Trickling Effects of Water on Education

Introduction: Making a Splash

Whether it is the presence of unclean water or the absence of clean drinking water, water plays a pivotal role in the sustenance and quality of life and has in turn earned its place as a major issue on the global agenda. Education also has and always will be a major issue on the global agenda. However, scholars have not taken into account that these two variables could be correlated in a causal relationship. Access to clean drinking water as an independent variable could be playing a vital role in determining the outcomes of education around the world. Instead, scholars have pointed to other independent variables such as a lack of provision of school supplies, teachers and school buildings, long distances to schools, lack of food, poverty, and high mortality rates to be the cause for low education rates.

This paper will specifically examine the relationship between these two variables: access to clean drinking water and education completion rate. Based on observation, I hypothesize that water and education are correlated and have a causal relationship and that water has more of an effect on education than theorists have accounted for thus far. The chief objective is to explain and explore the often overlooked and underrated relationship between water and education and to delve into the various ways and degrees in which water affects education.

When addressing the puzzle behind the relationship of water and education, I am looking at this research from a constructivist's perspective. This study employs the constructivist's point of view because the approach on water is that water represents something more than a commodity or resource that would be a means of gaining power. Rather, water and education represent larger ideas and values such as development, stability, life and livelihood. Furthermore, I assume that cultural norms and social identities constructed by human ideas play into molding the outcome of the puzzle at hand. Since I am taking on a constructivist's point of view, goals, threats and other elements of social reality found within my research will be accepted as social fact and analyzed accordingly.

The research will use a combination of quantitative and qualitative methods. The regression analysis and bar graph will focus on quantitative research, while the case studies of Ethiopia and Finland and the interviews will be analyzed qualitatively in order to address the question and test the hypothesis at hand.

Literature Review

Trickling Effects of Water: A Literature Review on the Correlation of Water and Education

There are already a plethora of studies and theories presented by scholars about water and about education. However, few have suggested or stressed the strong correlation between these specific two variables and thus, have not been able to discuss the causal effects one may have on the other. Instead, the correlation of water to education is overshadowed by presently ongoing conversations concerning some other variable and its effects on education. Some of the ongoing conversations address independent variables such as the lack of personnel, school supplies and school buildings within educational infrastructures, distance to school, food, poverty, and mortality rate among children and their effects on the dependent variable, education.

Educational Infrastructure

Khan, Bellew and King identify the factors responsible for low education enrollment rate as distance to school, cultural barriers, and lack of school buildings, teachers and school supplies (King and Hill). They present convincing theories stating which different variables could be affecting the education enrollment rate. However, the main criticism of Khan, Bellew and King's studies is they fail to address issues external from the educational infrastructures themselves.

A majority of their theories proposed in "*Women's Education in Developing Countries: Barriers, Benefits, and Policies,*" shifts the focus on issues within the educational infrastructure as the reason for the low enrollment rates. However, if external infrastructures (such as, public health or public service infrastructures that provide clean drinking water) that threaten children's education are not first dealt with, there is no use in mending the educational infrastructure since the flawed external infrastructure would get in the way of approaching the idea of enrolling to begin with. Then, the educational infrastructure is not what needs to be dealt with first but it is the external infrastructures that need to be addressed.

Khan, Bellew and King in "*Women's Education in Developing Countries: Barriers, Benefits, and Policies*" found some variables outside of the educational infrastructure such as, distance to contribute to low student enrollment rates. In building off of their argument, access to water qualifies under the same category as it also represents a form of external infrastructure that could potentially cause a shift in education outcomes.

Food and Education

Other theorists have addressed the relationship between underdeveloped, external infrastructure and low education enrollment rates, such as access to food. Programs such as Food For Education (FFE) recognize the vital role access to a basic human needs such as food play on education enrollment rate. In the case studies and experiments referenced in "*How Effective are Food for Education Programs?: A Critical Assessment of the Evidence from Developing Countries,*" a correlation and causational relationship is defined between access to food and education enrollment rate (Adelman, Gilligan and Lehrer). This is similar to my own study because I will be probing to see if there is a correlation and causal relationship between water – a vital human need just like food, and education.

This research is useful in constructing my own hypothesis because my own hypothesis attempts to establish a correlation and causational relationship between similar variables. Furthermore, Adelman, Gilligan and Lehrer's study concludes that there is indeed a positive correlational and causational relationship between access to food and education enrollment rate. Results from this study provide a strong foundational argument that I could utilize within my own hypothesis.

Malnutrition and Learning

Brown and Pollitt establish a causational relationship between malnutrition and learning. However, this is not to be confused with access to food and its causal relationship with attendance rates in school. They establish that high levels of malnutrition increase truancy levels which contribute to low completion rates.

Furthermore, Brown and Pollitt state that malnutrition poses many issues to health; malnutrition leads to diminishing weight, stunted growth, weakened resistance to infection and, in extreme cases, lower levels of life expectancy. However, the article fails emphasize how these variables influence the cultural norms within the observed societies; because quality of life and life expectancy is low in these regions, parents do not invest in long-term goals such as education for their children, but focus rather on meeting their immediate needs such as food and water.

The article inspired me to conduct more research on the causal relationship between basic resources and learning outcomes. In doing so, I eventually found a parallel between malnutrition and dehydration, food and water, and learning outcomes to education completion rates.

Mortality and Education

Oloo contributed to the ongoing conversation regarding the role access to clean drinking water plays in improving the quality of life in developing communities. Through their case study analysis on Senegal, Oloo established that access to clean drinking water, modern sanitation facilities and hygiene have a direct causal relationship with child mortality rates.

Similar to the relationship between malnutrition and education levels, child mortality rates affect the degree to which parents send their kids to schools. This relates to my argument as access to clean drinking water plays an important role in prolonging a child's life which, in turn, alters their long-term goals which may include pursuing education.

Thus, if access to clean drinking water were to be resolved, there would be a decrease in child mortality rates which could lead to an improvement in education outcomes.

Poverty and Education

In addition to the aforementioned variables that affect enrollment rates, the article, "*The Effect of Poverty on Child Development and Educational Outcomes*" examines the role poverty plays on attainment of education (Engle and Black, 243). The authors of this article exercise a multi-dimensional approach by examining the effects of poverty in the United States and developing countries. Through such processes, the authors are able to explore how characteristics of families, disruptions in family functioning, and relations between families and children all link to poverty's impact on the lives of children and families. Through close examination, they are able to frame a correlation between poverty rates and academic performance; more specifically, that children living in poverty tend to perform more poorly in cognitive studies than those not living in poverty.

This relates to my argument as access to water can be viewed as a reflection of the degree of poverty in developing societies. As access to water serves as a form of infrastructure, the absence of it conveys an important distinction between developed and underdeveloped societies.

Thus, in observing the relationship between poverty rates and academic performance, it is evident that factors such as access to drinking water contribute towards educational outcomes.

Reflections

Despite the varying theories presented in this section, there is no instance in which an article establishes water as the main source affecting education. While each article provides valid evidence, my argument incorporates aspects of each argument by focusing on the issue at a more macro-level.

A macro-level observation of water needs to be emphasized because the issue of access to clean drinking water encompasses all the aforementioned variables in this section. Upon analyzing these theories, lack of access to clean drinking water contributes to all these problems and thus, water itself should serve as the focus of this issue. This study will show that the relationship between water and education has a greater explanatory power than the other factors mentioned above.

Research Design

As discussed in the literature review, there have been diverse arrays of theories proposing a number of effects that different variables have on education. However, no theory seems to suggest that water is the root cause of the issues stated and the ultimate and most prominent variable which effects education through a series of trickling causal mechanisms. The overarching goal of this study is to explore whether clean drinking water effects education completion rates in developing countries and if so, how and in what ways.

The aim of this research is to use a combination of mixed methods to identify and understand the relationship – both correlation and causation, between clean drinking water and education outcomes. Thus, part of the research will incorporate a large-N research design format and another portion will incorporate small-N research design format.

For the large-N portion of the research design format, conclusions were drawn from comparing between conditions found in the case study of Ethiopia and Finland, respectively. Participants were grouped into categories (% of relevant age group that completed primary education, % of relevant age group that completed secondary education, % of population with access to an improved water source, etc.). Statistical tests were used to determine how reliable the acquired data was.

Another portion of the research used a small-N research design format. This type of approach in research design was used when conducting interviews and when observing a small group of women who drew water. Inferential statistics is not used here. Instead observations were made of real-life scenarios.

I will utilize qualitative methods when performing within-case analysis and cross-case comparisons on case studies of Ethiopia and Finland. The reason for having picked Ethiopia and Finland as my case studies is because they are relative in size. At first, I considered analyzing the United States; however, the United States is very large and much too diverse. The effects of ease of access to drinking water would vary drastically by region. I chose Finland because not only does it qualify as a developed country, Finland is more proportionate in size to Ethiopia than the United States. Also, Finland is renowned for having an excellent education system. Looking into a country that has a high-level of access to clean drinking water and also has a great education system may produce correlations between those two variables.

Utilizing two cases with extreme differences is ideal in exploring my argument for two reasons: 1.) the stark differences between the cases will make data more apparent and, 2.)

observing a developed country and an underdeveloped country would make my argument more universally applicable.

For the within-case analysis of Ethiopia, I will present data collected from interviews with females in Ethiopia who have had to sacrifice their education in order to draw water. It is appropriate to perform interviews because they provide a human perspective and also better depict the extent in which the lack of access to clean drinking water takes a toll on lives and on education.

For the cross-case comparisons of the two case studies, I will use quantitative methods. I will present percentages of school enrollment rates of females v. males in comparison to the access to improved water source of each country in bar graph format. The bar graph will depict the correlation between water and its effects on female education as opposed to male education. Although my study is not focused on the effects of access to water on female education, I will largely take into account the effects that access to water has on female education because females significantly make up such a large portion of the population that are not able to obtain an education due to the lack of access to clean drinking water.

Furthermore, I will present and analyze a linear regression analysis of water v. education completion rates to test my own hypothesis; an additional linear regression analysis of the # of teachers v. education completion rates will be analyzed in order to test for other underlying variables. Utilizing quantitative methods is appropriate because they provide statistical evidence of the correlation between clean drinking water and education completion rates. Furthermore, the regression analysis could generalize my argument by emphasizing any patterns that may appear within the data which incorporates more cases than a comparative case study.

All data collected for each respective case study and for the linear regression analyses will be drawn from 2005 as the point in time reference. This is due to the fact that the most data for all variables were available in 2005. It is also fairly recent since it isn't more than 10 years ago. The point in time of when the interviews were collected is unavailable since I did not collect them in person. Rather, they are being quoted from other sources. An estimated time frame of when the interviews were conducted would be around the time when the article was written (roughly, 2010) and the documentary was filmed (roughly, 2008).

Empirical Data

Trickling Effects of Water on Education

Independent Variable: Water

In this study, "clean drinking water" is specifically measured as "improved water source". "Access to clean drinking water" is calculated by measuring "total % of population with access to improved water source".

According to the World Bank's World Databank, "Improved water source" is defined as: "Access to an improved water source refers to the percentage of the population using an improved drinking water source. The improved drinking water source includes piped water on premises (piped household water connection located inside the user's dwelling, plot or yard), and other improved water sources (public taps or standpipes, tube wells or boreholes, protected dug wells, protected springs, and rainwater collection)." Clean drinking water and improved water source will be used interchangeably.

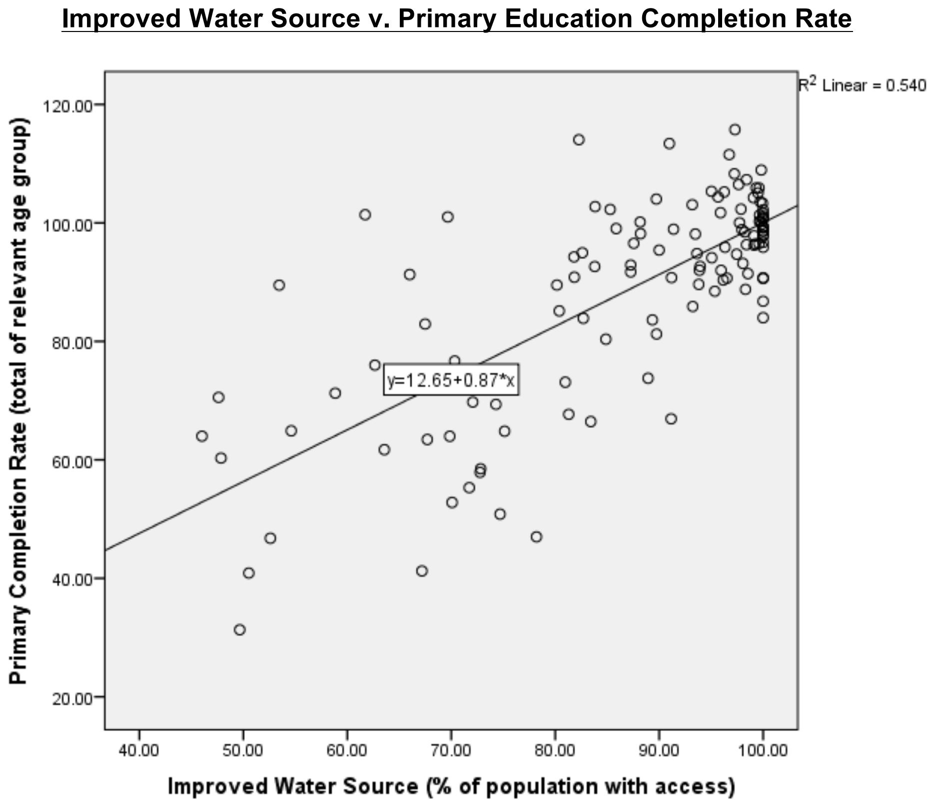
Dependent Variable: Education

In this study, "education completion rates" are taken into account to measure overall education outcomes. As opposed to measuring the education enrollment rate, I decided to calculate the education completion rate instead because students often drop out after having enrolled due to problems posed by the lack of accessible clean drinking water as the proposed causal mechanisms suggest. “Official enrollments sometimes differ significantly from attendance and even school systems with high average enrollment ratios may have poor completion rates” (World Bank). Thus, measuring the completion rate rather than the enrollment rate is more accurate.

Though calculating education completion rate as opposed to education enrollment rate is more accurate, calculating education completion rate is still flawed. The education completion rate does not equate to a quality education. Illiteracy rates are still high. However, it is still less flawed than education enrollment rate and thus, makes for a better means of calculating education.

Linear Regression Analysis

A linear regression analysis was conducted to calculate the correlation of clean drinking water and education. The independent variable is set as “Improved Water Source (% of population with access)” and the dependent variable is set as “Primary Education Completion Rate (% of total relevant age group)” and “Lower Secondary Education Completion Rate (% of total relevant age group)”.



*This scatterplot shows a strong positive linear correlation between Improved Water Source and Primary Completion Rate.

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Improved Water Source (% of population with access)[b]	.	Enter

a. Dependent Variable: Primary Completion Rate (total of relevant age group)

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.735[a]	.540	.536	11.95271

a. Predictors: (Constant), Improved Water Source (% of population with access)

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
	Regression	19934.958	1	19934.958	139.535	.000[b]
1	Residual	17001.207	119	142.867		
	Total	36936.166	120			

a. Dependent Variable: Primary Completion Rate (total of relevant age group)

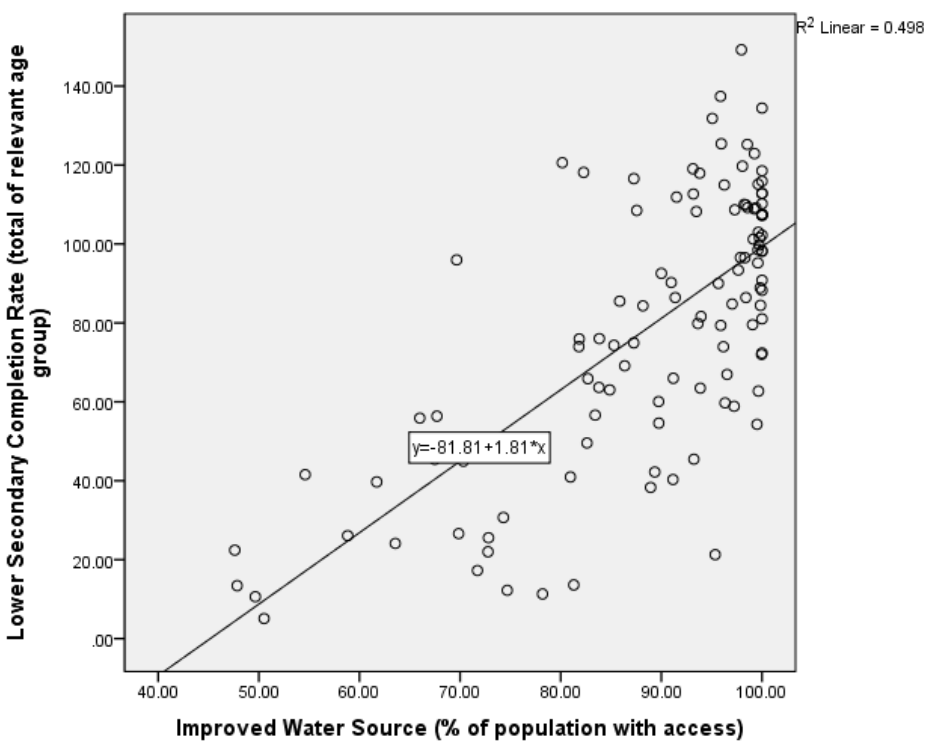
b. Predictors: (Constant), Improved Water Source (% of population with access)

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
	(Constant)	12.645	6.545		1.932	.056
1	Improved Water Source (% of population with access)	.874	.074	.735	11.812	.000

a. Dependent Variable: Primary Completion Rate (total of relevant age group)

Improved Water Source v. Lower Secondary Education Completion Rate



* This scatterplot shows a strong positive linear correlation between Improved Water Source and Lower Secondary Completion Rate.

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Improved Water Source (% of population with access)[b]	.	Enter

a. Dependent Variable: Lower Secondary Completion Rate (total of relevant age group)

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.706[a]	.498	.494	24.36538

a. Predictors: (Constant), Improved Water Source (% of population with access)

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	65398.678	1	65398.678	110.160	.000[b]
	Residual	65897.576	111	593.672		
	Total	131296.254	112			

a. Dependent Variable: Lower Secondary Completion Rate (total of relevant age group)

b. Predictors: (Constant), Improved Water Source (% of population with access)

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-81.807	15.537		-5.265	.000
Improved Water Source (% of population with access)	1.811	.173	.706	10.496	.000

a. Dependent Variable: Lower Secondary Completion Rate (total of relevant age group)

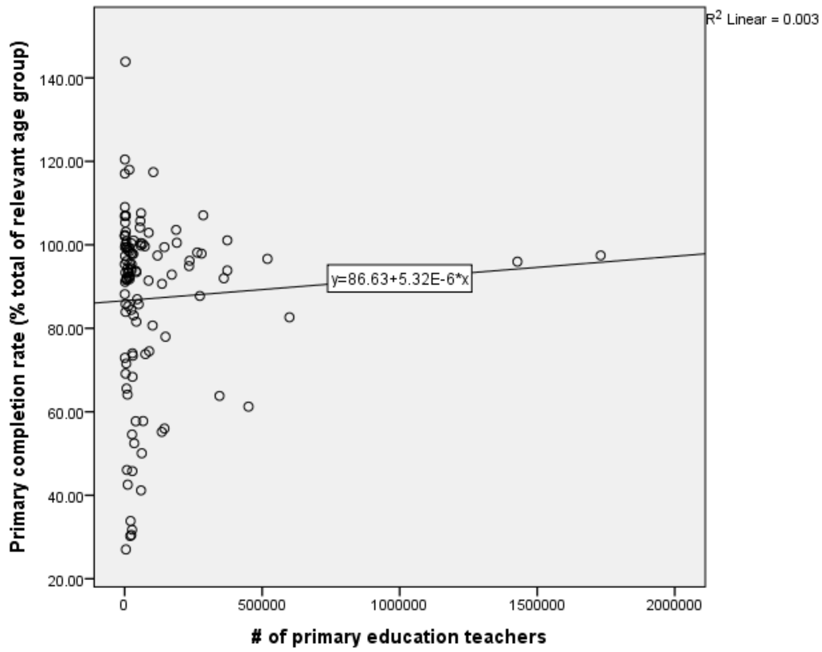
After having conducted a linear regression analysis on the access to improved water source and education completion rates, a significant correlation between education completion rate and access to improved water source was found. The statistical result shows a significant positive correlation between the two variables. This means when there is an increase in access to an improved drinking source, there will also be an increase in education completion rate on both primary and secondary levels.

Also, the probability of it being rejected due to chance is less than 5% since the significance level is at .000 in both linear regression analyses. This means the relationship between water and education completion rate is significant.

Another important indicator is R^2, which represents whether the model accurately reflects reality. In the linear regression analysis of primary education completion rates and access to improved water source, the R^2 value was equal to .540. This is considered a strong value as it is >.4. This value also means that the regression explains 54% of the variation in the dependent variable, or the outcome of primary completion rate. In the linear regression analysis of lower secondary education completion rates and access to improved water source, the R^2 value was equal to .498. Again, this is considered a strong value as it is >.4. This value also means that the regression explains 49.8% of the variation in the dependent variable, or the outcome of lower secondary education completion rate.

Also, another linear regression analysis was conducted to challenge underlying variables such as the number of teachers (proposed independent variable by Khan, Bellew and King), suggesting that revisions to educational infrastructures will bring about a positive correlation in education enrollment/completion rates. Although I did not measure all the suggested variables within the educational infrastructure to be adjusted, I measured one type of revision to educational infrastructure to be representative of other revisions to educational infrastructure.

# of Primary Education Teachers v. Primary Education Completion Rate



Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	# of primary education teachers[b]	.	Enter

a. Dependent Variable: Primary completion rate (% total of relevant age group)

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.057[a]	.003	-.006	21.41637

a. Predictors: (Constant), # of primary education teachers

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	169.719	1	169.719	.370	.544[b]
	Residual	51828.695	113	458.661		
	Total	51998.413	114			

a. Dependent Variable: Primary completion rate (% total of relevant age group)

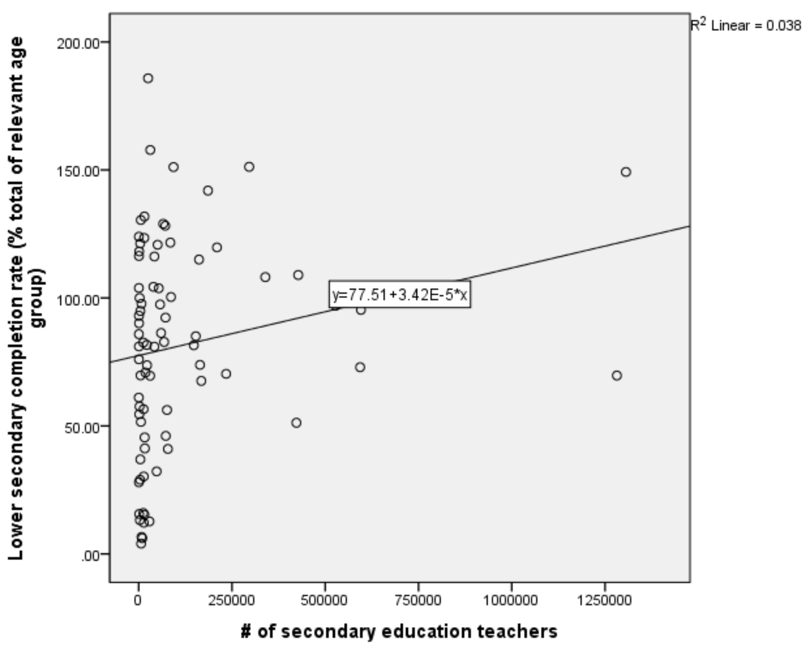
b. Predictors: (Constant), # of primary education teachers

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	86.634	2.177		39.786	.000
	# of primary education teachers	5.316E-006	.000	.057	.608	.544

a. Dependent Variable: Primary completion rate (% total of relevant age group)

# of Secondary Education Teachers v. Lower Secondary Education Completion Rate



Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	# of secondary education teachers[b]	.	Enter

a. Dependent Variable: Lower secondary completion rate (% total of relevant age group)

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.194[a]	.038	.025	40.72153

a. Predictors: (Constant), # of secondary education teachers

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4997.773	1	4997.773	3.014	.087[b]
	Residual	127684.722	77	1658.243		
	Total	132682.495	78			

a. Dependent Variable: Lower secondary completion rate (% total of relevant age group)

b. Predictors: (Constant), # of secondary education teachers

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	77.509	5.077		15.265	.000
	# of secondary education teachers	3.421E-005	.000	.194	1.736	.087

a. Dependent Variable: Lower secondary completion rate (% total of relevant age group)

The independent variable “Improved Water Source (% of population with access)” was replaced by “# of primary education teachers” and “# of secondary education teachers” and the dependent variable (primary education completion rate and lower secondary completion rate) remained the same.

The regression analysis results are statistically insignificant. The regression was not a perfect model by any means. Admittedly, the linear regression analysis of water v. # of primary teachers is flawed because 1) the ratio of student-to-teacher is varies depending on population of each country and is not accounted for, and 2) the outliers to the far right of the graph could have thrown off the linear regression analysis. This could have attributed to skewed data and incorrect analysis of its significance in regards to correlation between # of teachers to education outcomes.

Despite these flaws, the results are still insignificant. The alternative hypothesis that suggests that there is a correlation between the number of teachers and education completion rates is insignificant. In fact, the significance level was .544 when it came to primary education and .087 when it came to lower secondary education. Since these values are greater than .05, the correlation is insignificant.

Also, in the linear regression analysis of primary education completion rates and the number of primary education teachers, the R^2 value was equal to .003. This is considered a very weak value as it is <.4. This value also means that the regression explains .3% of the variation in the dependent variable, or the outcome of primary completion rate. In the linear regression analysis of lower secondary education completion rates and the number of secondary education teachers, the R^2 value was equal to .038. Though less of a weak value than the linear regression analysis concerning the number of primary education teachers, the value is still considered a weak value as it is <.4. This value also means that the regression explains only 3.8% of the variation in the dependent variable, or the outcome of lower secondary education completion rate.

The purpose of testing this underlying variable is to address an alternative hypothesis and see whether investing in the actual educational infrastructures has been bearing significant outcomes or whether the hypothesis of my own study which suggests that problems with access to water and problem with external infrastructures (such as public service infrastructures that supply water) bears a more significant outcome. ***In conclusion, when the regression of the linear was quantified, the results showed that the relationship between completion of education in both primary and lower secondary level and access to an improved water source were significant (World Bank). In contrast, in the simple scatterplot with the completion of education set as the dependent variable and the available number of teachers set at the independent variable, the relation was inconclusive (World Bank).***

The Case of Ethiopia

Ethiopia has one of the lowest enrollment rates (Ababa, 18). Apart from the low level of enrollment, primary education in Ethiopia suffers from persistent disparity between sexes (Ababa, 18). Also, according to *Drinking Water: Equity, safety and sustainability JMP Thematic Report on Drinking Water 2011*, 25-39% of Ethiopia's population takes more than 30 minutes on one trip to collect water (UNICEF and World Health Organization, 29). In order to find a reason for the low enrollment rates and to explore whether it could be due to the lack of access to clean drinking water, I gathered interview transcripts of females living in Ethiopia. In all reviewed interviews, interviewees were unable to obtain an education due to having to invest their time and energy into traveling long distances to draw water (Rosenberg).

In "*Miraculous Water: Effects of Scarcity and Abundance in Benin, Ethiopia, Ghana, and Mali*", two sisters named Ardo and Nema Umer explained how they walk 20 kilometers every day to fill a bucket with water so that their mother can cook and so that the whole family can drink it. The daily need to get water for survival makes it impossible for them to have time for any other activity so they have never gone to school. This reflects the story of thousands of other families in Ethiopia that do not have regular access to water. Another female named Shokira further supported their claims stating, "I did not go to school either, but I would have liked to. The water takes up most of our time."

In the case of Aylito Binayo, she had to drop out of school when she was 8 years old, partly in order to help her mother fetch water (Rosenberg). "The need to fetch water for the family, or to take care of younger siblings while their mother goes, is the main reason very few women in Konso have attended school" (Rosenberg). All in all, the interviews explain how inaccessible water plays a huge role in making education unattainable – especially for women but, not limited to women. The problem with the lack of access to drinking water is inclusively true, for all.

The Case of Finland

The United Nations "World Water Development Report: Water for People, Water for Life" published in 2003 ranked Finland as the country with the best water out of 122 other countries. "A report published at the Third World Water Forum in Kyoto listed 122 countries in order from the best to the worst in terms of the quality of their water. After Finland came Canada, New Zealand, Great Britain and Japan. According to the Ministry of Agriculture and Forestry, Finland is one of the top countries in the world in regard to the amount and quality of water. Finland has enough water for the needs of all their citizens and functioning water services cover the whole country" (Boakye, 12).

Water quality indicator values in selected countries*

Rank	Country	Indicator Value	Rank	Country	Indicator Value	Rank	Country	Indicator Value
1	Finland	1.85	42	Estonia	.11	83	Kazakhstan	-.33
2	Canada	1.45	43	Panama	.11	84	China	-.33
3	New Zealand	1.53	44	Slovakia	.10	85	Libya	-.33
4	United Kingdom	1.42	45	Turkey	.10	86	Papua New Guinea	-.35
5	Japan	1.32	46	Trinidad and Tobago	.10	87	Malaysia	-.35
6	Norway	1.31	47	South Africa	.09	88	Israel	-.35
7	Russian Federation	1.30	48	Croatia	.09	89	Honduras	-.36
8	Republic of Korea	1.27	49	El Salvador	.08	90	Paraguay	-.37
9	Sweden	1.19	50	Fiji	.06	91	Uzbekistan	-.37
10	France	1.13	51	Bulgaria	.04	92	Azerbaijan	-.39
11	Portugal	1.09	52	Botswana	.04	93	Gabon	-.40
12	United States	1.04	53	Venezuela	-.01	94	Senegal	-.42
13	Argentina	1.03	54	Lithuania	-.02	95	Ukraine	-.47
14	Hungary	.93	55	Jamaica	-.04	96	Bhutan	-.49
15	Philippines	.91	56	Ecuador	-.06	97	Madagascar	-.49
16	Switzerland	.87	57	Germany	-.06	98	Togo	-.53
17	Ireland	.86	58	Zimbabwe	-.08	99	Tunisia	-.54
18	Austria	.85	59	Peru	-.08	100	Thailand	-.59
19	Iceland	.74	60	Lebanon	-.11	101	Haiti	-.61
20	Australia	.73	61	Romania	-.13	102	Nigeria	-.62
21	Netherlands	.70	62	Albania	-.14	103	Mozambique	-.64
22	Mali	.66	63	Egypt	-.15	104	Algeria	-.64
23	Brazil	.64	64	Sri Lanka	-.16	105	Zambia	-.67
24	Slovenia	.63	65	Saudi Arabia	-.18	106	Mexico	-.69
25	Singapore	.62	66	Armenia	-.19	107	Benin	-.70
26	Greece	.61	67	Bolivia	-.2	108	Uganda	-.70
27	Cuba	.60	68	Cameroon	-.2	109	Ethiopia	-.74
28	Spain	.58	69	Moldova	-.22	110	Indonesia	-.77
29	Denmark	.55	70	Tanzania, United Rep. of	-.22	111	Malawi	-.77
30	Iran, I.R.	.52	71	Belarus	-.22	112	Mauritius	-.77
31	Italy	.47	72	Macedonia	-.23	113	Rwanda	-.78
32	Uruguay	.39	73	Viet Nam	-.23	114	Central African Rep.	-.81
33	Kuwait	.39	74	Mongolia	-.24	115	Burundi	-.95
34	Poland	.37	75	Kenya	-.26	116	Burkina Faso	-1.0
35	Columbia	.27	76	Dominican Republic	-.28	117	Niger	-1.04
36	Czech Republic	.27	77	Kyrgyzstan	-.28	118	Sudan	-1.06
37	Ghana	.23	78	Nepal	-.28	119	Jordan	-1.26
38	Costa Rica	.23	79	Syrian A.R.	-.29	120	India	-1.31
39	Chile	.19	80	Pakistan	-.30	121	Morocco	-1.36
40	Bangladesh	.18	81	Guatemala	-.30	122	Belgium	-2.25
41	Latvia	.15	82	Nicaragua	-.32			

Pressures on water quality are particularly severe in developing countries where institutional and structural arrangements for the treatment of municipal, industrial and agricultural wastewater are often poor. Source: Esty and Cornelius, 2002.

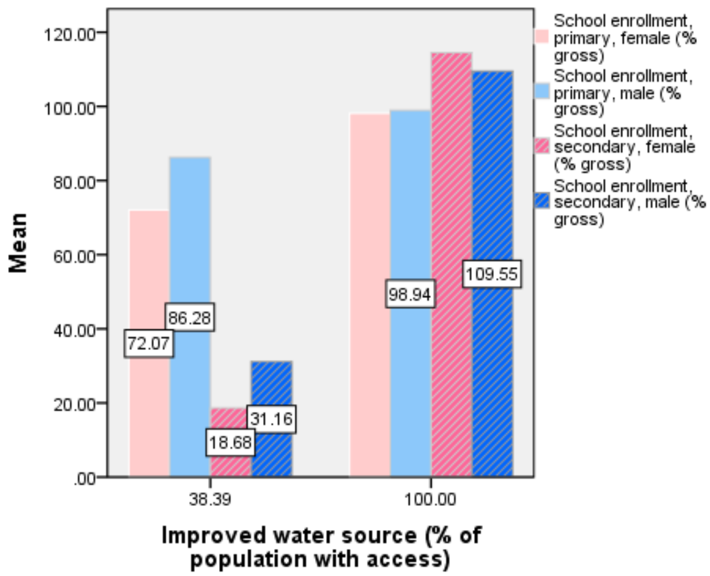
These are composite figures based upon a range of factors, such as the quantity and quality of freshwater, especially groundwater, wastewater treatment facilities as well as legal issues such as the application of pollution regulations.

Credit: http://www.unesco.org/bpi/wwdr/WWDR_chart2_eng.pdf

According to the Economist Intelligence Unit for Pearson and documentary "*The Finland Phenomenon: Inside the World's Most Surprising School System*", Finland has the best education system in the world (Economist Intelligence Unit, 40). It's interesting to see that the country with the best education system also happens to be one of the top countries, if not the best, in the world in regards to the amount and quality of water. Perhaps one of the major reasons Finland has become a country with such a great educations system can be traced back to how it has great quality water and accessibility to it.

Furthermore, the problems posed by the lack of access to clean drinking water mentioned in the interviews conducted in Ethiopia are non-existent in Finland. According to these observances, the hypothesis that the access to clean drinking water has a causal relationship to education is supported.

The Comparative Case of Ethiopia and Finland



As this chart shows, there is a significant gender gap among female and male student enrollment rates in Ethiopia on both the primary and secondary enrollment levels. However, in the case of Finland, there is barely a noticeable difference in male and female enrollment rates among primary school enrollment rates. In the case of secondary school enrollment rates, there is a higher enrollment rate among females than males.

From this bar graph, one can deduct that there is a significant amount of students that are not enrolled who are females in comparison to males in countries with populations with little access to an improved water source. Additionally, one could infer that access to clean drinking water may be causing this rift in female-to-male enrollment rates.

The reason for such a low female enrollment rate could be due to the need for them to draw water (UNICEF and World Health Organization, 28). If the water issue were to be resolved, there would be a significant number of girls who no longer need to invest their time and effort into travelling long distances to draw water. Instead, they could invest their time and effort into attending school. Perhaps then, the rift in female-to-male enrollment rates would not be as great.

Though the focus of this study is not women, a large portion of the study addresses the issue of women not going to school because female students make up a significant amount of students that are not enrolled. They are accounted for because if the problem with access to clean drinking water were to be resolved, females would make up a significant number of people that could not but now are able to obtain an education.

Conclusion: Pooling It Together

In conclusion, with the use of quantitative and qualitative methods, a direct correlation between the access to clean drinking water and the education completion rate was established. However, water could not be determined as the only independent variable as the causal factor for education rates. A strong causal relationship could not be established between just water due to too many underlying variables (i.e., gender roles, geographic location) to isolate access to water as the only causal factor.

A major weakness in my research design can be found in my case studies. The case studies on Ethiopia and Finland had too many different variables that could not be controlled. Finland being a developed country and Ethiopia being an underdeveloped country posed several complications. Finland has the economic means to afford other programs despite the provision of water that could increase outcomes in education while Ethiopia does not have the economic means to do so. Finland has a higher level of gender equality while Ethiopia has a lower level of gender equality. Due to these differences, the case studies were not in agreement with either of Mill's Theory of Agreement or Mill's Theory of Difference and thus, became a major weakness in my paper.

My research still contributes to the ongoing conversation concerning water and/or education because it analyzes the relationship between water and education. Although water could not be identified as the single causal factor to education outcome rates, still, a strong correlation between access to clean drinking water and education completion rates was established through my study and thus, would still prove to be sufficient grounds for policy implications.

Had I had more funding, I would have conducted much of the research in-person by traveling to Finland and Ethiopia as opposed to searching up scholarly articles, reports and journals online. Had I had more time, I would have conducted more research on the underlying variables. In doing so, I would have been able to formulate a stronger case for my hypothesis and would have been able to delve deeper into the puzzle at hand. Although there is much more to be explored, my study on the relationship of access to clean drinking water to education could be another step forward in the right direction.

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