuance in every category. Ultimately, the pollution graphs and regression analysis show that there is a significant relationship between a green bond issuance for a company and the pounds of pollution that that company releases surrounding the issuance date. This analysis illuminates the actual effect of climate bonds and solidifies their importance as a tool that is proven to impact the environment.

Esg Score Data Analysis

After analyzing the EPA pollution data and finding promising results, I focused on understanding the Thomson-Reuters ASSET4 ESG data to inspect the effect of a green bond issuance on the ESG scores of corporations that issue these bonds. An ESG (environmental, social, and governance) score is a measurement of a company's devotion to social

12 Additional company data points include CUSIP numbers (unique bond identifier), PERMNO (a principal unique identifier for bonds in the CRSP database), company ticker, volume, price, shares outstanding, market capitalization, returns, standard industrial class (SIC) code, etc.

13 ESG stands for: environmental, social, and governance. An ESG score is a number between 1 and 100 that shows how a company performs compared to the entire ASSET4 universe based on various values.

14 ASSET4 was acquired by Thomson Reuters in 2009 and is the leading provider of ESG data in the market. (Ribando & Bonne, 2010).

15 The EPA is the United States Government's official agency devoted to regulating environmental issues. (EPA, 2020).

standards. ESG scores are important for companies because they communicate to investors how effectively the company is prioritizing ethical and social initiatives. It is relevant to examine ESG scores because they are another key indicator of how green bonds are working to impact corporations and investors in the market. If green bonds are working as my argument suggests, I expected to see ESG scores fluctuating after the issuance of a green bond. Using the same methodology that I used in the pollution data analysis, I examined the data first using summary statistics, then with ordinary least squares regression analysis, and finally graphical representation.

The four variables I chose to focus on for my analysis are A4IR[16] (the equally-weighted average score across social, environment, and governance), cgvscore (a measure of corporate governance[17]), envscore (a measure of environmental impact including air, land, and water), and socscore (a measure of social impact including the impact on customers, employees, and society). I chose these variables from the ASSET4 dataset because they were the most applicable to my research and would collectively assess the performance of companies in each sector that ESG scores encompass.

Figure 9 showcases the summary statistics table for the ASSET4 data generated by Stata. According to the mean statistic, it is clear that typically, for the companies in my dataset, the corporate governance score is the highest, followed by the A4IR score, social score, and environmental score. Continuing my analysis, I created regression outputs using the same method I used for the pollution variables, and produced results to communicate whether or not there was a definitive relationship between a company's issuance of a green bond and its ESG scores before and after issuance.

Similar to the EPA pollution data regressions, the ESG score variables all showed varying relationships to the green bond issuance indicator. Again, examining t-statistic values to interpret the confidence level that the null hypothesis (that the green bond independent variable has zero effect on the ESG score variable) should be rejected, I was able to interpret which ESG score was most closely correlated to green bond issuance. (See Tables 5-8). Social score (socscore) was the variable with the highest t-statistic absolute value of 3.99, meaning the regression model was very confident in a strong relationship between a company's social score and a green bond issuance event. Following the social score variable was the corporate governance score (cgvscore), which showed a t-statistic absolute value of 1.01. This variable, while it showed a less strong t statistic value, still demonstrated a level of confidence that there is a relationship between green bond issuance and corporate governance score. Environmental score (envscore) and A4IR score both showed lower t-statistic values of 0.73 and 0.10, respectively.

Ultimately, the regression analysis showed that there is some effect of a green bond issuance on corporate ESG scores, which means corporations are affected by the use of a green bond. Surprisingly, the environmental score and total score did not communicate a strong confidence level through their t-statistic outputs that there is a notable correlation. This result could be impacted by a wide range of factors, including the fact that environmental scores may take more time to fluctuate compared to the other scores or that the A4IR total score takes much larger amounts of data into consideration and is therefore less subject to change based on an event like a bond issuance.

Remaining consistent with my data analysis methodology finally, I produced graphical representations of the ESG score data to visually represent my findings. To do so, I graphed the mean ESG score for each variable in each month surrounding a green bond issuance. The resulting graphs, found in Figures 10-13, show that on average, mean ESG scores are not drastically affected by a green bond issuance event. In each variable excluding environmental score, there is a slight increase of score value in months following the green bond issuance. At month 4 in each graph, there is a notable drop in score value, which may be regarded as an outlier in the mean data without further evidence to describe the phenomenon. The graphical data for the ESG scores is less definitive than the EPA pollution data; however, there is a still significant takeaway that there is a small—yet relevant—increase in most ESG score variables during the months following a green bond issuance event.

Ultimately, the empirical analysis of green bonds and their impact using both the EPA pollution data and the ESG scores data suggests that green bonds are significantly impacting the environment and corporations. The statistical analysis of these variables establishes a connection between corporate green bond issuance and measurable impact on the environment and corporate social responsibility. It is my projection that as the market continues to grow and green bonds become more popular and robust, the data will become increasingly confident in the relationships between these variables. The

16 According to Thomson Reuters, the A4IR score is defined as: The Equal-Weighted Rating is an example of how a company's financial and extra-financial health can be equally weighted based on the information in ASSET4's economic, environmental, social and corporate governance pillars. It reflects a balanced view of a company's performance in these four areas.

17 Corporate governance is concerned with a company's Board structure and functionality, compensations, shareholders' rights, and strategy. (Ribando & Bonne, 2010).

exciting takeaway from this analysis is that there is significant work being done, and the forward trajectory of the green bond market will continue to make critically important steps towards a carbon-neutral future.

Future Implications

Looking ahead, the future of the climate bond market is bright. Though ambiguities in the market and process will persist until the market becomes more mature, there is substantial evidence provided in this paper to suggest the market will continue to thrive in upcoming years. The implications of the green bond revolution are compelling. As the market has caught wind of investor interest in this new branch of transparent bonds, innovative social bonds, and transition bonds have entered the market.

As Paramjot Kaur and Matteo Bigoni both specifically highlighted in their interviews, transition bonds and their growing traction will add to the growth in the Green and Social Bonds market. According to a report published by the European Commission and Technical Expert Group on Sustainable Finance (TEG), the EU's taxonomy for green bonds is paving the way for the bond market to regulate and include transition bonds in the wave of financial instruments that contribute to global carbon decreasing goals. "The Taxonomy Regulation identifies three conditions for an activity to be included as a transitional activity: that it (i) has greenhouse gas emission levels that correspond to the best performance in the sector or industry; (ii) does not hamper the development and deployment of low-carbon alternatives; and (iii) does not lead to a lock-in of carbon-intensive assets, considering the economic lifetime of those assets," (TEG, 2018). The fact that such established entities like the European Commission have already taken interest in transition bonds signifies the ability for these bonds to expand in the market and assist green bonds in the effort to catalyze significant market and environmental change.

In addition to green bonds, there is an emerging market for use of proceeds bonds in a variety of different industries. Sustainalytics, just one example of a verifier involved in this innovation, now verifies social bonds including but not limited to projects promoting: affordable basic infrastructure (clean drinking water, sewers, sanitation, transport, energy), access to essential services (health, education, and vocational training, healthcare, financing, and financial services), affordable housing, employment generation, food security, and Socioeconomic advancement and empowerment. These areas are just a portion of the ways the market has begun to expand, following the example of green bonds.

This October, Citigroup issued its first affordable housing bond. "The transaction consisted of a $2.5 billion 4-year non-call 3-year fixed to floating rate note issuance, the largest-ever social bond from an issuer in the private sector," (Businesswire, 2020). This monumental event demonstrates relevant and current evidence of the market's attraction towards transparent social bonds. "Our Social Bond Framework for Affordable Housing and accompanying inaugural offering strengthens our partnerships with clients around the world and responds to increasing investor interest in social bonds and broader ESG initiatives," said Michael Verdeschi, Treasurer of Citi (Businesswire, 2020).

Another testament to the market's interest in socially conscious labeled bonds is the dramatic increase of social bond issuances following the outbreak of COVID-19 in early 2020. According to a recent publication by the International Finance Corporation (IFC)[18], a significant increase in social bond issuances in 2020 is due to the introduction of COVID-19 Bonds (also referred to as corona bonds or pandemic bonds). "The proceeds of COVID-19 Bonds should address or mitigate issues wholly or partially emanating from the coronavirus outbreak. While in principle COVID-19 bonds can be structured as green, social, or sustainability bonds or even remain unlabeled, some issuers have taken advantage of their existing social or sustainability bond frameworks and programs to launch COVID-19 related bonds," (Peeters, Volk, & Schmitt, 2020). The new COVID-19 bonds contributed to a 170% increase in the issuance of social bonds between January and April of 2020, according to Bloomberg (Peeters, Volk, & Schmitt, 2020) (See Figure 14).

Without the recent innovations of green bonds, a pandemic relief social bond issuance may not have been possible 20—or even 10 years ago. According to the IFC publication, the social bond market is projected to follow in the footsteps of green bonds and see significant growth in upcoming years, launching the bond market further into the transparency revolution of labeled bonds. The examples of heightened interest in social bonds allude to a potential future in which the bond market is a more transparent and reliable place for investors to designate their money.

Conclusion

Green bonds, though a relatively new financial instrument, have a measurable and meaningful impact on corporations, the environment, and the bond market. With the Paris Agreement's

18 IFC is a member of the World Bank Group.

ambitious 2-degree Celsius goal, corporations need to take actionable steps to be mindful of their environmental footprint, and green bonds provide a way to do so. The green bond market is accelerating, and this trajectory displays the eager interest from investors, companies, and verifiers who have all invested in the profitability and social implications of these climate bonds.

The certification of green bonds is a streamlined and robust process. Green bond issuers have multiple methods to choose from when verifying their climate bonds, may choose to draft their own framework, and use their choice of verifier or choose a more ambitious route to get certified through CBI. In either case scenario, issuers must follow the market standards of the Green Bond Principles and choose a verifier that aligns with their project. External-party verifiers conduct extremely thorough due diligence that investigates the scientific proof of a company's green project for which the bond proceeds are earmarked. If a green bond is certified through CBI's certification scheme, and therefore falls within CBI's specified sector criteria, issuers work with more strict guidelines that result in a CBI certification mark. The consequence for ceasing to meet market guidelines, verified project standards, or CBI's scheme (if a bond chooses to be certified through CBI) is potential reputation destruction for both issuers and verifiers, elimination of external party verification on the bond, and possible removal of a firm's status as an Approved Verifier. According to market experts, the certification process will continue to be a streamlined and respected process that will provide the expanding market with bonds that significantly contribute to environmental projects.

Empirical analysis of market data on corporate green bonds and their relationship to pollution outputs and ESG scores proves an exciting future for the climate bond market. Using summary, regression, and graphical analysis methodology in Stata, I observed promising results that prove the importance of green bonds. Pollution data among variables water, air, land, and total onsite release of pounds of pollution demonstrated notable correlation to green bond issuance, and average pollution output in pounds decreased months following bond issuance. For ESG analysis, variables social score, corporate governance score, environmental score, and A4IR score communicated varying levels of confidence in correlation to green bond issuance, but ultimately have plausible relationships to corporate climate bonds, which is a noteworthy benefit of green bond issuance for corporations.

The green bond revolution has inspired other bond market innovations like social and transition bonds. Social bonds provide transparent investments that fund a wide variety of projects that contribute to socioeconomic, affordability, accessibility, and charity causes among others. Transition bonds are bonds that do not fully align with market standards for green bonds, but do contribute to a lower-carbon future (ex: hybrid cars). As social and transition bonds follow the example of success that green bonds pioneered, investors will be able to expect a bond market that offers a wider array of investment options that detail exactly what money is earmarked for.

As the bond market travels away from a previously opaque tradition, a more modern future that allows transparency and variety is quickly approaching. Green bonds have set a precedent for transparency bonds that proves investor excitement around this new type of instrument. The lasting influence of the entrance of green bonds into the market extends beyond paving the way for similar socially-conscious bonds to pioneering taxonomies, certification schemes, and market standards that will measurably impact the environment socially and scientifically. Ultimately, the green and social bond market is buzzing with success and growth that is sustainable in every sense of the word, and will surely affect investors, corporations, and the environment for years to come.

Tables & Figures

Figure 1: Climate Bonds Taxonomy

The Climate Bonds Taxonomy identifies the assets and projects needed to deliver a low carbon economy and gives GHG emissions screening criteria consistent with the 2-degree global warming target set by the COP 21 Paris Agreement.

(2020, November 27. More information is available at climatebonds.net/standard/taxonomy)

Energy	Transport	Water	Building	Land Use & Marine Resources	Industry	Waste	ICT
Solar	Private transport	Water monitoring	Residential	Agriculture	Cement production	Preparation	Broadband networks
Wind	Public passenger transport	Water storage	Commercial	Commerical Forestry	Steel, iron, & aluminum production	Reuse	Tele-commuting software and service
Geothermal	Freight rail	Water treatment	Products & systems for efficiency	Ecosystem conservation & restoration	Glass production	Recycling	Data hubs
Bioenergy	Aviation	Water distribution	Urban development	Fisheries & aquaculture	Chemical production	Biological treatment	Power management
Hydropower	Water-borne	Flood defence		Supply chain management	Fuel production	Waste to energy	
Marine Renewables		Nature-based solutions				Landfull	
Transmission and distribution						Radioactive waste management	
Storage							
Nuclear							

Certification Criteria Appoved
Criteria Under Development
Due to Commence

Figure 2: Certification Process for a bond, loan or other debt instrument

(2020, November 27. More information is available at climatebonds.net/certification/get-certified)

1 Issuer begins by preparing the bond
- •Identify assets that meet the relevant sector criteria and compile supporting information.
- •Create Green Bond Framework setting out how proceeds of the bond will be used the Issuer's internal controls

2 Engage a verifier
- •Engage an Approved Verifier for Pre- and Post-Issuance Certification
- •Provide them with relevant information.
- •Receive a Verifier's Report giving assurance that Climate Bonds Standard requirements are met.

3 Get Certified & issue a Certified Climate Bond
- •Submit the Verifier's Report and Information Form to the Climate Bonds Initiative.
- •Receive a decision on Pre-Issuance Certification.
- •Issue the bond, using the Certified Climate Bond mark.

4 Confirm the Certification Post-Issuance
- •Within 24 months of issuance, submit the Verifiers Pose-Issuance report.
- •Receive notification of Post-Issuance Certification

5 Report annually
- •Prepare a simple report each year for term of the bond.
- •Provide it to bond holders and Climate Bonds Initiative
- •Provide updates through public disclosure

Figure 3: CBI's List of Approved Verifiers

(Approved Verifiers under the Climate Bonds Standard. (n.d.) Retrieved from climatebonds.net/certification/approved-verifiers)

Verifier	Website	Region/Geographic Scope
BAM	https://buildamerica.com/	United States
Beijing Zhongcai Green Financing Consultants Ltd	http://enrccef.cufe.edu.cn	China
Blue Snow Consulting	https://www.bluesnow.com/	Malaysia UK and ASEAN region
Bureau Veritas (Brazil)	http://www.bureauveritas.com/wps/wcm/connect/bv_com/group	Brazil
Bureau Veritas (UK)	http://www.bureauveritas.com/wps/wcm/connect/bv_com/group	Worldwide
Carbon Care Asia Limited (CCA)	http://www.carboncareasia.com/eng/	Asia
Carbon Trust	https://www.carbontrust.com/home/	Worldwide
CECEP		China
China Chengxin Credit Management Co.	http://www.ccx.com.cn/#	China
China Lianhe EIA	http://www.lhcis.com/	China
China Quality Certification Centre (CQC)	http://www.cqc.com.cn/www/english/	China
Deloitte		Individual member firms are the Verifier.
DNV.GL	https://www.dnvgl.com/	Worldwide
DQS CFS	https://dqs-cfs.com/	Worldwide
Emergent Ventures India (EVI)	http://www.emergent-ventures.com/	Worldwide
EPIC Sustainability	http://epicsustainability.com/	Worldwide
EQA Spain	https://eqa.es/	Worldwide excl US, Canada
ERM CVS	http://www.ermcvs.com/	Worldwide
EY		Individual member firms are the Verifier.
First Environment	http://www.firstenvironment.com/	Worldwide
Golden Credit Service Co. Ltd.		China
Greensolver	https://greensolver.net/en/	Worldwide
HKQAA	http://www.hkqaa.org/en_index.php	Worldwide except United States and Canada
HR Ratings	https://www.hrratings.com/	Worldwide
iGreenBank	http://www.igreenbank.cn/	China (not include Hong Kong, Macau)
Indufor Oy	https://induforgroup.com/	Worldwide
ISS	http://www.issgovernance.com/esg	Worldwide
Japan Credit Rating Agency	http://www.jcr.co.jp/	Japan
Kestrel Verifiers	http://www.kestrelverifiers.com/	United States and worldwide
KPMG	https://home.kpmg.com/xx/en/home.html	Individual member firms are the Verifier.
Multiconsult ASA	https://www.multiconsultgroup.com/	Worldwide except United States
NSF Certification, LLC	http://www.nsf.org/about-nsf/	Worldwide
Pacific Credit Rating	https://www.ratingspcr.com/	Latin America Caribbean
PwC	http://www.pwc.co.uk/services/sustainability-climate-change/green-bonds.html	Individual network member firms are the Verifier.
Raising Clean-tech Investment Consulting Co., Ltd.	http://www.decarbonfund.com/	China
RAM Sustainability	https://www.ram.com.my/sustainability	Worldwide
RSM Australia	https://www.rsm.global/australia/	Australia
SGS Hong Kong	https://www.sgsgroup.com.hk/	Worldwide
SinoCarbon	http://en.sino-carbon.cn/	China
Sustainalytics	http://www.sustainalytics.com/	Worldwide
SynTao Green Finance	http://www.syntaogf.com/index_EN.asp	China
TRIS Rating	https://www.trisrating.com/	Thailand
Tuv Nord	https://www.tuv-nord.com/en	Worldwide
Vigeo Eiris	http://www.vigeo-eiris.com/	Worldwide

Figure 4: Pollution Data Variable Summaries

Variable	Obs	Mean	Median	Std. Dev	Min	Max
WATER	25,805	114,903	0	973,052	0	21,600,000
AIR	25,805	312,716	7,042	1,088,725	0	13,000,000
LAND	25,805	531,109	0	3,336,366	0	46,900,000
on_site_tot_relase	25,805	958,728	8,719	3,870,710	0	49,800,000

Table 1: Water Variable Regression Output Table

Variables	Water_Size
green_bond	
Coefficient	-0.0000
T-stat	(-0.05)
Constant	
Coefficient	0.0001***
T-stat	(64,050.18)
Observations	25,744
R-squared	0.655
Robust t-statistics in parentheses ***p<0.01, **p<0.05, *p<0.1	

Table 2: Air Variable Regression Output Table

Variables	Air_Size
green_bond	
Coefficient	-0.0001*
T-stat	(-1.84)
Constant	
Coefficient	0.0001***
T-stat	(1,756.45)
Observations	25,744
R-squared	0.376
Robust t-statistics in parentheses ***p<0.01, **p<0.05, *p<0.1	

Table 3: Land Variable Regression Output Table

Variables	Land_Size
green_bond	
Coefficient	-0.0000
T-stat	(-0.16)
Constant	
Coefficient	0.0002***
T-stat	(3,986.94)
Observations	25,744
R-squared	0.613
Robust t-statistics in parentheses ***p<0.01, **p<0.05, *p<0.1	

Table 4: On Site Total Release Variable Regression Output Table

Variables	tot_Size
green_bond	
Coefficient	-0.0001
T-stat	(-1.17)
Constant	
Coefficient	0.0004***
T-stat	(3,105.63)
Observations	25,744
R-squared	0.56
Robust t-statistics in parentheses ***p<0.01, **p<0.05, *p<0.1	

Figure 5: Water Pollution Variable Graph

*Month 0 is green bond issuance event

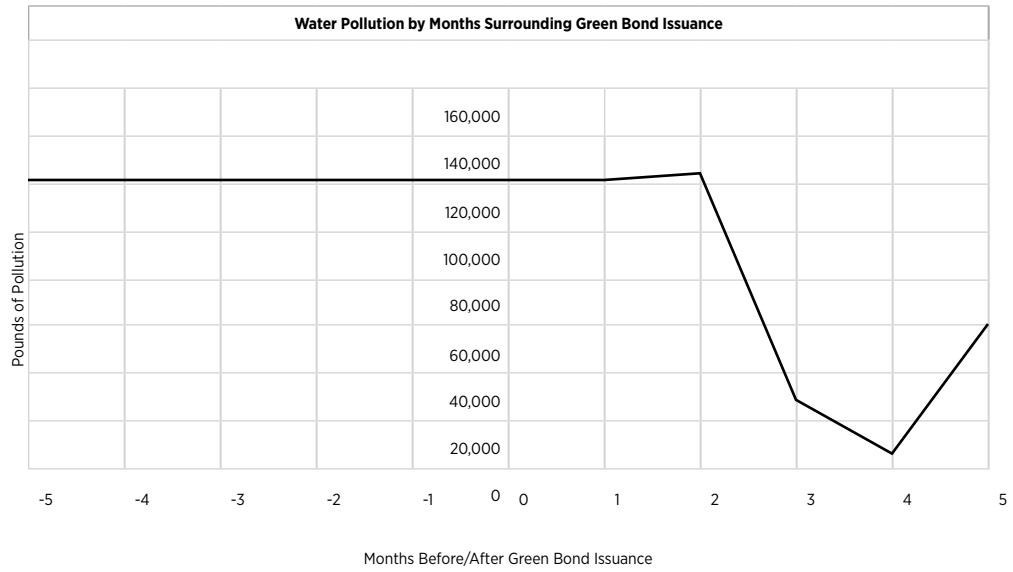


Figure 6: Air Pollution Variable Graph

*Month 0 is green bond issuance event

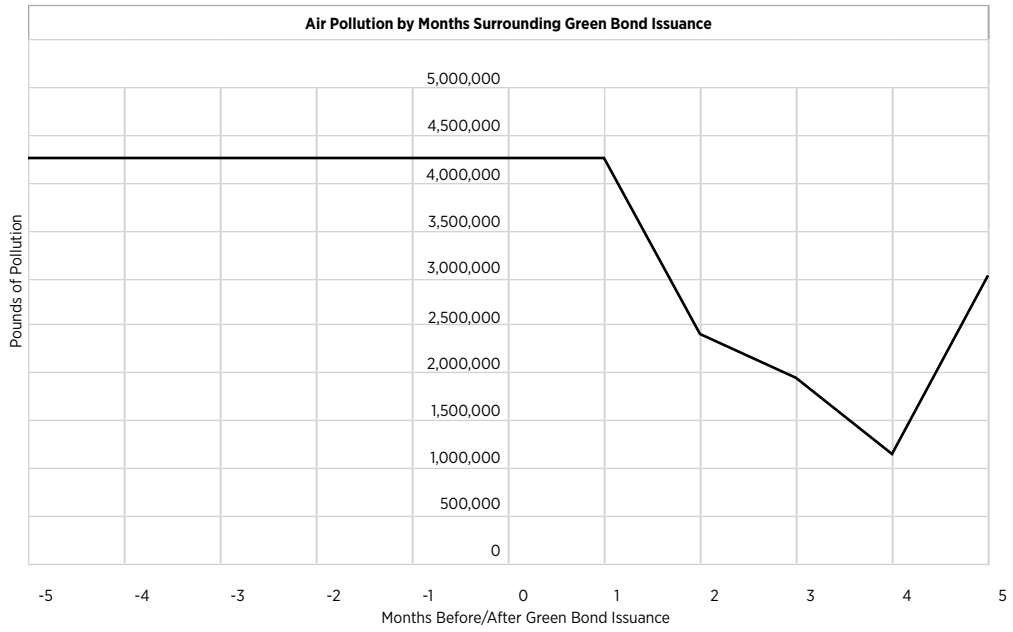


Figure 7: Land Pollution Variable Graph

*Month 0 is green bond issuance event

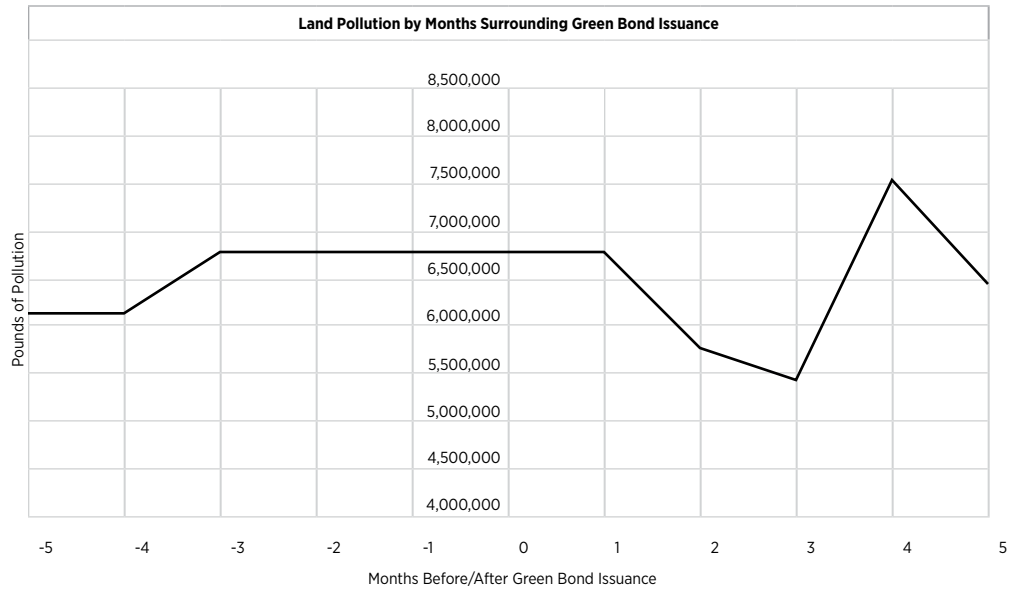


Figure 8: Total On Site Pollution Variable Graph

*Month 0 is green bond issuance event

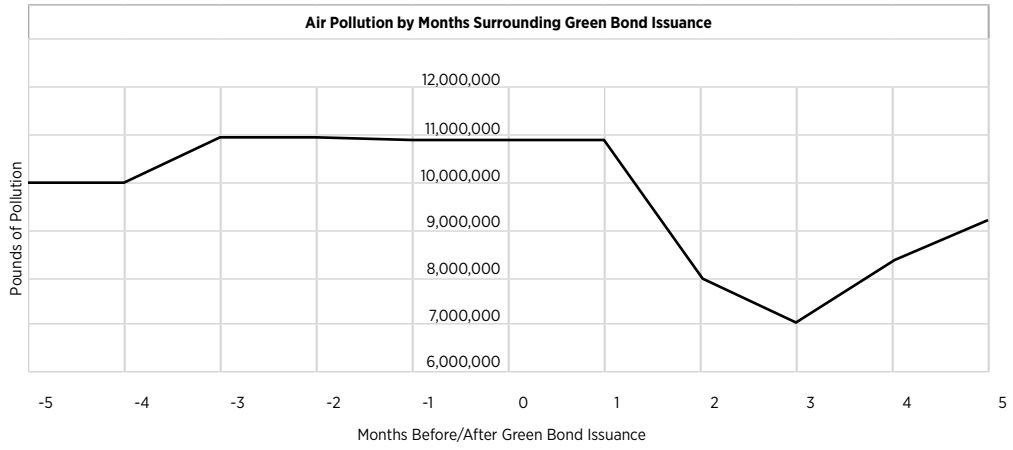


Figure 9: Asset 4 ESG Score Variable Summaries

Variable	Obs	Mean	Median	Std. Dev	Min	Max
a4ir	17,100	47.16	40.22	29.64	2.96	98.72
cgvscore	17,100	68.53	72.89	20.25	1.32	98.23
envscore	17,100	38.44	22.08	30.14	8.12	97.40
socscore	17,100	40.72	31.87	28.57	3.58	99.32

Table 5: A4ir Variable Regression Output Table

Variables	a4ir
green_bond	
Coefficient	0.8050
T-stat	(0.10)
Constant	
Coefficient	39.5497***
T-stat	(3,979.50)
Observations	5,718
R-squared	0.968
Robust t-statistics in parentheses ***p<0.01, **p<0.05, *p<0.1	

Table 6: Corporate Governance Score Variable Regression Output Table

Variables	cgvscore
green_bond	
Coefficient	8.2100
T-stat	(1.01)
Constant	
Coefficient	62.0912***
T-stat	(6,265.36)
Observations	5,718
R-squared	0.916
Robust t-statistics in parentheses ***p<0.01, **p<0.05, *p<0.1	

Table 7: Environmental Score Variable Regression Output Table

Variables	envscore
green_bond	
Coefficient	2.6050
T-stat	(0.73)
Constant	
Coefficient	33.8841***
T-stat	(7,753.47)
Observations	5,718
R-squared	0.974
Robust t-statistics in parentheses ***p<0.01, **p<0.05, *p<0.1	

Table 8: Social Score Variable Regression Output Table

Variables	socscore
green_bond	
Coefficient	0.4675***
T-stat	(3.99)
Constant	
Coefficient	35.1988***
T-stat	(245,418.26)
Observations	5,718
R-squared	0.973
Robust t-statistics in parentheses ***p<0.01, **p<0.05, *p<0.1	

Figure 10: A4ir Score Graph

*Month 0 is green bond issuance event

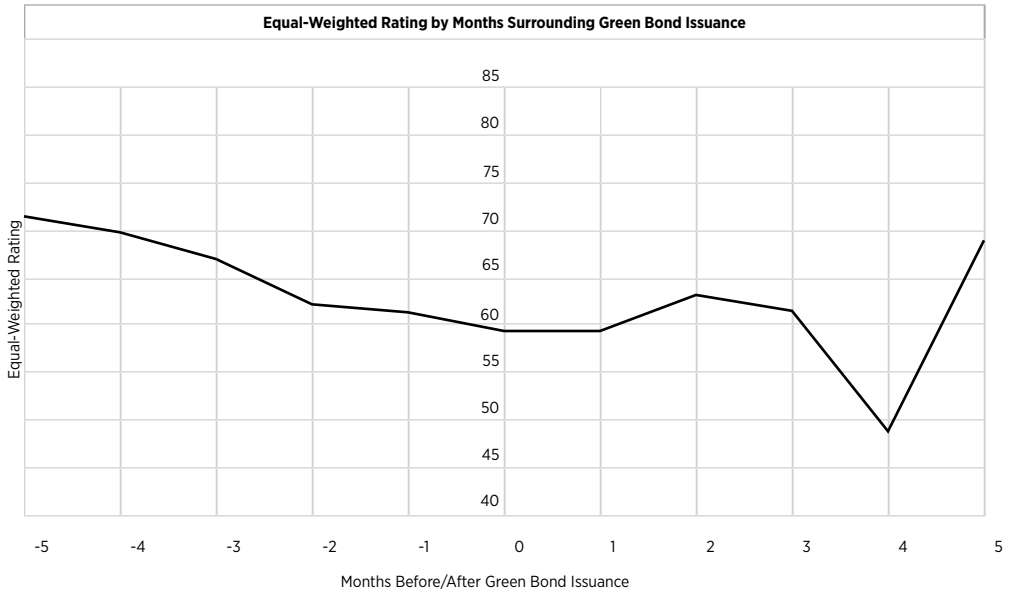


Figure 11: Corporate Governance Score Graph

*Month 0 is green bond issuance event

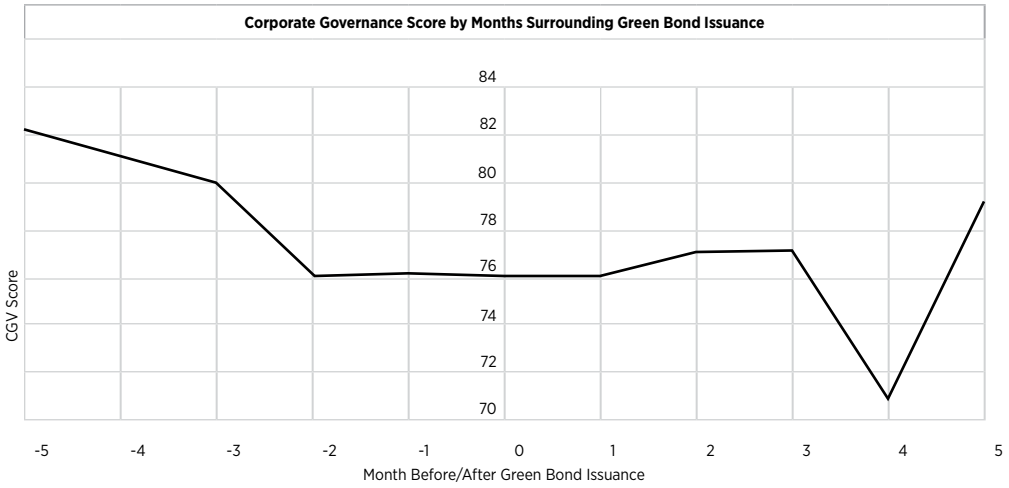


Figure 12: Environmental Score Graph

*Month 0 is green bond issuance event

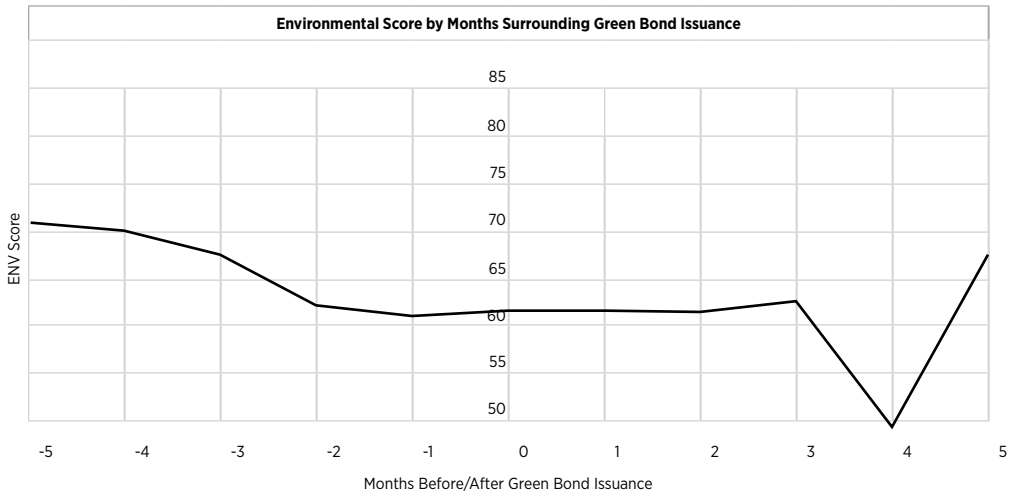


Figure 13: Social Score Graph

*Month 0 is green bond issuance event

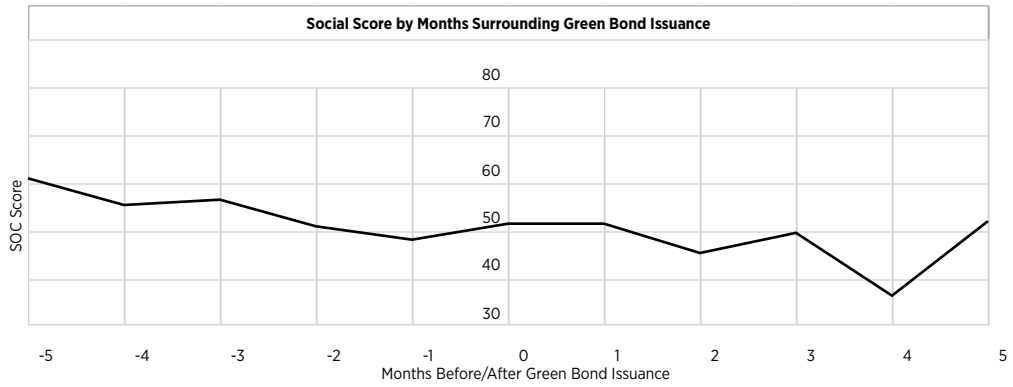
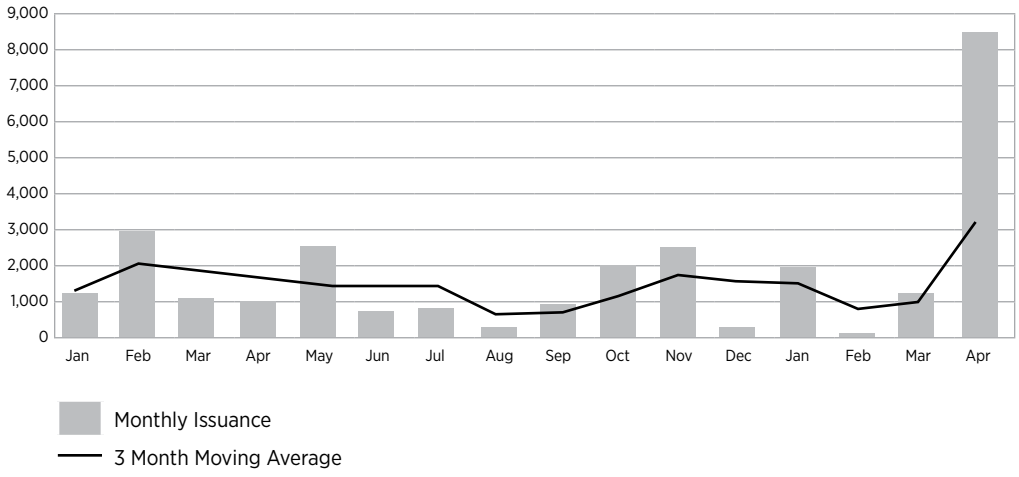


Figure 14: Graph of Social Bond Issuance in 2019-2020

*This graph is from the 2020 IFC publication: *Social Bonds Can Help Mitigate the Economic and Social Effects of the COVID-19 Crisis* (Peeters, Volk, & Schmitt, 2020)



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PUBLIC OFFICIAL CONTRIBUTIONS

Why Clean Air?

Utah Representative Steve Handy

Several years ago I had one of those "I remember where I was and what I was doing" moments. No, it wasn't the day that JFK was assassinated or the Twin Towers fell. Rather, it was a day that I finally got it, clean air matters to Utahns.

I'm a fifth-generation Utahn, born and raised and as a kid I remember those foggy days, sometimes several times each winter. Car headlights were nearly worthless and it was just depressing. I have a distinct memory of our family driving from Ogden to the Salt Lake area in the 60s to see relatives. The winter fog had set in and my Dad couldn't see the street signs as we attempted to make our way home. He hit upon the idea of having my sister and me walk in front of the car, she in front of one headlight and I in front of the other as he inched along. How long we walked I can't remember but Dad finally began to get his bearings and soon we were on our way albeit probably way under the speed limit.

I also remember a time as a young father when it was now called smog and it meant something different, it meant pollution. I was working for the Standard-Examiner newspaper in Ogden and it was a multi-week phenomenon, we were socked in day after day. I wormed my way home slowly each night to Layton and can still remember the dreariness of that time. One local ski resort started running newspaper ads telling skiers to come up, the sky was clear and the skiing was great. By now I think I sort of started to get it.

But it wasn't until that day as a fairly new legislator that a constituent finally got my attention. I answered my phone and the person on the other end began the conversation with, "Representative Handy, what are you going to do about this dirty air?" We were having another one of our infamous inversions that I had recently come to understand how warmer air near the ground is trapped by a blanket of colder air in the atmosphere after a good snow storm and then hemmed in by the Wasatch Front. It wasn't my finest hour because I answered back, "Well, I can't change the locations of our mountains, I can't legislate a change in our geography." It was the wrong thing to say, it was flippant, and he let me have it. He shamed me and I deserved it.

From that time on, I decided to see if there wasn't something I could do about Utah's dirty air short of moving

mountains either through legislation or faith.

I was now interested and open-minded and then an opportunity presented itself. I was approached by the business manager at the State Board of Education to run a bill that sought to restore some $20 million in transportation appropriations that had been cut in the 2008-2009 downturn. I met with the transportation directors from all school districts to work out the details, which were this: "Legislature, if you'll restore that $20 million that we lost, we will direct those funds into replacing many aging and polluting school buses, some 500 in number and some over 20 even 30 years old."

The bill contemplated requiring each district to submit a plan and bring a matching amount in order to leverage the legislative appropriation. Well, it wasn't successful, the first year, or the second year or even the third and fourth years. I even dropped the appropriation request to $10 million. That didn't even gain favor with legislative leaders.

What I did learn as the bill generated significant publicity was that everyone was interested in clean air, it wasn't a partisan issue, it was a people issue. And then I attached myself to Rep. Patrice Arent from the other side of the aisle and a friend from years ago when we both served on the University's Young Alumni Board. Patrice was not only knowledgeable, she was also tenacious and far more savvy about the inner workings of the legislative process than I was having served as a legislative attorney, a state Senator and now as a Representative. She was the founder and organizer of the Legislature's Bi-Partisan Clean Air Caucus and I started to attend, to get educated and to get support.

It was fun and my constituents appreciated my involvement, and it mean something personal to them. I began running other bills because I could see that pushing for clean air initiatives was something I could hang my spurs on, I could maybe, just maybe, even make a difference.

Back to Clean Fuel School Buses. I never did get any money from the legislature but Governor Herbert did direct $7.5 million from the Volkswagen Cheating Scandal settlement toward the initiative. This resulted in an immediate groundswell of support and resulted in the purchase of 115 new, Clean Fuel School buses across multiple districts and including charter schools. It will make a difference, not just in pollution reductions, but also in the protection of developing brains of young students who have had to sit on polluting buses while they were traveling and idling. I came to understand how dangerous and even lethal that was.

What I didn't realize on that day of accounting by a constituent was that Utah's dirty air, most prevalent after one of our notorious inversions, was not only inconvenient and unsightly, it was also dangerous to Utah's at-risk populations with other health problems. And, it's also an impediment to economic development. I've since heard several stories about corporate relocation teams flying into Salt Lake International during an inversion and saying, "This isn't going to work." Sometimes, they didn't even leave the airport and booked the next available flight out.

We have seen progress in improved air quality not just though legislation, but also due to greater public awareness and the application of good science. Our Clean Air Caucus meetings are now attended by nearly 100 individuals including multiple legislators, both Republicans and Democrats, who want to learn and understand how to best represent their constituents on a matter that affects each Utahn.

I'm glad that day happened, I'll never forget where I was and what I was doing when I was called out and decided to get an attitude adjustment.

So that's why clean air, we all need it, we all benefit from it.

The Intertwined Sicknesses of COVID-19 and Racism

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Richard R. Orlandi, *MD, Associate Chief Medical Officer for Ambulatory Health, University of Utah Health*

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*The views expressed herein are those of the authors and do not necessarily represent those of University of Utah Health.

Prior to the COVID-19 pandemic, two children born less than 10 miles away from one another in Salt Lake County will have a 12-year difference in life expectancy (IBIS Complete Health Indicator Report of Life Expectancy at Birth). In Utah, an individual's native language has had a 3-fold impact on whether that person became infected with COVID-19 or not (University of Utah Health patient data). Nationally, one million additional White people would have to die this year for them to have the same life expectancy as Black people, leading some experts to wonder whether COVID-19 or systemic racism was the more deadly threat (Wrigley-Field, 2020). How long will we as Utahns continue to accept these disparities in our community?

The year 2020 will go down as a historic year for not only the COVID-19 outbreak, but also the shift in thinking about systemic racism in all institutions from policy making to delivery of healthcare. Our country has experienced social unrest triggered by the unjust killing of George Floyd, and countless others, and the egregious impact of COVID-19 on communities of color nationwide, and in Utah (Tanner, Courtney, 2020).

COVID-19 has laid bare the underlying health disparities many of us have chosen to look away from. We would expect a microscopic viral particle to be blind to skin color or deaf to spoken language, but clearly this has not been the case. The intertwined sicknesses of longstanding racism and a novel coronavirus conspired to prey on those already vulnerable due to underlying health disparities (Figure 2). Crowded multi-generational homes, inability to work remotely due to the nature of one's job or access to technology, inability to access personal protective equipment, distrust of leaders due to past injuries, and language barriers are some of the many synergistic factors that worsen healthcare for some in our community. Acknowledging and confronting these realities is the first step toward correcting them.

University of Utah Health (U of U Health) made equity a foundational principle of its COVID-19 vaccine distribution. As a result, the vaccination planning team accounted for race and ethnicity in every planning step from the beginning. Yet despite every effort to assure vaccines appointments were

equitably distributed within U of U Health, inequities were obvious within a few days of starting. Discouraging though not surprising, the team redoubled its efforts and has made some progress toward a more level racial and ethnic distribution of vaccine. This brief experience emphasized two very important lessons: first, inequities will become apparent when we look for them - even with every effort to avoid them - and, second, a concerted effort can compensate for these inequities in real time.

As we emerge on the other side of the pandemic and are still grappling with addressing systemic racism in healthcare, there needs to be concentrated efforts for more active institutional interventions to dismantle racism in policies and practice. Communities of color have suffered the physical and mental consequences of institutional racism and interpersonal racial discrimination resulting in higher morbidity and mortality rates for chronic diseases, hypertension, depression, anxiety, and psychological distress for generations (Bleich et al., 2019).

Our top priority should be to increase funding and support to public and community health infrastructure. There are three policy priorities within public and community health that could be improved upon, given the lessons we've learned over the last year.

First, we recommend supporting and sustaining Community Health Workers (CHWs) as a recognized workforce in Utah. During the pandemic, the Utah Office of Health Disparities contracted with 11 non-profit organizations to hire 38 CHWs who were able to reach 6 different underrepresented communities and spoke over 20 languages. These CHWs were trained to respond to community questions about COVID-19, quarantine and isolation, testing, mask resources, access to healthcare, and more (Okada et al., 2020). The work that these CHWs were able to accomplish during COVID-19 should not stop when the pandemic ends. CHWs are a critical workforce for all of public health to reach underrepresented populations within our communities with important health information.

Our policy recommendation is to work with the state to adequately develop CHWs' scope of services they can provide, and for certification to take place to allow for Medicaid reimbursement of their services. Since CHWs are people who live and work in their communities, intentional investment in CHW infrastructure has demonstrated significant potential to reduce health inequities rooted in socioeconomic status, race/ethnicity, tribe, or religion (Blanchard et al., 2019).

Second, we recommend using the state Medicaid program to drive equity for underrepresented communities. Children's health insurance coverage has played an essential role in addressing health inequities. Since the creation of the Children's Health Insurance Program (CHIP), created by former Senators Orrin Hatch and Ted Kennedy in 1997, covered children have had better health outcomes in every statistical category in comparison to uninsured children (Engelgau et al., 2019).

Our policy recommendation is for Utah to reduce red tape barriers for Medicaid applicants, including joining more than 20 states who have invested in 12-month continuous Medicaid & CHIP eligibility for children. Doing so reduces the amount of times families come on and off the program, resulting in interruptions of care. Studies have shown that ensuring continuous health coverage may reduce children's hospitalizations by as much as 25 percent (Horner, D. 2009). Utah could also cover lawfully-residing immigrant children and/or lawfully-residing pregnant women without a 5-year waiting period to be eligible to receive health benefits from the state.

Third, we recommend policies to support development of statewide infrastructure to address social determinants of health (SDoH). Health is more than healthcare. In fact, it's estimated that clinical care only accounts for 20% of a person's health outcomes, whereas social and economic factors account for 40%, physical environment accounts for 10%, and health behaviors account for 30% (Magnan, 2017). SDoH underlie the health inequities that lead to adverse health outcomes and even death fueled by both antiquated policies and infrastructure that perpetuate racism as realized with the COVID-19 pandemic (Maness et al., 2021). Currently, several institutions across Utah including health care systems, Medicaid and insurance plans, non-profit organizations, and governmental agencies are looking at how we can break down silos and create a no-wrong-door approach for community members who interact with each system.

Our policy recommendation is for Utah to invest in a statewide infrastructure that allows for collaboration between institutions, and easily connects individuals with community-based resources to assist them with their social needs.

Racism in health care and public health institutions is complex, multi-dimensional, and systemic (Feagin & Bennefield, 2014). As policymakers, healthcare professionals, and voters, we have been complicit in this persistence. Dominant racial hierarchy, comprehensive white racial framing, individual and collective discrimination, social reproduction of racial-material inequalities, and racist institutions integral to white domination of people of color as framed by Feagin (2010) as part of the systemic racism theory have significantly influenced how we organize, advocate, vote, and develop policies. Consequently, many people have

died and communities of color have suffered the brunt of these consequences.

For generations, White people have benefited from socioeconomic infrastructure and resources derived from slavery, segregation, and other racial oppression; today, these same resources, policies, and societal behaviors continue to allow restricted access to better jobs, quality education, healthy neighborhoods, political representation, and quality healthcare (Feagin & Bennefield, 2014). There is no better example and manifestation of the consequences of systemic racism in health care than COVID-19. This once-in-a-century pandemic has presented the opportunity to transform our systems, policies, and healthcare delivery to ensure the health and wellbeing of communities of color so we all can thrive. Now is our time to come together as Utahns and begin to end racism. We cannot fail one another.

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"*Most everything worthwhile is borne of some dreamer's dream*"

-Robert H. Hinckley