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Libraries in society: comparing international metrics of societal progress to library usage statistics

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Abstract

Introduction. Literacy is a major predictor of education, income, and health. Both historically and currently, libraries have been leaders in promoting literacy globally. The objective of this research is to determine if countries with higher metrics related to the Sustainable Development Goals also demonstrate evidence of stronger relationships between library usage and literacy.

Method. Using data from the World Bank, UNESCO, the United Nations and the IFLA Map of the World, the author grouped countries several different ways by income levels, the Human Development Index, literacy rate, and the Gender Inequality Index to explore the relationship between literacy and library usage in each categorization.

Analysis. Spearman's rank correlation coefficient was used to determine if there is a relationship between the variables.

Results. In the grouping of countries by Human Development Index, literacy, progress, Gender Inequality Index and income, the correlation coefficients generally increased for each individual library usage statistic as the indicator improved.

Conclusion. In groupings of countries with higher metrics of societal health, correlation rates between library usage and literacy increase from country groups with lower rates of those metrics.

Introduction

There are few skills as universally crucial to individual success as the ability to read and write. Literacy is a major predictor of education, income and health (Grosse and Auffrey, 1989; Zimmerman, 2017). Literacy dictates, to a certain extent, the ability to participate in civic engagement and, therefore, the individual exercising agency within their own communities. As literacy demonstrates a relationship with improving the overall quality of life of the literate and, for parents, those in their care, it also promotes societal well-being on a holistic level. Typically, it has been found in research that in regions where there is higher literacy, people are healthier, better off economically and have improved civic efficacy (Paduk, 1997; Stromquist, 2006).

Because of the impact of literacy on the individual and community, literacy outreach and education is integral to library missions worldwide. Both historically and currently, libraries have been leaders in promoting literacy globally (Fitzgibbons, 2001: Jaeger, et al., 2015.). When literacy has such a great impact on the quality of life of people and libraries are effective agents of literacy outreach, they are at the forefront of working towards the Sustainable Development Goals.

This article is an exploration of the relationships between societal health, literacy and library usage on a macro, global scale, using metrics assessed by the Goals as measures. While there is a large breadth of literature on the impact of literacy on people and their greater communities and ample scholarship on the relationships between libraries and literacy, the overall picture of libraries, literacy, and societal health is incomplete. For example, is the effectiveness of libraries to promote literacy impacted by societal health and well-being? This research is an attempt to fill in some of that canvas by examining data from the World Bank, the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the International Federation of Library Associations and Institutions (IFLA) map of the World, and exploring the relationships present in those data. A novel methodological approach is taken to evaluate these relationships and, potentially, provide another way to evaluate library efficacy. The objective of this research is to determine if countries with higher metrics related to the goals also demonstrate evidence of stronger relationships between library usage and literacy. If this data can be determined to properly evaluate these relationships, can these methods therefore demonstrate the influence of libraries in their communities? With this objective in mind, this research has been conducted with the aim of answering the following questions:

1. What are the different relationships between literacy and library usage in groups of countries organized by indicators of societal health?
2. What are alternative means of grouping countries that may better reflect homogeneity?
3. Can these methods reflect the efficacy of libraries in their communities?

Background

The benefits of literacy are vast and frequently relayed in scholarship such as this. Literacy has regularly been linked to good health while low literacy has been consistently linked with poor health outcomes in academic research (DeWalt, et al., 2004; Zhang, 2020). Illiteracy impacts patients' ability to receive good medical care, leaving them more likely to miss appointments, fail to understand directions by clinicians and misread prescriptions (Spittles, 2012). Strong literacy and educational attainment have been associated with longer active life expectancy and cognitive-impairment-free life expectancy (Huang, et al., 2019). A recent systemized review determined that over the past four decades, the ability to read has been a major predictor of maternal and child survival in low and middle-low-income countries, even when controlling for socioeconomic status and the literacy level of the father (Zimmerman, 2017). Scholars have speculated that these relationships exist because of the mother having heightened cognitive comprehension of health information (Stevenson, 2012) or by increasing her agency over decision making (Smith-Greenaway, 2013). Illiteracy has demonstrated relationships with mental illness, physical health (Ahmad, 2017;

Zhang, 2020) and healthy longevity (Rentería et al., 2019). Illiteracy is both a cause and a consequence of poverty. Learning to read is an essential facet of the ability to participate in economic and social development (Zapata, 1994).

Library usage has long been positively correlated with improving rates of educational attainment and literacy (De Jager, 2002; Stone, et al., 2013). Public libraries consistently demonstrate efficacy in promoting literacy within their communities. Public libraries have been positively correlated with improving users' information literacy and numeracy. They also have been found to have a statistically significant indirect effect on nations' economic production by way of improving the capabilities and achievements of the workforce through such literacy and numeracy education (Liu, 2004). Libraries and literacy education produce a wide range of positive effects on the life of the learner (Decandido, 2001) and the society (Ashley and Niblett, 2014).

A study in Zimbabwe, as one example of library literacy promotion, specifically cites the provision of library services as a major contributing factor to the country having the highest literacy rate in Africa, stating that, "fighting illiteracy is high priority for public libraries in Zimbabwe since it is a barrier to the realization of the goals of a democratic and egalitarian society" (Chisita, 2011, 3). By their core missions, libraries are institutions concerned with the literacy of the people that they serve as a vindication of democracy (Zapata, 1994). Libraries in developing countries have been assets not only in promoting literacy, but also essential in providing access to online educational resources and personal information needs (Gomez, 2014). Even in societies where some libraries may be accused of supporting an imperialist agenda, their overarching contributions are found to be that of valued promoters of literacy and community development that strengthens local populations (Perry, 2011). However, historically libraries have been perceived as neutral spaces and purveyors of information access and basic literacy and information literacy training and, more recently, valuable allies in health literacy promotion across developing countries (Ogunsola, 2009).

As this is a study looking specifically at the health-related metrics of societal well-being, it also bears mentioning the impact of libraries on promoting this well-being across disparate country settings. A recent literature review of 49 articles that focused on the value of libraries in health care in developing economies determined that, '*Libraries in developing countries can counteract the effect of the low resource status of their health care system on health literacy by proactively facilitating access to quality information, literacy skills and lifelong learning for individuals, community and practitioners*' (Popoola, 2019, p. 111). Health sciences librarians were cited as important stakeholders to promote health literacy skills and improve health outcomes. However, consumer health requests in public libraries are an important resource for people in lower-income countries.

Previous research had cited public libraries and librarians as valuable partners in health promotion and even assessment in developing countries. One article discussed the opportunities libraries must discern and respond to the health-related information needs of their community members, possibly using computer access as an incentive to such programmes (Ogunsola, 2009). In addition to community members, health care workers in developing countries have also been considered a target population of health information campaigns. This may include providing resources or training for clinicians, as well as education for health librarians (Cheeseborough, et al., 2015). All this is done with the implicit understanding that access to reliable health information in low-income countries, along with educated librarians and information professionals to assist the public in finding health information, is fundamental to improving the well-being of such societies.

Because of this, it is also paramount to consider the requirements of libraries to function in societies. Scholarship in this area is scarce. Instead, The International Federation of Library Associations and Institutions (IFLA) has produced a Global Vision Report which details

the five main challenges to libraries throughout the world with input from more than 30,000 people from 140 countries, largely composed of library professionals (IFLA, 2020). The votes were tallied by region and globally. On a global level and in order, the top challenges to libraries were:

1. Insufficient library funding and investment
2. Value of libraries and stakeholders
3. Ongoing technical changes
4. Image and status of libraries
5. Managing change

When speaking specifically about public libraries, inadequate infrastructure and lack of skilled staff were also some of the most frequently mentioned challenges, as they also were with school libraries. These reasons, along with inadequate legal environments, also ranked highly in more economically depressed regions of the world. If these challenges, which are largely related to economic insufficiency and government stability, present some of the greatest barriers to libraries' capability, it stands to reason that across countries that suffer from poorer societal health, libraries may struggle to succeed in producing effective literacy education. Or, because it is not solely the responsibility of the library to produce a literate society, is it likely that in countries deemed less healthy on a macro level, is there also a weaker relationship between library usage and literacy?

One question tangential to this work enquires into the traditional groupings of countries. It is common in research for these to be organized by regions of the world or the income level of the society- to the degree that there is often no precedent cited in the literature review to justify this (Dietrich et al., 2014; Verner, 2005). Differing grouping metrics may sometimes be utilised outside of these for specific reasons related to a distinct line of inquiry, though customarily geography or income are the defaults (Cummins, et al., 2007; Fantom, et al., 2016). However, there is an increasing consensus of thought that such groupings of countries are unhelpful (Alonso, et al., 2015; Taras, et al., 2016). Geographic regions such as Western Europe or Southeast Asia can be ambiguous and difficult to define (Aguilera, et al., 2007). As one example, Kyambalesa and Houngnikpo (2016) elaborate on the complexity of such geographic clustering in their research and findings regarding the challenges of grouping African countries which are far from homogeneous in culture or development. In Fantom and Serajuddin's work (2016), the authors discuss how World Bank Income groups have continuously evolved as the global economic landscape has changed, thereby potential rendering the classification system outdated. They argue that within distinct countries there are varied economies that may be disparate from each other and so classifying a nation as middle-low income, for example, is an oversimplification of their economic state and does not attribute the variances between the different areas. Alonso, Cortez and Klasen agree that the internal economic situations of 'developing' countries have increased in intricacy since the original classification system came about and they offer other suggestions for country classification including per capita income, country indebtedness, state of governance and the Human Development Index, which is used in this study.

Methods

To address the research questions, the author grouped countries several different ways to explore the relationship between literacy and library usage in each categorisation. World Bank income levels were used in keeping with a traditional metric to classify nations. Each country's ranking on the Human Development Index (United Nations Development Programme, 2019) and the literacy rate of the country (UNESCO Institute for Statistics, 2019b) were extracted and compiled into an Excel spreadsheet with their income levels. Only countries with sufficient representation in these datasets were kept for analysis (n=158), with literacy rates often being the missing data. Next, each country's standing on the Gender Inequality Index was added (United Nations Development Programme, 2019a). Finally, an additional metric was developed based upon each country's progress in relation to the Sustainable Development Goals (hereafter, the

Goals) using a method developed by the author in a prior study (Zimmerman, 2021).

Additional data were downloaded from the World Bank's data repository to calculate this metric and evaluated separately from the variables listed above. For the 158 countries, data that are representative of specific indicators of Goals were extracted. Each of the Goals represents a critical barrier to societal improvement. However, the first five Goals have explicit focus on people at an individual level rather than focusing on progress related to larger institutions or influential environmental factors. Because this research is meant to explore how literacy, health and well-being influence rates of library usage, the author decided to narrow down consideration to the first five Goals to address in this analysis. These are to "end poverty in all its forms everywhere" (SDG1), "end hunger and achieve food security and improved nutrition" (SDG2), "ensure healthy lives and promote well-being for all at all ages" (SDG3), "ensure inclusive and equitable quality education" (SDG4) and "achieve gender equality and empower all women and girls" (SDG5) (Sustainable Development Goals, 2019).

The following indicators were downloaded from the World Bank data repository to assess each country's progress toward achieving the first five Goals: the poverty headcount ratio (SDG1), undernourishment and the percent of children stunted (SDG2), maternal mortality, under-five mortality, neonatal mortality and percent prevalence of HIV in the adult population (SDG3), gross percent of children enrolled in primary school (SDG4) and gender parity and fertility (SDG5) (World Bank Data Catalog, 2019 a-j). To determine the progress each country has made in addressing the Goals, the author extracted data from 2000 and the most current numbers available. When the data from 2000 was inaccessible, the data from 1999 or 2001 were used. No data that were more than four years old were used for the most recent variables. Most of the data represented in this study was from 2017, as 2018 was not yet available. When it was, for example with under-five mortality, the 2018 numbers were used.

The data from the year 2000 pre-dates the Sustainable Development Goals which were created in 2012 and implemented in 2015. However, these were derived as successors to the Millennium Development Goals implemented by the United Nations in 2000 (Millennium Development Goals, 2018). The Goals were created to celebrate the progress attained and address the gaps remaining from the Millenium Goals. The first five Goals are in concert with the aims of the first six Millenium Goals and they used similar metrics as indicators. Therefore, the areas of progress that this research is meant to explore has been prioritized by the United Nations for the entire period that the data represent. The author chose to examine the first five Goals instead of the Millenium Goals simply because they represent the current conversation within this domain.

The per cent of improvement from the earlier data to the later data was calculated for each variable. As an example of this, Romania had an under-five mortality rate of 21.9 per 1,000 live births in 2000. This improved to 7.3 per 1,000 live births in 2017 (World Bank Data Catalog, 2019e). This would be a 66.67 per cent improvement. Each country was assigned a rank order based on the calculated percent of improvement over the period. In rank order, a country would be assigned the number one, for example, to show that it had the lowest under-five mortality in comparison with the other countries being measured. This helps to control for the over-influence of outlying variables. Each country's rank order number for each variable was averaged to give the country a specific overall progress-related rank order number, which was then added to the Excel spreadsheet with the variables mentioned in the first paragraph of this section.

Next, further data was entered into the Excel sheet from the IFLA Library Map of the World. This data included total number of libraries, number of full-time staff, number of registered users and number of physical visits. All statistics were per one million people. Because of the limits of the IFLA Library Map data, 64 countries were excluded because they were

not represented adequately. This left a remainder of 94 countries for the analysis.

This study examined the relationship between literacy and measures of library usage. However, the goal of this research was not to find a relationship between whole datasets for all the countries, but instead to determine if there were different relationships between literacy and library usage in groups of countries organized by other indicators of societal health. For example, is there a stronger correlation between library usage and literacy in high-income countries than in low-income countries? Is correlation between library usage and literacy higher in countries with a higher ranking on the Human Development Index? To determine this, the countries were grouped by the various rankings listed above: Human Development Index ranking, Gender Inequality Index, literacy rate, the progress ranking and World Bank income grouping. For the first three, the countries were categorized into three divisions: the countries with the lowest, highest and middle-level scores. For income level, the predetermined four World Bank categories were used of low income, lower middle income, upper middle income and high income. In the first set of rankings the countries were evenly divided into three groups of 30 representing the highest, lowest and middle of each grouping. For the countries by income level, each country was included regardless of how many countries were in each category. Finally, while the correlation of literacy rates and library usage were examined for each data set, the countries were also grouped by high, medium and low levels of literacy to see if highly literate countries showed a different level of correlation than less literate countries.

Spearman's rank correlation coefficient was used to determine if there is a statistical relationship between the variables. Spearman's rank is "a nonparametric technique for evaluating the degree of linear association or correlation between two independent variables" (Gautheir, 2001, 359). In this examination, correlation analysis was conducted on each grouping of countries between that array's literacy rates and the metrics of library usage downloaded from the IFLA Map of the World. So, the literacy rates of the countries in, for example, the low progress group were correlated with the number of libraries, registered users, full-time staff and physical visits for each of those countries. Correlation was run for these specific metrics for each ranked group. This gave four correlation results for each grouping. These correlation results were analysed separately and averaged to provide a measure of how much general library usage correlated with literacy rates as societal health showed indicators indicative of improvement.

Results

In the grouping of countries by Human Development Index, literacy, progress, Gender Inequality Index and income, the correlation coefficients generally increased for each individual library usage statistic as the indicator improved. Using the example of Human Development Index and number of libraries per million people for each country, the correlation between number of libraries and the literacy rate of the population in the group of countries with the lowest Human Development Index was r= .409 and increased to r= .640 for the countries with the highest Human Development Index. For low-income countries, the correlation coefficient was r= .131 and for high income countries the correlation coefficient was r= .562. For the countries that were grouped by progress as related to the Sustainable Development Goals and the library usage statistic of full-time staff per million people, the correlation coefficient for the countries that have exhibited the lowest progress was r= .065 and the countries that were grouped as having the highest progress had a correlation coefficient of r= .493. The countries that were grouped by Gender Inequality Index and the library usage statistic of physical visits per million people, the correlation coefficient for the countries that had the lowest Gender Inequality Index was r= .049 and the countries that were grouped as having the highest progress had a correlation coefficient of r= .426. When literacy was compared with registered users within this grouping, the countries with the lowest Gender

Inequality Index had a correlation coefficient of r= .005 and the countries that were grouped as having the highest Gender Inequality Index had a correlation coefficient of r= .349.

The specific correlation coefficient for each country grouping and each library statistic as correlated against the literacy rates for those groups is displayed in Table 1 below.

Library statistics per 1 million people	Lowest HDI	Medium HDI	Highest HDI	Lowest Literacy	Medium Literacy	Highest Literacy	Lowest Progress	Medium Progress	Highest Progress
Libraries	**0.409**	**0.341**	**0.64**	**0.077**	**0.018**	**0.654**	**0.358**	**0.575**	**0.373**
Full Time Staff	**0.243**	**0.674**	**0.577**	**0.344**	**0.185**	**0.673**	**0.065**	**0.474**	**0.493**
Registered Users	**0.134**	**0.07**	**0.512**	**0.073**	**0.061**	**0.485**	**0.032**	**0.344**	**0.449**
Physical Visits	**0.382**	**0.418**	**0.43**	**0.327**	**0.25**	**0.494**	**0.238**	**0.384**	**0.501**

Library statistics per 1 million people	Low Income	Low Middle Income	Upper Middle Income	High Income	Lowest GII	Medium GII	Highest GII
Libraries	**0.131**	**0.27**	**0.389**	**0.562**	**0.172**	**0.219**	**0.666**
Full Time Staff	**-0.323**	**0.485**	**0.498**	**0.482**	**0.105**	**0.403**	**0.637**
Registered Users	**0.833**	**0.281**	**0.132**	**0.46**	**0.005**	**0.009**	**0.349**
Physical Visits	**0.111**	**0.452**	**0.287**	**0.508**	**0.049**	**0.273**	**0.426**

Table 1. Correlation coefficients of library statistics compared to literacy rates in each grouping

Next, the correlation coefficients of each indicator grouping were averaged together to give an overall sense of how library usage was influenced by an increase in that measure of societal well-being. Using the example of Human Development Index, there was a very weak correlation (r= .292) between literacy and the library usage statistics in countries with the lowest Human Development Index rankings. In countries with middle Human Development Index rankings, the correlation coefficient improved (r= .376). There was again significant improvement in the grouping of countries with the highest Human Development Index rankings (.540 average for the grouping). For the groupings of countries by literacy rate, progress, income and Gender Inequality Index, the averaged correlation coefficients more than doubled between the lowest and highest ranked countries. With all country groupings the averaged correlation of the lowest ranked countries library usage and literacy rates rose substantially as each measure of societal well-being increased. These numbers are displayed in Table 2 below.

Averaged correlation coefficients for each grouping					
Lowest HDI	0.292	Lowest Literacy	0.205	Lowest Progress	0.173
Medium HDI	0.376	Medium Literacy	0.129	Medium Progress	0.444
Highest HDI	0.540	Highest Literacy	0.576	Highest Progress	0.454
	Low Income	0.188			
	Low Middle Income	0.372	Lowest GII	0.083	
	Upper Middle Income	0.327	Medium GII	0.226	
	High Income	0.503	Highest GII	0.519	

Table 2. Averaged correlation coefficients for each grouping

Finally, it can be concluded that, with a few exceptions, for each country grouping as the individual measure of societal progress increased, so did the correlation between literacy and statistics measuring library usage. It is clear from these results that countries with higher rankings of societal health also have stronger correlative relationships between library usage and literacy rates.

Discussion

This article began with the following research questions:

1. What are the different relationships between literacy and library usage in groups of countries organized by indicators of societal health?
2. Are there alternative means of grouping countries to better reflect homogeneity?
3. Can these methods reflect the efficacy of libraries in their communities?

The results of this research conclude that in groupings of countries with higher metrics of societal health, correlation rates between library usage and literacy increase from country groups with lower rates of those metrics. Therefore, it can be concluded that based upon the results of this analysis, the answer to question number one is that countries with higher quality of life have stronger correlative relationships between library usage and literacy. The author clearly admits that none of the correlation rates are strong. However, finding strong correlation was not the goal of the research. The almost uniform, significant increases in the correlation across each arrangement of countries is the meaningful result of this work.

The literature review of this article found clear evidence that library services are contributing factors to improving literacy rates in their communities (Chisita, 2011). Libraries are change agents in literacy education globally (Fitzgibbons, 2001). In countries with higher literacy rates, citizens also enjoy the benefits of improved health, quality of life and citizenry (Stromquist, 2006; Zimmerman, 2017). If procurement of library services promotes literacy, if libraries are agents of literacy education and if literacy improves health, poverty status and civic engagement, these

correlative relationships may point to a larger picture in which in countries where citizens are not utilising library services are more likely to also have negative outcomes related to these exact same metrics. This finding, that there are stronger relationships between literacy and library usage in healthier societies than in less healthy societies is the most significant of this research.

In consideration of the second question, this analysis was an effort to explore other ways of grouping countries than the traditional World Bank and regional groupings- including the progress metric created for this project. This part of this research is also a first step. There is no context by which to consider this part of the analysis successful or conclusive except by perhaps considering that the various ways in which the countries were grouped did produce similar results- that the correlation rank increased as the metric of societal health increased- even though each specific grouping was made up of different sets of countries. The consistency across the data that as metrics of health improved varied sets of countries showed increased correlative relationships, may indicate that there was homogeneity throughout the different ways in which these groupings were composed.

It is not as simple as saying that these relationships are the result of countries, for example, of lower income also having lower Human Development Index and Gender Inequality Index and therefore lower progress- all of which would align with lower literacy and library usage. This answer would be simple, but it is wrong. If it were true, the internal consistency of the groups would be the same and each would have roughly the same countries. But they did not. In each specific ranking of countries, the groups were significantly different or that specific ranking would not have remained in the analysis; there would have been no purpose in running correlation repeatedly on the same groups of countries. Instead, the different grouping mechanisms, Gender Inequality Index, Human Development Index, income, progress and literacy on its own, produced varied arrangements of countries. What they did have in common was that in each instance literacy rates and library usage similarly improved as the metric increased.

Does this reflect homogeneity? To an extent, yes. Regarding literacy and library usage correlation, these groupings reflect consistent behaviour. Beyond this is outside of the purview of this research. If anything, the main purpose in conducting this part of the analysis was to explore different ways of thinking about grouping countries for quantitative analysis. By organising countries in these varied groupings and by creating the progress metric for a different means of assessment, the author was able to successfully conduct analysis that looked at non-traditional means of arrangement that may be of use in future research.

Finally, in response to the third research question, *Can these methods reflect the efficacy of libraries in their communities*, as a preliminary study it would be a leap to assume that relationship from this work. However, as stated above, these results demonstrate that countries with higher rankings of societal health have stronger correlative relationships between library usage and literacy rates. In countries with more active participation in libraries, literacy rates are higher, and the overall picture of societal health is better. This points to increased efficacy of libraries in these communities but does not guarantee a causal relationship.

Conclusion

This article is an attempt by the author to explore the way in which countries are grouped when we talk about metrics of societal health, as well as an exploration into a method of potentially demonstrating library efficacy within communities. The author designed a progress metric to rank countries by their advancement regarding the Goals. This ranking system was effective in providing an alternative system of grouping countries to assess their relationships with libraries and literacy rates.

The findings of this work are that there in an increase in groupings of countries with higher metrics of societal health, and that correlation rates between library usage and literacy

increase from country groups with lower rates of those metrics. Simply put, as countries have better wellbeing, there is a higher correlation between literacy rates and library usage statistics. While this is a small preliminary study, it would seem to indicate increased efficacy of libraries within these comminates. More research is needed to determine a causal relationship.

Limitations

This work is an examination of numeric metrics related to the Goals and not in any way a referendum on these individual countries or cultures. The author recognizes that this work is limited to the data available and that some of the data may be incorrect. There has also been criticism of the metric Human Development Index being western-centric and not reflective of the values of other cultures. Finally, the findings of this work are limited to correlation and cannot be assumed to explain more than they do. The ultimate larger picture of why these relationships exist is complicated, nuanced and beyond the scope of this small project.

About the author

Margaret Sullivan is an assistant professor in the School of Information at Florida State University. She completed a doctorate in Library and Information Science from the University of South Carolina. Her research areas of interest focus on the health-seeking behaviors and patterns of disadvantaged populations, with a focus on the opioid-use population. She can be contacted at mzimmerman@fsu.edu.

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