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# Do Societies benefit by a more Gender equal Education System?

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## **Abstract**

Evolutionary, the two sexes have been selected for different traits, and some division in interests and activities between the genders is natural. The important thing is that both sexes are given the same opportunities and treated equally valuable. In the modern society, education has become an important factor, for both sexes, to be successful later in life. Even though the gender gap in education has decreased over the last decades, there is still a tendency that girls are underrepresented in school cross-culturally, and it is clear that some world regions and religions have lower ratio of girls in school than others. In this master thesis I have examined possible connections between more gender equality in education and different aspects of a society. I found that there are significant correlations between “Number of years in school for girls in relation to boys” and HDI, Life expectancy, Child mortality, Maternal mortality, Age at first marriage and Mean number of children per woman. My results also suggest possible correlations with Divorce, Population growth, Suicide and Homicide, while HIV did not turn out to correlate with “Number of years in school for girls in relation to boys” in my analyses.

## **Summary in Norwegian**

Menn og kvinner har i løpet av evolusjonen blitt selektert for ulike egenskaper, og det er naturlig at vi ser en viss forskjell i interesser og aktiviteter mellom kjønnene. Det som er viktig er at begge kjønn blir gitt like muligheter og at alle behandles med like stor respekt. I det moderne samfunn har utdanning blitt en viktig forutsetning for å lykkes videre i livet, både for menn og kvinner. Selv om kjønnsforskjellene i utdanning har minnet i løpet av de siste tiårene, er det fremdeles en klar tendens at jenter går færre år på skolen enn gutter, og det viser seg at noen verdensregioner og religioner har tydelig lavere jente-ratio i skolen enn andre. I denne masteroppgaven har jeg undersøkt mulige sammenhenger mellom det å ha flere jenter i skolen og ulike aspekter ved et samfunn. Jeg fant at «antall år jenter går på skolen i forhold til gutter» har en statistisk signifikant sammenheng med HDI, forventet levealder, barnedødelighet, dødelighet blant mødre, alder ved første ekteskap og antall barn per kvinne. Resultatene mine antyder også en mulig sammenheng med skilsmisserate, populasjonsvekst, selvmord og drap, mens HIV ikke virket å ha sammenheng med «antall år jenter går på skolen i forhold til gutter» ifølge disse analysene.



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# INTRODUCTION

## Background

The main question in life history theory is how to use resources most efficiently. Through time, selection has caused males and females to evolve diverse traits and characteristics, and these differences have led each sex to have different optimal strategies in utilizing available resources (Low 2015). The fact that females invest energy in large, nutritious gametes, while males produce small, cheap, fast-travelling gametes, makes it profitable for females to specialize in parental effort and for males to specialize in mating effort (Low 2015). To be reproductive successful, a male should spread his gametes as much as he can, and traits that help him do so will evolve. A female, on the other hand, will be reproductive successful if she possesses traits that makes her good at parental care (Low 2015). Males are for instance adapted to be bigger, to strive power and achievement and to be more willing to take risks. Females are more adapted to appreciate benevolence and universalism values (Schwartz and Rubel-Lifschitz 2009) and to be more protecting and risk averse (Campbell 1999; Low 2015).

“Gender equity” and “gender equality” are terms that often are exchanged and misunderstood, also when it comes to women’s rights. “Gender equality” proposes that everyone should be treated the same way to ensure equal opportunities, while “gender equity” considers the fact that people are different and have various needs and desires. Since men and women through evolution have been adapted to different qualities, it is not necessarily profitable to treat men and women exactly the same. The evolved sex differences makes it “natural” to have different interests and division of labour (Low 2011). This does not necessary mean gender inequality. In fact, Schwartz and Rubel-Lifschitz (2009) argue that in more gender equal societies, both sexes have more freedom to pursue the traits they have been selected to appreciate. Consequently, we might see even larger sex differences in certain traits in societies with higher gender equity (Schwartz and Rubel-Lifschitz 2009). What is important is to treat both sexes equally respectful and to give everyone a chance to live worthy lives. Today we often focus on three aspects of equity: job opportunity and pay equity, equity in voting and office-holding in politics, and equity in reproductive decisions (Low 2011). It is important to offer both girls and boys education to ensure that everyone has the same opportunities within these traits. People with limited education have shown to have less autonomy than more educated people. They have less choices, are more vulnerable and might handle personal crises poorly (Malik 2014).



Women as a group, together with poor, minorities, indigenous people and people from rural areas, are more likely to meet barriers throughout life that prevent them from having resources and equal rights as men (Malik 2014). In many countries, girls have been greatly underrepresented in schools, particularly at higher levels (Gakidou, et al. 2010), despite the fact that several studies have shown numerous positive effects of educating women. A mother's education has turned out to be one of the most important factors determining child survival and health (Caldwell 1979; Gakidou, et al. 2010; Hobcraft, et al. 1984). Children of mothers with seven or more years of schooling have shown to have mortality rates 10 to 40 % of the mortality rates for children of mothers without any education (Hobcraft, et al. 1984). A better education system for everyone, with equal opportunities and rights, improves health, economic growth and democracy (Lutz and Samir 2011). A Ghanaian scholar stated "If you educate a man you educate an individual, but if you educate a girl you educate a nation" (Isaacs 2013).

More equal education possibilities for everyone reduce the distance between rich and poor and leads to a more resistant society (Malik 2014). Societies with more equal citizens have shown to be profitable in many ways (Pickett and Wilkinson 2011). From an evolutionary point of view, humans tend to care about the people they are close to (e.g. relatives, neighbours). Before our modern society, we used to live in small groups with few people around us, and where everyone knew each other (Bongard and Røskaft 2010). Today we might bypass thousands of people each day, but we unconsciously choose to spend time with our in-group (those we are close or related to) rather than with an out-group (those we are not close to) (Bongard and Røskaft 2010). It is easier to feel compassion with the in-group, rather than the out-group. According to Pickett and Wilkinson (2011), the more economic equal a society is, the more people will be in the in-groups, and this will result in societies with more cooperation and trust, and less discrimination and crime (Pickett and Wilkinson 2011). More equal citizens are also believed to increase life expectancy and improve health (Pickett and Wilkinson 2011). To achieve a more equal society, it is important that everyone has the same opportunities, and education for all is an essential asset to reach such a goal (Malik 2014).

Distinct gender roles in a society might occur from several reasons. The position of women in a society varies around the world and has also changed through time. (Cooray and Potrafke 2011; Low 2005; McDonald 2000). This variation is a result of interaction of both natural selection and ecological and social constraints. In traditional societies the gender roles were mostly decided by ecological and social reasons. Being a warrior or big-game-hunter and taking high risk could be profitable for men to show off resources and strength and increase their

reproductive success. Women, on the other hand, had too much to lose by taking such risks. Pregnancy and nursing made it more reasonable to use women as child nurturer and gatherers of food nearby (Low 2015). Murdock and Provost (1973) studied work activities in countries all over the world and found that several activities were performed almost strictly by men, and other strictly by women. However, as more machines and technology have developed, we see that more men contribute in the typical female work (Low 2011). In the modern society most work can be performed equally well by both men and women, as long as they have the right education (Low 2011). The ecological arguments for division of work are therefore not as strong as before, and today different gender roles seem to be more culturally than ecologically determined (Low 2011). There is a tendency cross-culturally that sons and daughters are raised differently. Sons are usually trained in behaviours that are beneficial in competition, while girls are trained in sexual restraint, obedience and responsibility (Low 2005). Most human societies are polygynous which means that reproductive success varies more in men than in women (Low 2015). Because of this, men are more dependent on having abundant resources to achieve high reproductive success. In a polygynous society most women will marry, while an unattractive man easily could end up with no wife or children. In polygynous societies, parents gain by investing more in their sons than in their daughters, and they often, with or without conscious, prioritize their sons (Low 2015).

The opportunity for education for girls has improved in many countries over the last decades, but it is still a tendency that there are fewer girls than boys in school (Gakidou, et al. 2010). Also, in countries where women are encouraged to go to school, there are still not many well-paid, high-status jobs that women can do while simultaneously raising children (Low 2005). Even though we see some few women in top jobs today, it does not mean that the labour-market is equal for both genders (Low 2011). In the US, women without children earn almost the same as men, but women with children earn significantly less (Low 2011). It is usually the wife and mother who has to take the economic cost of being home with the children (Low 2011). In such societies there might be equity in individual-oriented social institutions, but still low equity in family-oriented social institutions (McDonald 2000). When women are educated and become professional workers, they will acquire more economic independence (Low 2011). There is reason to believe that increased education of girls might result in changes in marriage and family organization since educated women are more capable of living on their own (Stewart and Brentano 2006).

## **Aim of study**

The aim of this master thesis is to explore possible effects of a more gender equal education system. As explained, girls seem to be the underrepresented gender in school, and I want to examine if it seems profitable to invest in sending more girls to school. My hypothesis is that societies with more equal education possibilities for girls and boys will be healthier in several ways. I will discuss the subject from a more biological point of view, to hopefully give some new perspective to more sociological studies.

# **METHODOLOGY**

To examine the possible effects of a more gender equal education system, I did cross-cultural analyses to test for correlations between variables that could explain possible connections between gender equality in education and characteristics of a society. Most data in this master thesis are gathered from Gapminder, which is a non-profit venture registered in Stockholm, Sweden. (Gapminder 2015). By using the database from Gapminder, I managed to extract data from 175 countries. I selected the variables I expected would shed light to my hypothesis, and further analyses with the chosen variables were done in the statistical program Statistical Package for Social Science (SPSS), version 20.

## **Statistical analyses**

The data were tested for normal distribution, which is essential to get reliable results from the analyses. Not all countries had information about every variable under study. That is why samples in some of the analyses are smaller, and statistical analyses regarding these variables have to be analysed more warily.

I used Analyse of Variance (ANOVA) to compare mean number of years in school for girls and boys between different world regions and religions. To test for intercorrelations between the independent variables, I performed pairwise correlation analyses between the variables. These tests were done to investigate whether some of the independent variables correlated too strongly with each other to be used in same tests in further analyses. The pairwise correlations including the dependent variable also gave indications of possible negative or positive correlations with the different independent variables. The r-values used in these analyses are only valid for linear relationships between variables, and I therefore had to assume linear relationships. To investigate more closely whether correlations between the dependent variable and the independent variables were significant, I did Analysis of Covariance (ANCOVA). ANCOVA test is a mix of both ANOVA and regression and was used because we had both numerical and categorical variables.

## Dependent variables

The dependent variables used to represent the education situation in each country were 1) “Number of years in school for girls”, 2) “Number of years in school for boys” and 3) “Number of years in school for girls in relation to boys”. The last variable was constructed by dividing “Number of years in school for girls” by “Number of years in school for boys” and this variable gives more information about gender equality in education.

There are some weaknesses with the dependent variables. They all consist of *mean* number of years in school for girls and boys in each specific country. They do not say anything about possible inequalities within each sex. For instance a society where there are some few girls that get very high education, while others don't go to school at all, might end up with the same *mean* number of years in school for girls as a society with more equal education for all girls. Besides, when using the ratio “Number of years in school for girls in relation to boys”, the effect of duration of education is lost. Societies with almost no education can turn out just as well as societies with high education. Also, difference in number of years in school between girls and boys will affect the ratio much more in societies with few years of education.

However, “Number of years in school for girls” correlated significantly with “Number of years in school for boys” ( $r = 0.963$ ), and also “Number of years in school for girls in relation to boys” correlated significantly with “Number of years in school for girls” ( $r = 0.839$ ) and “Number of years in school for boys” ( $r = 0.741$ ). All these correlations had p-value  $p < 0.0001$  and  $N = 347$ . Since all the variables correlated significantly with each other, and “Number of years in school for girls in relation to boys” correlated more strongly with “Number of years in school for girls” than with “Number of years in school for boys”, I argue that it is acceptable to use only “Number of years in school for girls in relation to boys” as the dependent variable in the ANCOVA-tests. For simplicity I will use YSGB as a shortening for “Number of years in school for girls in relation to boys” further in this master thesis.

## **Independent variables**

The independent variables I chose to correlate YSGB with were: World region, Religion, Year, Human Development Index (HDI), Life expectancy, Mean number of children per woman, Child mortality, Maternal mortality, Age at first marriage, HIV, Population growth, Divorce, Suicide and Homicide.

**World region** was used as a variable to examine whether education of girls seem to vary around the world. In my statistical analyses I have used the same world regions as in Gapminder: America, Europe & Central Asia, East Asia & Pacific, South Asia, Middle East & North Africa, and Africa Sub Saharan. Some of these regions had data from fewer countries than others. Sub Saharan consisted of only 7 countries, while Middle East & North Africa included 47 countries.

**Religion** was used as a variable because religion is believed to influence the position of women in a society and also gender inequality in education (Cooray and Potrafke 2011; Low 2005). However, there were no data on religion in Gapminder, and I had to use Wikipedia, despite the disadvantage of this. Information from Wikipedia is not as quality secured as the rest of the data, and should be interpreted with more care. Religion is not a straightforward variable. Since many countries have several religions I chose to categorize the countries as belonging to one of the main religions if Wikipedia indicated that more than 50 % of the citizens were members of that religion. In the countries where there were more than one religion with high percentage of members, I defined the religion as “Other religions”. The rest of the categories were: Islam, Catolism, Christians, and Asian religions (Buddhism and Hinduism). Catolism was used as a separate group to test for differences also among Christian religions. The category Christians includes the other Christian religions, and also Judaism since there was only one country with this as the main religion. As with World regions, the sample sizes among the religion categories varied. Asian religions had a sample size of only 8 countries, while Christians included 57 countries.

**Year** was used as a variable to investigate a possible development in education of girls through time. Most of the countries had well registered data for the chosen variables in the time period 1980-2009. I have therefore chosen data from year 2009 to represent today’s situation and from year 1980 as a reference to control for changes through time.

**“Human Development Index” (HDI)** is an index used to rank countries by level of "human development" not just by economic growth. It consists of three dimensions: health level, educational level and living standard” (Gapminder 2015). Health level is determined by life expectancy at birth, educational level is based on UNESCOs data on mean number of years of schooling for adults over 25 years old and expected years of schooling for children just entering school. The living standard is based on gross national income (GNI) per capita. HDI does, however, not consider factors like inequalities, poverty, human security or empowerment (UNDP 2015). I had to treat HDI with care since education level is included in the index. I have therefore omitted HDI from some of the analyses and used other independent variables instead.

**Life expectancy** is defined as “the average number of years a newborn child would live if current mortality patterns were to stay the same” (Gapminder 2015).

**Mean number of children per woman** is a measure of total fertility rate and is defined as: “number of children that would be born to each woman with prevailing age-specific fertility rates” (Gapminder 2015).

**Child mortality** is defined as “The probability that a child born in a specific year will die before reaching the age of five if subject to current age-specific mortality rates”. In this case the value is calculated as a rate per 1000 live births (Gapminder 2015).

**Maternal mortality** is calculated by dividing the number of maternal deaths by the number of live births in a given year, multiplied by 100 000. Maternal death is defined as “the death of a women while pregnant or within the 42 days after termination of that pregnancy, regardless of the length and site of the pregnancy, from a cause related to or aggravated by the pregnancy” (Gapminder 2015).

**Age at first marriage** describes the average age at first marriage for women. Women who never married are not included in the data. Neither cohabitation is registered. The data are based on multiple sources and definitions might vary (Gapminder 2015).

**HIV** was in these analyses defined as percentage of people in the age group 15-49 years living with HIV in the country (Gapminder 2015).

**Population growth** is measured as annual percentage of increase in number of people in a country. Population includes all residents regardless of legal status or citizenship, “except for refugees not permanently settled in the country of asylum, who are generally considered part of the population of the country of origin” (Gapminder 2015).

I wanted to examine if other aspects of population could have a connection with gender equality in education, and I tested if population size, population density or population growth correlated with YSGB. However, pairwise correlations showed that neither population size ( $P = 0.345$ ) or population density ( $P = 0.346$ ), but only population growth ( $P < 0.0001$ ) seemed to correlate significantly with YSGB. I have therefore used only population growth in this thesis and omitted population size and population density.

**Divorce** is calculated by number of divorces divided by the number of marriages in the given year (Wikipedia 2015). There were no data on divorce in Gapminder, and that is why the applied data are collected from Wikipedia and are not as quality secured as the rest of the data. I did not have data on divorce from 1980, so analyses regarding divorce are only with reference to today’s situation. The divorce data varied from being registered in year 2001-2011. However, most were registered in the period 2009-2011. In my analyses I will treat all divorce data as if they were from 2009, even though this will lead to slightly more uncertainty concerning correlation analyses regarding divorce.

**Suicide** includes in this case only women, and it is defined as “Mortality due to self-inflicted injury among women, per 100 000 standard population” (Gapminder 2015).

**Homicide** includes in this case only women, and it is defined as: “Mortality among women due to inter-personal violence, per 100 000 standard population” (Gapminder 2015).



# RESULTS

## Number of years in school in relation to world regions

Number of years in school for girls (ANOVA tests; 1980;  $F = 50.0$ ,  $df = 5$ , 169,  $p < 0.0001$ ; 2009;  $F = 43.7$ ,  $df = 5$ , 169,  $p < 0.0001$ ) and boys (ANOVA tests; 1980;  $F = 47.2$ ,  $df = 5$ , 169,  $p < 0.0001$ ; 2009;  $F = 43.7$ ,  $df = 5$ , 169,  $p < 0.0001$ ) differed statistically significant among the different regions (Appendix 1). Also, YSGB differed statistically significant among regions (ANOVA tests; 1980;  $F = 41.0$ ,  $df = 5$ , 169,  $p < 0.0001$ ; 2009;  $F = 27.8$ ,  $df = 5$ , 169,  $p < 0.0001$ ) (Figure 1).

Number of years in school for girls and boys in 1980 was highest in Europe and Central Asia, while Middle East and North Africa had the lowest numbers (Appendix 1). Increase in number of years in school for girls and boys was observed in all world regions from 1980 to 2009. The number of years in school for girls and boys was highest in Europe and Central Asia also in 2009, while African Sub Saharan had the lowest mean number of years in school for both girls and boys in 2009 (Appendix 1).

America had the highest YSGB both in 1980 and in 2009, closely followed by Europe and Central Asia (Figure 1). African Sub Saharan had the lowest ratio of YSGB, both in 1980 and in 2009 (Figure 1). However, there has been an increase in YSGB in all world regions since 1980. Especially the world regions with low ratios of YSGB have had a significant increase (Figure 1).

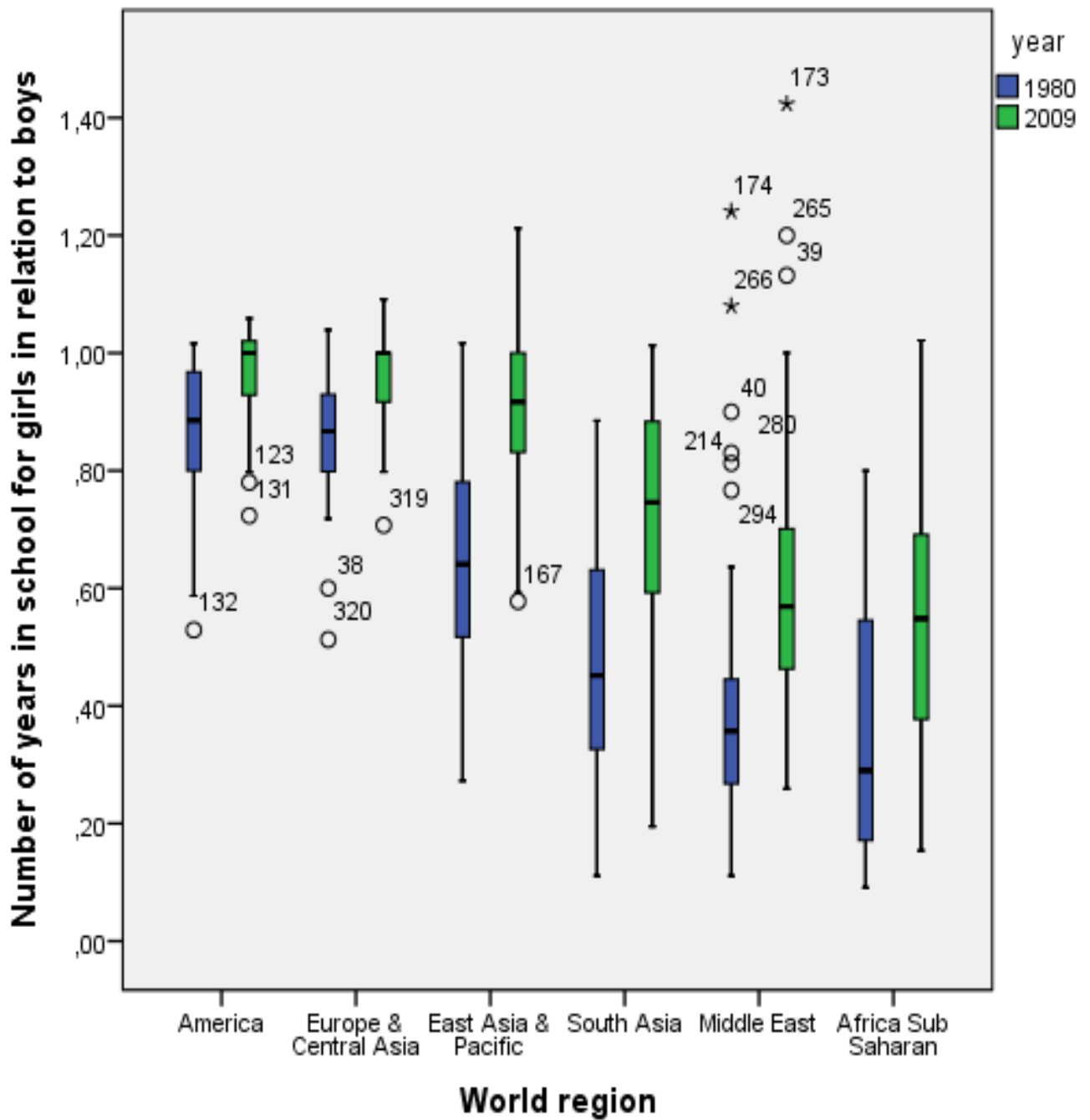


Figure 1: Number of years in school for girls in relation to boys (YSGB) in the different World regions (data from 1980 and 2009). Stars and circles show outlier countries.

## **Number of years in school in relation to religions**

Number of years in school for girls (ANOVA tests; 1980;  $F = 8.8$ ,  $df = 4$ , 170,  $p < 0.0001$ ; 2009;  $F = 9.1$ ,  $df = 4$ , 170,  $p < 0.0001$ ) and boys (ANOVA tests; 1980;  $F = 6.9$ ,  $df = 4$ , 170,  $p < 0.0001$ ; 2009;  $F = 6.3$ ,  $df = 4$ , 170,  $p < 0.0001$ ) differed statistically significant among the different religions (Appendix 2). Also, YSGB differed statistically significantly among religions (ANOVA tests; 1980;  $F = 12.6$ ,  $df = 4$ , 170,  $p < 0.000$ ; 2009;  $F = 12.8$ ,  $df = 4$ , 170,  $p < 0.0001$ ) (Figure 2).

Christians had the highest number of years in school for girls and boys in 1980, closely followed by Catolism. Islam was the religion with lowest number of years in school for girls and boys in 1980 (Appendix 2). There was an increase in number of years in school for girls and boys from 1980 to 2009 in all religions (Appendix 2). In 2009, Catolism was the religion with highest number of years in school for girls, while Christians had the highest number for boys. Islam was still one of the religions with lowest number of years in school for girls in 2009, accompanied by Asian religions (Appendix 2). Asian religions had the lowest number of years in school also for boys in 2009 (Appendix 2).

With respect to YSGB, Christians had the highest value in 1980 while Catolism had the highest value in 2009. However, both these religions scored almost equally high when it comes to YSGB. Islam came worst off, with the lowest value both in 1980 and in 2009 (Figure 2). Still, YSGB has increased in all religions since 1980 (Figure 2).

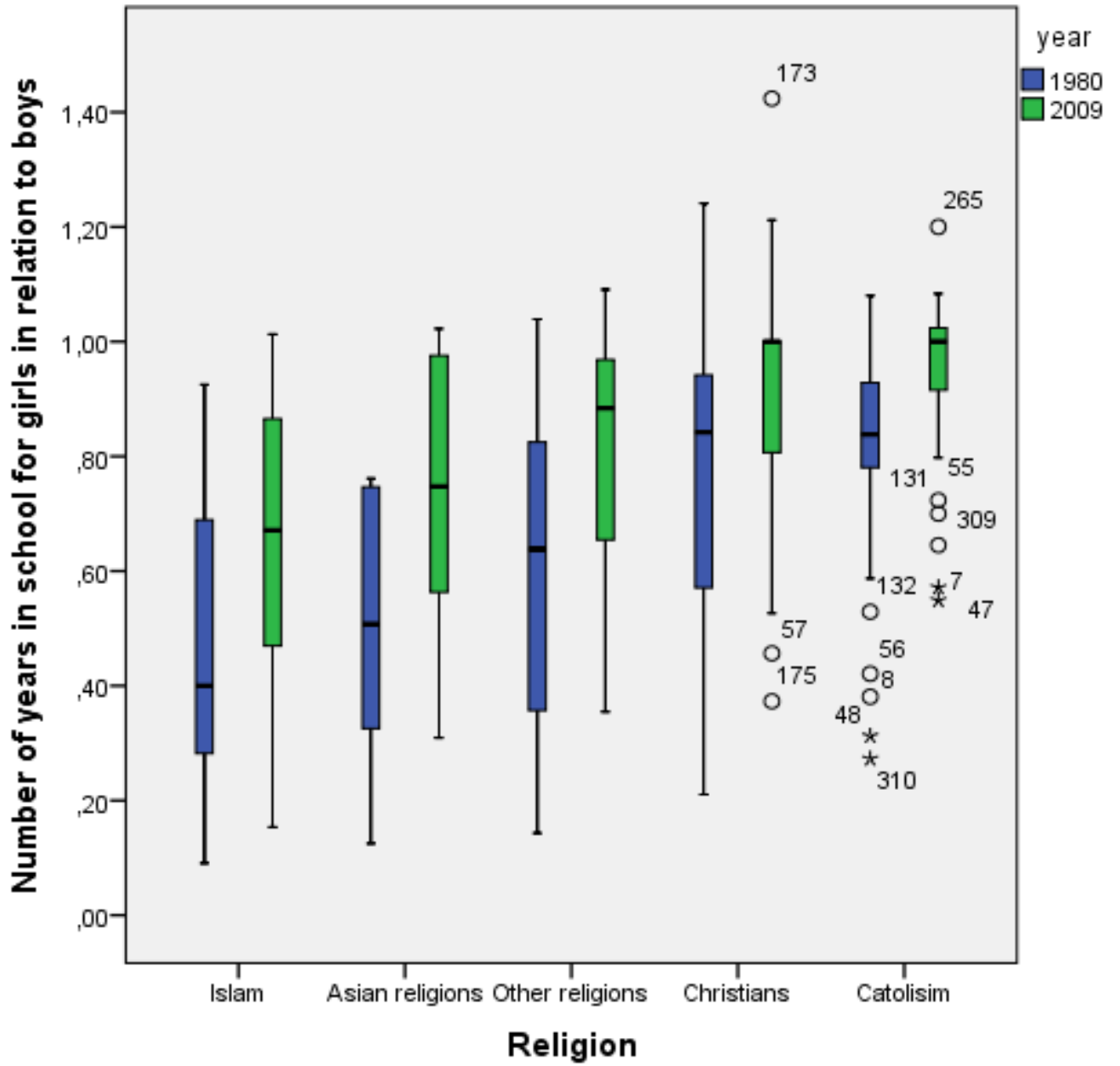


Figure 2: Number of years in school for girls in relation to boys (YSGB) in the different Religions (data from 1980 and 2009). Stars and circles show outlier countries.

## **Pairwise correlations**

The pairwise correlations indicate that YSGB has negative correlations with Mean number of children per woman, Child mortality, Maternal mortality and Population growth, and positive correlations with Life expectancy, HDI, Age at first marriage, and Divorce. HIV did not show a significant correlation with YSGB (Table 1). However, we can't rely on correlations with YSGB simply by these univariate analyses, and the possible connections need to be analysed further in ANCOVA tests.

The pairwise correlations also show high correlations between several of the independent variables, especially between Life expectancy, Child Mortality, Maternal mortality, Mean number of children per woman and HDI (Table 1). These intercorrelations have to be considered in the further ANCOVA tests.

Table 1: Pairwise correlations among the variables; YSGB, Life expectancy, Mean number of children per woman, Child mortality, HDI, Maternal mortality, Age first marriage, HIV, Divorce and Population growth (data from 1980 and 2009).

		Life expectancy	Mean number of children per woman	Child mortality	HDI	Maternal mortality	Age at first marriage	HIV	Divorce*	Population growth
<b>YSGB</b>	R p < N	0.731 0.0001 348	-0.763 0.0001 348	-0.779 0.0001 350	0.788 0.0001 330	-0.728 0.0001 350	0.601 0.0001 322	0.095 0.101 296	0.363 0.0001 89	-0.421 0.0001 349
<b>Life expectancy</b>	R p < N	1  348	-0.831 0.0001 348	-0.925 0.0001 348	0.887 0.0001 330	-0.824 0.0001 348	0.650 0.0001 322	-0.274 0.0001 296	0.375 0.0001 89	-0.315 0.0001 347
<b>Mean number of children per woman</b>	R p < N		1  348	0.838 0.0001 348	-0.826 0.0001 330	0.735 0.0001 348	-0.631 0.0001 322	0.056 0.339 296	-0.447 0.0001 89	0.544 0.0001 347
<b>Child mortality</b>	R p < N			1  350	-0.859 0.0001 330	0.836 0.0001 350	-0.637 0.0001 322	0.066 0.0001 296	-0.554 0.0001 89	0.340 0.0001 349
<b>HDI</b>	R p < N				1  330	-0.792 0.0001 330	0.744 0.0001 310	-0.155 0.008 290	0.594 0.0001 87	-0.353 0.0001 330
<b>Maternal mortality</b>	R p < N					1  350	-0.556 0.0001 322	0.120 0.038 296	-0.487 0.0001 89	0.286 0.0001 349
<b>Age first marriage</b>	R p < N						1  322	-0.006 0.916 280	0.454 0.0001 84	-0.324 0.0001 321
<b>HIV</b>	R p < N							1  296	-0.135 0.244 76	0.001 0.992 296
<b>Divorce</b>	R p < N								1  89	-0.169 0.113 89

\*Divorce data were only recorded in 2009.

Suicide and Homicide were tested for pairwise correlations with YSGB in separate tests, one test with data from 1980 and one with data from year 2009. Interestingly, the analyses show that neither Suicide nor Homicide correlated significantly with YSGB in 1980. However, in 2009 did both Suicide and Homicide turn out to correlate significantly with YSGB (Table 2). As mentioned, we can't rely completely on the pairwise correlations, but they give indications of possible connections.

*Table 2: Pairwise correlations between YSGB, Suicide and Homicide (data from 1980 and 2009).*

		<b>1980</b>		<b>2009</b>	
		<b>Homicide</b>	<b>YSGB</b>	<b>Homicide</b>	<b>YSGB</b>
<b>Suicide</b>	r	0.66	0.245	0.258	-0.188
	p <	0.628	0.068	0.001	0.014
	N	56	56	171	171
<b>Homicide</b>	R		0.064		-0.298
	p <		0.638		0.0001
	N		56		171

## ANCOVA tests

The ANCOVA test with YSGB as dependent variable, World region and Religion as fixed factors and HDI and Year as covariates, showed that YSGB correlates significantly with HDI, World region, Year and Religion (Table 3).

*Table 3: ANCOVA test with Number of years in school for girls in relation to boys (YSGB) as dependent variable, World region and Religion as fixed factors, and Year and HDI as covariates (data from 1980 and 2009).*

	<b>df</b>	<b>Mean square</b>	<b>F</b>	<b>P &lt;</b>
<b>Corrected Model</b>	11	1.57	77.94	0.0001
<b>Intercept</b>	1	0.35	17.42	0.0001
<b>HDI</b>	1	3.27	163.03	0.0001
<b>Year</b>	1	0.36	17.93	0.0001
<b>World region</b>	5	0.21	10.30	0.0001
<b>Religion</b>	4	0.11	5.51	0.0001

Since education is a major part of HDI, the response variable and one of the predictor variables in the above analysis consist of almost the same variable. This could be problematic, and since HDI also was found to highly correlate with several of the other independent variables, it is necessary to exclude HDI in the next ANCOVA test. Since Child mortality, Life expectancy, Mean number of children per women and Maternal mortality also was found to have high intercorrelations, I choose to use only one of these variables in the following ANCOVA test to avoid problems with intercorrelations.



*Table 4: ANCOVA test with Number of years in school for girls in relation to boys (YSGB) as dependent variable, World region and Religion as fixed factors, and Mean number of children per woman, Age at first marriage, Year and Population growth as covariates (data from 1980 and 2009).*

	<b>df</b>	<b>Mean square</b>	<b>F</b>	<b>P &lt;</b>
<b>Corrected Model</b>	13	1.23	61.11	0.0001
<b>Intercept</b>	1	0.06	3.11	0.079
<b>Mean number of children per woman</b>	1	1.27	63.52	0.0001
<b>World region</b>	5	0.21	10.37	0.0001
<b>Religion</b>	4	0.17	8.23	0.0001
<b>Age at first marriage</b>	1	0.21	10.29	0.001
<b>Year</b>	1	0.10	5.10	0.025
<b>Population growth</b>	1	0.08	3.74	0.054

The ANCOVA test show that Mean number of children per woman, World region, Religion, Age at first marriage and Year all have significant correlations with YSGB. Population growth did not turn out to be significant in this test (Table 4). Child Mortality, Life expectancy and Maternal mortality were tested for significance in separate, equivalent ANCOVA tests, just replacing Mean number of children per woman. Child mortality, Life expectancy and Maternal mortality all turned out to have significant correlations with YSGB in these separate tests (Appendix 3a-c).

I tried to include HIV, Divorce, Suicide and Homicide in the ANCOVA test. However, when including these variables almost all the variables shown to be significant in the previous ANCOVA tests, lost their significance (Table 5). HIV, Divorce, Homicide and Suicide all have smaller sample sizes than the other independent variables, and since Divorce only had data from 2009, data from 1980 were excluded in the analysis.

*Table 5: ANCOVA test with Number of years in school for girls in relation to boys (YSGB) as dependent variable, World region and Religion as fixed factors, and Population growth, Age at first marriage, Mean number of children per woman, Homicide, Divorce, Suicide and HIV as covariates (data from 2009).*

	<b>df</b>	<b>Mean square</b>	<b>F</b>	<b>P &lt;</b>
<b>Corrected Model</b>	16	0.02	4.05	0.0001
<b>Intercept</b>	1	0.33	57.95	0.0001
<b>World region</b>	5	0.23	4.00	0.004
<b>Religion</b>	4	0.01	1.93	0.117
<b>Population growth</b>	1	0.01	2.47	0.122
<b>Age at first marriage</b>	1	0.01	1.27	0.264
<b>Mean number of children per woman</b>	1	0.004	0.72	0.399
<b>Homicide</b>	1	0.003	0.52	0.474
<b>Divorce</b>	1	0.002	0.31	0.577
<b>Suicide</b>	1	0.0001	0.02	0.881
<b>HIV</b>	1	0.000085	0.02	0.901

The inconsistency between the ANCOVA tests, does not mean that none of the variables are significant. Contrary, it argues that we have to poor data samples regarding Divorce, HIV, Suicide and Homicide, and that we therefore can't determine any certain correlations between YSGB and these variables. The other independent variables, on the other hand, can be discussed based on the results showed in table 4.

## DISCUSSION

It is important to keep in mind that the results are correlations, not necessarily causalities. In some cases correlations could be caused simply by coincidences. The observed correlations between YSGB and some of the independent variables could have occurred as a consequence of correlations only between independent variables or other not considered factors. The presence of intercorrelations made the analyses more challenging, and even though I have tried to adjust for them, there might be some bias in the results from influences between the independent variables. Most of the tests did, however, have high power and several of the independent variables correlated strongly with YSGB. This makes the results worth considering, and it gives good indications of connections. We can't distinguish between cause and effect based on the correlation analyses, and we should be careful with drawing conclusions about the directions of the observed connections.

The results show that women are more educated today than in 1980, and also that the gender gap in education has been reduced in all the World regions and Religions. The statistically significant correlation between Year and YSGB means that the observed increase in YSGB cross-culturally is significant. This finding is supported by Gakidou, et al. (2010) which states that women's status has improved in many societies over the last decades. However, even though the average YSGB in every World region has increased, it does not necessarily mean that we see the development in every country, and it is important to keep focusing on the countries where we might not see the same development. According to Gakidou et al. (2010), large countries like India, Pakistan, Nigeria and Ethiopia still have low ratios of girls in school in relation to boys. The education gap between girls and boys in these countries is actually bigger now than it was in 1970 (Gakidou, et al. 2010).

It should be taken into consideration that it is difficult to compare education between countries. The quality of one year of schooling in a country can be very different from one year in another country. For this discussion I will focus on the main patterns worldwide, but in another study it could be interesting to take a closer look into the situation within a country, or maybe to examine the effects of educating girls separately in developing countries and developed countries. A study by Low et al. (2013) showed that life expectancy, age at first birth and fertility had different connections in countries with low HDI-ranks compared to countries with

higher HDI-ranks (Low, et al. 2013). It wouldn't be surprising if also YSGB has different effects in countries with high HDI index compared to countries with low HDI index.

## **World region and Religion**

The results argue that where you are born might predict your education opportunities as a girl. The analyses show that YSGB varies significantly between the World regions and between the Religions. It is likely to think that countries in the same region influence each other and that Religion and World region therefore have strong intercorrelation. This is difficult to test statistically since both are categorical variables. However, the analyses show that Religion and World region independently correlate significantly with YSGB, also when controlling for the other variable. It is hard to determine exactly why world region and religion seem to have such strong connections with gender equality in education. Value consensus and value importance in societies have shown to correlate with socioeconomic development and political democratization (Schwartz and Sagie 2000), and the correlation between YSGB and World region could be a result of clustering of more developing countries in certain world regions. Also the study by Low et al. (2013) suggests that aspects of women's lives differ between developing and developed countries.

Religion has shown to be an important variable influencing gender equality in education also in previous studies (Cooray and Potrafke 2011). Religion is part of forming social norms and the view of women, and religious views are often more traditional. Some religions still believe that women's role is to stay home with children, which might originate from our evolutionary past since women have evolved traits related to caring and nurturing (Low 2015; Schwartz and Rubel-Lifschitz 2009). However, in the modern society, with fewer children per woman and more similar gender roles (Low 2011), there should be no reason to deny girls education because of their traditional role as child nurturers. Some religions influence women's freedom even more directly, where girls have to cover their face with clothes and will be stoned for adultery (Low 2005). Certain religious groups restrict women to their home and oppose female education. There have been incidences in for instance Afghanistan where extremist groups have thrown acid at young school girls in protest of education of girls (Larson 2009). There has been a tendency in traditional societies that men control women (Low 2011). From an evolutionary point of view, you could explain this by men's desire to control women's reproductive value. It is important for men to spread their own genes and avoid other men from impregnating their woman (Low 2011).

It is important to show consideration when using religion as a variable. Even though a country has a main religion, there are huge differences in how religious people are both within and across countries (Smith and Sawkins 2003). Besides, as explained in the methodology section, some countries have more than one important religion and this makes it difficult to know which of the religions that influence the culture the most. It would be interesting to investigate religion and education more closely. For instance, to test differences in education between religious groups within the same country. Finally, it should be mentioned that religions are interpreted differently. It is not necessarily the religion which disapproves of female education, instead it is the people who govern and claim to follow the religion that sometimes oppose education of girls.

### **Longer lives and less mortality**

There is reason to believe that more gender equality in education has a connection with better health. The results show that when YSGB increases, the tendency is that HDI and Life expectancy increase and that Child mortality and Maternal mortality decrease. However, with these variables we have to consider intercorrelations. The strong positive correlation between YSGB and HDI is expected since education is included in the index. HDI is a measure of national development, and high HDI is often associated with devolved countries with good medical care, high life expectancy, stable infrastructure, high income and good education system (Low, et al. 2013). When we see correlation between HDI and YSGB it is hard to know whether more gender equality in education affects HDI positively, or if we just observe that countries with higher HDI, also are better at sending girls to school. Several of the independent variables regarding lifetime and health were found to correlate with each other. It makes sense that variables like Maternal mortality, Child mortality and Life expectancy correlate with each other since lower mortality rates reasonably have positive effect on average life expectancy. Also connections between child mortality and maternal mortality are well recognised, especially the fact that maternal mortality has negative effect on the child's probability of survival (Anderson, et al. 2007).

The analyses don't explain whether it is YSGB that influence the independent variables or if it's the other way around. However, it is closely to think that higher YSGB could promote higher Life expectancy, and lower Maternal mortality and Child mortality. As discussed in previous studies, educated women are likely to improve their own health by gaining more knowledge about illnesses and healthy lifestyles and by using health services (Koch, et al. 2012; Levine, et al. 1991). By attending school, girls might get a wider perspective and become more critical to some of the traditional methods that could be harmful for herself or the child (Caldwell and McDonald 1982). When it comes to Child mortality, previous studies have shown that the mother's amount of education is more important for child survival than the father's education (Caldwell and McDonald 1982). Even though mothers haven't learned anything specific about nurturing and child caring in school, still just a few years of education seem to influence child survival (Basu and Stephenson 2005). Educated women are also more likely to possess material resources, and to avoid low status jobs which are associated with stress, cancer and heart diseases (Pickett and Wilkinson 2011). Interestingly, the Life expectancy variable includes lifetime of both sexes, which indicate that not just girls gain from more equal education opportunities. It has been shown that having a more educated partner is associated with higher life expectancy. Accordingly, when the wife has higher education, also the husband is expected to live longer. (Spoerri, et al. 2014). Pickett and Wilkinson (2011) supports the fact that in societies with more equal citizens, both girls and boys live longer. More equal societies are associated with better physical and mental health, less obesity, violence and homicide (Pickett and Wilkinson 2011).

My results suggest that more gender equality in education could have a connection with lower homicide and suicide rates, even though this finding is not certain. The pairwise correlation analyses with YSGB and Suicide and Homicide with data from year 2009 indicate negative correlations between YSGB and these variables, but the similar correlation analyses with data from 1980 did not show significant correlations. The sample sizes were much smaller in 1980, and the results can be misleading because of this. However, the results could also indicate that the connection between YSGB on Suicide and Homicide has become more significant over the last decades. One could hypothesize that it has become even more vital for girls to attend school today, and that the influence on suicide and homicide therefore has become more important. However, since Suicide and Homicide were not part of the ANCOVA, and the results turned out differently in 1980 and 2009, it is difficult to make any conclusions regarding this. It would be interesting to follow up the possible connections between these variables in the upcoming

years. If further studies also find similar connections with gender equality in education and suicide and homicide, it is yet another strong argument that sending more girls to school could improve health conditions in a country.

So far, I have presented low mortalities and high life expectancy as only positive. Even though low mortalities and high life expectancy indicate a functioning society and will be positive for the single individual, it is worth mentioning that on a more global level it could increase population growth and worsen the problems with overpopulation, like the loss of biodiversity (Primack 2010).

### **Changes in family organization**

YSGB seems to correlate with several aspects of family organization. Mean number of children per woman and Age at first marriage both correlate significantly with YSGB, and the tendency is that when YSGB is higher, we have fewer children per woman and delayed first marriage. The pairwise correlation with YSGB and Divorce indicated that also divorce rates increase when YSGB is higher. However, since Divorce didn't have good enough data samples to be part of a reliable ANCOVA test, the connection between YSGB and Divorce is uncertain. Correlations between YSGB and Mean number of children per woman and Age at first marriage, on the other hand, seem to be reliable.

For most women, especially in developing countries, it is an advantage to have fewer children because many women in these countries have more children than they can take care of. Smaller families mean that a woman can use more energy and time to make sure that her children get the best of everything (Low 2011). As mentioned, the analyses show that Mean number of children per woman intercorrelated with both Child mortality and Maternal mortality. Connections between low fertility and low maternal and child mortality has been shown also in previous studies (Fortney 1987; Trussell and Pebley 1984). When intervals between births are short, children face stronger competition for the family's resources, and the mother will also be reduced from the frequent pregnancies (Trussell and Pebley 1984). It will be less demanding for a mother to give each child enough care to survive when she has fewer children. It is not necessarily just number of children that influences mortality rates, mortality rates could also influence number of children. Ecologically, women tend to have earlier reproduction and more children when the circumstances are rough and the probability of infants dying is high (Low

2005; Low, et al. 2013). When Child mortality is low, women don't have the same need to give birth to extra children, and decreased number of children per woman is expected.

Evolutionary, men profit by having numerous children while women usually gain by having fewer, so when women become educated in developing countries and get more autonomy regarding marriage and number of children, it is natural to see decreased fertility (McDonald 2000). There is a tendency, in both developed and developing countries, that first-time pregnancy is postponed when girls get higher education and participate in labor (Low, et al. 2002). This often results in lower lifetime fertility. As mentioned, reduced fertility could be positive in developing countries, however, it is not necessarily positive with fewer children if your work is preventing you from having the number of children you want (Low, et al. 2002; McDonald 2000). When women in more developed countries are postponing their first pregnancy to focus on their education and career, the probability of them never having a child increases. This indicates trade-offs between fertility and education which can result in fitness costs for women with higher education (Low, et al. 2002). Besides, older women have higher chance of complications related to pregnancy and birth (Koch, et al. 2012). It has been shown that pregnant women over 35 years old have higher risk of death than women aged 20 to 25 years old (Karlsen, et al. 2011).

The negative correlation between YSGB and Mean number of children per woman could partly be due to the higher cost parents have to pay per child if they want to send all their children to school. In traditional societies children contributed to the family at early age, by working at the farm or watching younger siblings. In modern societies children are costly until they have finished their education and starts earning money on their own. It has been shown that as education has become more and more crucial, number of children per family has decreased (Low 2011). In life history strategies it all comes down to how to spend calories and time most efficient (Low 2015). Since it has become even more important to invest a lot in each child and provide them with a good education to make them competitive in the race for resources and status, most parents rather prioritize to invest extra in few children than to have many (Low 2011). The decrease in Mean number of children per woman argue that the traditional gender roles, with the mother as mainly child nurturer, might be outdated. When resources become more important in child rearing, it will be profitable that also the mother work and spend time gathering resources instead of only reproducing (Low, et al. 2002). In evolutionary terms poorly educated women will have many children of poor quality, while well educated women in western society tend to have few children of high quality (Low 2015).



The correlation between YSGB and Age at first marriage indicate that more gender equality in education is linked to postponed marriages. Oppenheimer (1988) argues that when gender roles change and women get more economic independence, women might avoid unhealthy marriages and spend more time to find the desired spousal. It has been shown that educated women often choose to stay out of marriage or postpone it if marriage is associated with the wife doing housework while husband going to work (Ono 2003). However, if it is equity in both individual-oriented and family-oriented social institutions, education of girls doesn't seem to affect marriage formation as much as in societies with strict gender roles in the home (Ono 2003; Sweeney 2002). In fact, in more egalitarian societies, it might be attractive with high economic status in a woman (Sweeney 2002), and educated women who participate in labor will be preferred partners. When both partners are educated and work, they become more equal (Low 2011; Stewart and Brentano 2006), which could be profitable because they get more in common, but also challenging because the division of roles in the home might become unclear.

### **Uncertain connections**

Divorce did, unfortunately, not give dependable results in the ANCOVA test. Even though Divorce indicated a positive correlation with YSGB in the pairwise correlation, it is not good enough evidence that the connection is significant. It would be interesting to investigate divorce rates and gender equality in education further, for instance to examine possible correlations within each country. Higher divorce rates are a result of complex social, cultural, demographic and economic changes (Stewart and Brentano 2006), and higher education of girls is just one of the possible causes. Since the results indicate that YSGB have connections with other aspects of family organization, it is not unreasonable that education of girls also could have effects on divorce rates. Kreager, et al. (2013) stated that women with higher education are more likely to maintain a stable marriage, but they are also more likely to leave if the marriage is violent or damaging. This suggests that it is not necessarily negative for women if higher YSGB should turn out to increase divorce rates.

The possible link between YSGB and Population growth is also highly uncertain. The pairwise correlation with YSGB and Population growth indicated lower population growth when there is higher gender equality in education. Cohen (2008) also suggests that educating more women could contribute in lowering the world's population growth due to lower fertility. However,

Population growth did not turn out to be significant in the ANCOVA test, and we can therefore not conclude to have a significant correlation between YSGB and Population growth. Even though more education of girls seem to reduce number of children being born, it also indicates higher life expectancy and lower mortality rates. These effects have opposite influence on population growth, and might explain why Population growth didn't turn out to have a stronger connection with YSGB.

HIV was one of the few variables that didn't show a significant pairwise correlation with YSGB. The data on HIV were not as complete as some of the other variables, and since we couldn't include HIV successfully in the ANCOVA, the results are uncertain. Also prior studies show confusing connections between education and HIV. Some studies argue that education is an important preventive measure to avoid HIV infection (Alsan and Cutler 2013; Hallfors, et al. 2011; Jellema and Phillips 2004). Knowledge about HIV and how it is transmitted has turned out to be much higher among women with secondary education compared to uneducated women (Alsan and Cutler 2013). There are still people in Africa believing that having sex with a virgin will cure AIDS (Niens and Lowery 2009), and more knowledge is clearly needed. However, other studies from Africa have actually found that education could cause more HIV infections since educated people are thought to have more premarital sex (Fortson 2008; Hargreaves and Glynn 2002). They often stay single for a longer time which could mean more sexual partners and higher risk of HIV infections (Hallfors, et al. 2011). Other studies again conclude that school attendance reduce the number of sexual partners (Jukes, et al. 2008). The HIV problematic is clearly complex, and it would be interesting to study this further in other projects.

## CONCLUDING WORDS

In this master thesis I have tested for possible correlations between YSGB and different variables, and based on the results from these analyses I have discussed whether higher gender equality in education seems to be profitable for a society. I found that YSGB varies significantly between World regions and Religions, and that it also has varied significantly through time. Even though not all the found correlations were equally statistically robust, the overall tendency seems to be that educating more girls could have several positive effects. The statistically significant correlations indicate that where YSGB is high, there are also high Life expectancy, HDI and Age at first marriage. At the same time there is lower Mean number of children per woman, Child mortality and Maternal mortality. All these connections could be associated with a functioning society. Suicide, Homicide, Divorce, Population growth and HIV could not be stated to correlate significantly with YSGB based on these analyses. However, my results suggests that divorce rate might increase, and that suicide, homicide, and population growth could decrease as a consequence of sending more girls to school. Such findings would be interesting, and it would be worth analysing these variables further with more complete data sets. Possible causes and effects of educating women are complex, and there are probably extremely many variables which are linked to gender equality in education in some kind of way. However, together with previous studies, the results from this thesis point towards positive effects of sending more girls to school.

## REFERENCES

- Alsan MM, Cutler DM. 2013. Girls' Education and HIV Risk: Evidence from Uganda. *Journal of Health Economics* 32(5):863-872.
- Anderson FWJ, Morton SU, Naik S, Gebrian B. 2007. Maternal mortality and the consequences on infant and child survival in rural Haiti. *Maternal and Child Health Journal* 11(4):395-401.
- Basu AM, Stephenson R. 2005. Low levels of maternal education and the proximate determinants of childhood mortality: a little learning is not a dangerous thing. *Social Science & Medicine* 60(9):2011-2023.
- Bongard T, Røskoft E. 2010. *Det Biologiske Mennesket*. Trondheim, Norway: Tapir Akademisk Forlag. 342 p.
- Caldwell J, McDonald P. 1982. Influence of Maternal Education on Infant and Child-Mortality - Levels and Causes. *Health Policy and Education* 2(3-4):251-267.
- Caldwell JC. 1979. Education as a Factor in Mortality Decline - Examination of Nigerian Data. *Population Studies-a Journal of Demography* 33(3):395-413.
- Campbell A. 1999. Staying alive: Evolution, culture, and women's intrasexual aggression. *Behavioral and Brain Sciences* 22(2):203-+.
- Cohen JE. 2008. Make secondary education universal. *Nature* 456(7222):572-573.
- Cooray A, Potrafke N. 2011. Gender Inequality in Education: Political Institutions or Culture and Religion? *European Journal of Political Economy* 27(2):268-280.
- Fortney JA. 1987. The Importance of Family-Planning in Reducing Maternal Mortality. *Studies in Family Planning* 18(2):109-114.
- Fortson JG. 2008. The gradient in sub-Saharan Africa: Socioeconomic status and HIV/AIDS. *Demography* 45(2):303-322.
- Gakidou E, Cowling K, Lozano R, Murray CJL. 2010. Increased Educational Attainment and its Effect on Child Mortality in 175 Countries between 1970 and 2009: a Systematic Analysis. *Lancet* 376(9745):959-974.
- Gapminder. 2015 Gapminder. Access year:11.02: <http://www.gapminder.org/about-gapminder/>.
- Hallfors D, Cho H, Rusakaniko S, Iritani B, Mapfumo J, Halpern C. 2011. Supporting Adolescent Orphan Girls to Stay in School as HIV Risk Prevention: Evidence From a Randomized Controlled Trial in Zimbabwe. *American Journal of Public Health* 101(6):1082-1088.
- Hargreaves JR, Glynn JR. 2002. Educational attainment and HIV-1 infection in developing countries: a systematic review. *Tropical Medicine & International Health* 7(6):489-498.
- Hobcraft JN, McDonald JW, Rutstein SO. 1984. Socio-Economic Factors in Infant and Child-Mortality - a Cross-National Comparison. *Population Studies-a Journal of Demography* 38(2):193-223.
- Isaacs D. 2013. Female Education. *Journal of Paediatrics and Child Health* 49(6):425-426.
- Jellema A, Phillips B. 2004. Learning to survive: how education for all would save millions of young from HIV/AIDS. Brussels, Belgium: Global Campaign for Education 2004. 32 p.
- Jukes M, Simmons S, Bundy D. 2008. Education and vulnerability: the role of schools in protecting young women and girls from HIV in southern Africa. *Aids* 22:S41-S56.
- Karlsen S, Say L, Souza JP, Hogue CJ, Calles DL, Gulmezoglu AM, Raine R. 2011. The relationship between maternal education and mortality among women giving birth in

- health care institutions: Analysis of the cross sectional WHO Global Survey on Maternal and Perinatal Health. *Bmc Public Health* 11.
- Koch E, Thorp J, Bravo M, Gatica S, Romero CX, Aguilera H, Ahlers I. 2012. Women's Education Level, Maternal Health Facilities, Abortion Legislation and Maternal Deaths: A Natural Experiment in Chile from 1957 to 2007. *Plos One* 7(5).
- Kreager DA, Felson RB, Warner C, Wenger MR. 2013. Women's Education, Marital Violence, and Divorce: A Social Exchange Perspective. *Journal of Marriage and Family* 75(3):565-581.
- Larson A. 2009. Toward an Afghan Democracy? Exploring Perceptions of Deocratisation in Afghanistan. . Afghanistan Research and Evaluation Unit.
- Levine RA, Levine SE, Richman A, Uribe FMT, Correa CS, Miller PM. 1991. Womens Schooling and Child-Care in the Demographic-Transition - a Mexican Case-Study. *Population and Development Review* 17(3):459-496.
- Low BS. 2005. Women's Lives There, Here, Then, Now: a Review of Women's Ecological and Demographic Constraints Cross-Culturally. *Evolution and Human Behavior* 26(1):64-87.
- Low BS. 2011. Gender Equity Issues in Evolutionary Perspective. *Applied Evolutionary Psychology*:131-148.
- Low BS. 2015. *Why Sex Matters*. Princeton: Princeton University Press. 412 p.
- Low BS, Parker N, Hazel A, Welch KB. 2013. Life Expectancy, Fertility, and Women's Lives: A Life-History Perspective. *Cross-Cultural Research* 47(2):198-225.
- Low BS, Simon CP, Anderson KG. 2002. An Evolutionary Ecological Perspective on Demographic Transitions: Modeling Multiple Currencies. *American Journal of Human Biology* 14(2):149-167.
- Lutz W, Samir KC. 2011. Global Human Capital: Integrating Education and Population. *Science* 333(6042):587-592.
- Malik K. 2014. Summary. Human Development Report 2014. Sustaining Human Progress: Reducing Vulnerabilities and Building Resilience. . New York: United Nations Development Programme. 28 p.
- McDonald P. 2000. Gender Equity in Theories of Fertility Transition. *Population and Development Review* 26(3):427-439.
- Murdock GP, Provost C. 1973. Factors in Division of Labor by Sex - Cross-Cultural Analysis. *Ethnology* 12(2):203-225.
- Niens L, Lowery D. 2009. Gendered Epidemiology: Sexual Equality and the Prevalence of HIV/AIDS in Sub-Saharan Africa. *Social Science Quarterly* 90(5):1134-1144.
- Ono H. 2003. Women's economic standing, marriage timing, and cross-national contexts of gender. *Journal of Marriage and Family* 65(2):275-286.
- Oppenheimer VK. 1988. A Theory of Marriage Timing. *American Journal of Sociology* 94(3):563-591.
- Pickett K, Wilkinson R. 2011. *The Spirit Level: Why Greater Equality Makes Societies Stronger*. .
- Primack RB. 2010. *Essentials of Conservation Biology*. Massachusetts, USA: Sinauer Associates Inc. 601 p.
- Schwartz SH, Rubel-Lifschitz T. 2009. Cross-National Variation in the Size of Sex Differences in Values: Effects of Gender Equality. *Journal of Personality and Social Psychology* 97(1):171-185.

- Schwartz SH, Sagie G. 2000. Value consensus and importance - A cross-national study. *Journal of Cross-Cultural Psychology* 31(4):465-497.
- Smith I, Sawkins JW. 2003. The economics of regional variation in religious attendance. *Applied Economics* 35(14):1577-1588.
- Spoerri A, Schmidlin K, Richter M, Egger M, Clough-Gorr KM, Snc. 2014. Individual and spousal education, mortality and life expectancy in Switzerland: a national cohort study. *Journal of Epidemiology and Community Health* 68(9):804-810.
- Stewart A, Brentano C. 2006. *Divorce: Causes and Consequences*. New Haven, London: Yale University Press. 347 p.
- Sweeney MM. 2002. Two decades of family change: The shifting economic foundations of marriage. *American Sociological Review* 67(1):132-147.
- Trussell J, Pebley AR. 1984. The Potential Impact of Changes in Fertility on Infant, Child, and Maternal Mortality. *Studies in Family Planning* 15(6):267-280.
- UNDP. 2015 Human Development Index (HDI).Access year:02.03:  
<http://hdr.undp.org/en/content/human-development-index-hdi>.
- Wikipedia. 2015 Divorce Demography.Access year:02.02:  
[http://en.wikipedia.org/wiki/Divorce\\_demography](http://en.wikipedia.org/wiki/Divorce_demography).

# APPENDICES

## Appendix 1

*Appendix 1: Number of years in school for girls and boys in different world regions (data from 1980 and 2009).*

World region	1980						2009					
	Number of years in school for girls			Number of years in school for boys			Number of years in school for girls			Number of years in school for boys		
	Mean	N	±SD	Mean	N	±SD	Mean	N	±SD	Mean	N	±SD
<b>America</b>	5.3	33	±2.6	6.0	33	±2.5	8.9	33	±2.6	9.1	33	±2.5
<b>Europe &amp; Central Asia</b>	6.9	44	±1.7	8.0	44	±1.5	11.2	44	±1.6	11.6	44	±1.3
<b>East Asia &amp; Pacific</b>	4.0	25	±2.6	5.5	25	±2.4	7.8	25	±3.3	8.5	25	±2.7
<b>South Asia</b>	2.0	19	±1.8	3.8	19	±1.8	5.9	19	±2.9	7.7	19	±2.3
<b>Middle East &amp; North Africa</b>	1.1	47	±1.1	2.3	47	±1.2	3.6	47	±2.5	5.3	47	±2.1
<b>Africa Sub Saharan</b>	1.4	7	±1.6	2.9	7	±1.6	3.3	7	±2.9	5.2	7	±2.1
<b>Total</b>	3.9	175	±3.0	5.1	175	±2.8	7.4	175	±3.9	8.3	175	±3.2

## Appendix 2

Appendix 2: Number of years in school for girls and boys in different religions (data from 1980 and 2009).

Religion	1980						2009					
	Number of years in school for girls			Number of years in school for boys			Number of years in school for girls			Number of years in school for boys		
	Mean	N	±SD	Mean	N	±SD	Mean	N	±SD	Mean	N	±SD
<b>Islam</b>	2.0	43	±2.2	3.4	43	±2.4	5.0	43	±3.7	6.7	43	±3.4
<b>Catolism</b>	4.9	33	±3.0	5.8	33	±2.5	8.8	33	±3.2	9.2	33	±2.7
<b>Christians</b>	5.0	57	±3.2	6.0	57	±2.9	8.7	57	±3.7	9.3	57	±2.9
<b>Asian religions</b>	2.3	8	±1.9	3.9	8	±1.9	5.0	8	±3.0	6.3	8	±1.9
<b>Other religions</b>	3.8	34	±3.1	5.1	34	±2.9	7.2	34	±3.8	8.3	34	±3.1
<b>Total</b>	3.9	175	±3.0	5.1	175	±2.8	7.4	175	±3.9	8.3	175	±3.2



## Appendix 3

### Child mortality

*Appendix 3a: ANCOVA test with Number of years in school for girls in relation to boys (YSGB) as dependent variable, World region and Religion as fixed factors, and with Child Mortality, Age at first marriage, Year and Population growth as covariates (data from 1980 and 2009).*

	<b>df</b>	<b>Mean square</b>	<b>F</b>	<b>P &lt;</b>
<b>Corrected Model</b>	13	1.24	64.31	0.0001
<b>Intercept</b>	1	0.06	2.93	0.088
<b>Child mortality</b>	1	1.50	77.48	0.0001
<b>World region</b>	5	0.24	12.65	0.0001
<b>Age at first marriage</b>	1	0.20	10.41	0.001
<b>Religion</b>	4	0.07	3.83	0.005
<b>Year</b>	1	0.09	4.61	0.033
<b>Population growth</b>	1	0.000035	0.002	0.966

## Life expectancy

*Appendix 3b: ANCOVA test with Number of years in school for girls in relation to boys (YSGB) as dependent variable, World region and Religion as fixed factors, and with Life expectancy, Year, Age at first marriage and Population growth as covariates (data from 1980 and 2009).*

	<b>df</b>	<b>Mean square</b>	<b>F</b>	<b>P &lt;</b>
<b>Corrected Model</b>	13	1.18	53.74	0.0001
<b>Intercept</b>	1	0.40	18.34	0.0001
<b>Life expectancy</b>	1	0.69	31.28	0.0001
<b>World region</b>	5	0.25	11.23	0.0001
<b>Religion</b>	4	0.14	6.37	0.0001
<b>Year</b>	1	0.36	16.41	0.0001
<b>Age at first marriage</b>	1	0.21	9.61	0.002
<b>Population growth</b>	1	0.001	0.04	0.841

## Maternal mortality

*Appendix 3c: ANCOVA test with Number of years in school for girls in relation to boys (YSGB) as dependent variable, World region and Religion as fixed factors, and with Maternal mortality Age at first marriage, Year and Population growth as covariates (data from 1980 and 2009).*

	<b>df</b>	<b>Mean square</b>	<b>F</b>	<b>P &lt;</b>
<b>Corrected Model</b>	13	1.22	59.67	0.0001
<b>Intercept</b>	1	0.46	22.56	0.0001
<b>Maternal mortality</b>	1	1.17	57.22	0.0001
<b>World region</b>	5	0.22	10.86	0.0001
<b>Age at first marriage</b>	1	0.37	18.27	0.0001
<b>Religion</b>	4	0.12	5.91	0.0001
<b>Year</b>	1	0.53	25.72	0.0001
<b>Population growth</b>	1	0.001	0.03	0.863