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## RESEARCH ANALYSIS

# What makes parents enrol their child for primary school education?

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## Abstract

Early childhood education is the substratum in building blocks of a child's future academic success. In this report, I researched and analysed the world developmental indicators of all the countries as given by the worldbank.org to figure out what influences the gross percentage of primary school enrolment the most. In this analysis, I found that the availability and accessibility of professional healthcare influenced the primary school enrolment the most.

## Introduction

Early childhood education and care include more than just pre-school preparation. It is the comprehensive development of a child's social, emotional, cognitive, and physical requirements to lay a firm and wide basis for lifelong learning and happiness. Early childhood education has the potential to develop future citizens who are compassionate, capable, and responsible. It is an extremely important time in a child's physical and mental development because this is when the brain's development and growth are at their crest.

Recent research demonstrates that the effects of adverse early childhood environments persist over a lifetime. Substantial gaps between the growth of advantaged children to those of disadvantaged children raise serious concerns about the life prospects of the disadvantaged children and the state of social mobility.

This significance of early childhood education motivated me to find the biggest correlations between the world development indicators of each country and the primary school enrollment(gross Percentage) data for the decade i.e. from 2011 to 2020 from the world bank would be. In this research analysis I will try to analyze what indicators would affect the parents to get their children enrolled in primary education the most. Once we recognise the indicators of higher primary school enrollments we can then work on these said indicators to increase the primary school enrollments in the population.

## What is Early Childhood Education?

There are three broad stages in the developmental phase of a child.

1. Early Childhood (Birth to 8 yrs)
2. Middle Childhood (8 yrs to 12 yrs)
3. Adolescence (12 to 18 years)

Early childhood is recognised as the peak time for brain development. During this stage children are highly influenced by the environment they are in. Age eight corresponds to third grade, a critical year for mastery of the reading skills upon which further learning will build. It is a reliable predictor for future educational success. The Madrasa Early Childhood Program of the Aga Khan Development Network is a published study on the impact of early childhood education on kids' performance in grade school. The findings suggest that children who attended Madrasa Early Childhood schools (almost all of whom came from low-income families) regularly performed in the top 20 per cent of grade 1 courses. The study also found that any type of formal early childhood education led to greater levels of cognitive development in language, arithmetic, and nonverbal thinking (Virani, 2022).

## Why is Early Childhood Education so important?

The process of learning begins even before we are born. Even when we are inside the warmth of our mother's womb, our brain develops and learns new things. In a recent study, scientists have discovered that babies only hours old can differentiate between sounds from their native language and a foreign language. The study indicates that babies begin absorbing language while still in the womb, earlier than previously thought. We know that the sensory and brain mechanisms for hearing develop at 30 weeks of gestational age. This new study shows that unborn babies listening to their mothers talk during the last 10 weeks of pregnancy and at birth can demonstrate what they've heard. This indicates that infants are in fact the best learners. Discovering how they soak up information could give insights into lifelong learning.(McElroy, 2022). There are many reasons why early childhood education is important for better overall development.

## 1. Neurological Development

A child's brain develops from birth to age 5, faster than at any other point in its life. Its ability to learn and achieve in school and life is immensely influenced by the early brain development that takes place during these years. The quality of a child's early experiences, whether favourable or unpleasant, has an impact on how their brain grows. At birth, the average baby's brain is about a quarter of the size of the average adult brain. Incredibly, it doubles in size in the first year. It keeps growing to about 80 per cent of adult size by age 3 and 90 per cent i.e nearly full-grown, by age 5. Brain connections allow us to move, think, communicate, and do almost anything. The importance of early infancy in creating these bonds cannot be overstated. We know that during this age, at least one million new neural connections (synapses) are formed every second, more than at any other period in life. Diverse parts of the brain are engaged in different functions including movement, language, and emotions, and they grow at different speeds. As connections grow more complexly connected, brain development builds on itself. This enables the infant to move, communicate, and think in a more complicated manner. This is the greatest time for the brain to form the connections necessary to grow into a healthy, competent, and successful adult as a child.

## 2. Ethical Development

Morality refers to our ability to distinguish between what is good and wrong and to make sound judgments. Morale, like other dimensions of development, is produced in conjunction with the previously stated area. Children's experiences at home, their surroundings, and their physical, cognitive, emotional, and social capacities all have an impact on their developing sense of good and evil. Many youngsters begin to exhibit ethically grounded behaviours and ideas between the ages of 2 and 5. Modern study has given us more knowledge on how newborns interpret morality. Children between the ages of 5 and 6 often conceive in terms of distributive justice, or the notion that they must properly distribute material items and "things." In other terms, everyone must get an exact "fair share." ("Early Childhood Moral Development - Child Development Parenting: Early (3-7)", 2022)

## 3. Substratum of the future

The educational experience during this period serves as basic knowledge. It establishes a connection between early skills and future outcomes. And early childhood education helps children get a clear glimpse of their upcoming life.

## 4. Self-Esteem

Self-esteem starts developing early in life. It develops slowly over time. The child's positive experiences with those around them create a natural inclination to feel safe, loved, and accepted. The baby's development begins with positive attention and affection. As toddlers get older, they can do things on their own. They feel better when they can use new skills. Their self-esteem grows when their parents pay attention, have their children try it, and show pride with a smile. As your child grows, so does your self-esteem. Children's self-esteem can grow as they try new things, do things, and learn new things. If a child is going forward toward their goals, learning things at school, making friends, and pursuing their favourite activities, they are more likely to be accepted by others. ("Early

Childhood Moral Development - Child Development Parenting: Early (3-7)", 2022)

## 5. Basic Knowledge Development

Knowledge is crucial to developing conceptual understanding and achieving long-term academic success. Children who are more educated in General knowledge tend to have better oral language and reading comprehension skills, critical reasoning, and learning abilities in most academic domains. It is crucial to provide children with a strong foundation of content knowledge for at least three reasons. 1. General knowledge is helpful when learning new information. 2. knowledge grows exponentially, the more children know, the better they are at learning new information. 3. having prior knowledge can help you organize and remember what you're learning new. 4. knowledge helps to improve thinking by freeing up resources that could be for comprehension and analysis. General knowledge is a critical part of their educational success. Recent surveys have shown that a lack of instructions focusing on developing children's general world knowledge and their knowledge of core concepts and domains during early childhood may lead to difficulties with reading comprehension or higher-order thinking skills in older children. ("Knowledge Development in Early Childhood", 2022)

## 6. Comprehensive Development

Holistic Development refers to learning that emphasises the importance of physical, emotional and psychological well-being in early childhood. Supporting children as they learn at their own pace is necessary for early childhood development. We should encourage and take every opportunity to explore their interests in a comfortable and natural environment. ("Support the Holistic Development of Children in Early Childhood Education", 2022)

## 7. Cognitive Skills

In the first five years of life, children grow and develop fast in four major areas. Motor skills, language and communication, as well as cognitive and social/emotional capacities, are all tied to the physical environment. The process through which youngsters think, investigate, and figure things out is referred to as cognitive development. Children may think about and comprehend the world around them as their knowledge, skills, problem-solving abilities, and dispositions develop. This brain development is an element of cognitive development. You must have regular, high-quality interactions with your youngster to aid his or her cognitive development. ("Help Me Grow MN", 2022)

## 8. Fundamental Skills

Subjective fundamental learning begins from the beginning of our lives. Rhymes, tales, and activities that include acting out the ABCs are the most effective ways for a kid to learn. Fundamental motions are a collection of abilities that involve the feet, legs, chest, head, arms, and hands, among other body components. These abilities serve as "building blocks" for more sophisticated and specialised abilities that children will require throughout their life in order to engage properly in a variety of games, sports, and recreational activities. The following are the primary types of movement skills: 1. Balance abilities are movements in which the body remains stationary while moving along its horizontal and vertical axes. 2. Running,

leaping, jumping, and galloping are examples of motor skills. 3. Catching, throwing, kicking, armpit tossing, and hitting are all ball-playing talents.

## Analysis

To analyse the total number of primary school enrollments around the world, I used the data from worldbank.org, showing World Developmental Indicators for each country over the years 2011 to 2020. One of the attributes in the data set was Primary school Enrolments (percentage gross) for each country. To perform the analysis on this data set, I used Python programming language due to its vast library resources and widespread acceptance as an analytical tool.

Here is how the data looked like after I grouped each country according to their continent using data from United Nations Statistics Division (Division, 2022) :

```
In [171]: df = pd.read_excel('/Users/sachin/Desktop/Topics_final_project/Data_Extract_From_World_Development_Indicators.xlsx')
df.head()
```

```
Out[171]:
```

	Country Name	Continent	Country Code	Series Name	Series Code	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
0	Argentina	South America	ARG	Adolescent fertility rate (births per 1,000 women ages 15-19)	SP.ADO.TFR.T	63.441200	63.567000	63.410000	63.253000	63.096000	62.939000	62.782000	62.585400	62.348	
1	Argentina	South America	ARG	Agriculture, forestry, and fishing, value added (% of GDP)	NV.AGR.TOTL.ZS	6.968734	5.781744	6.050918	6.712704	5.156686	6.264566	5.231622	4.537879	5.1111	
2	Argentina	South America	ARG	Annual freshwater withdrawals, total (% of internal resources)	ER.H2O.FWTL.ZS	12.907534	12.907534	12.907534	12.907534	12.907534	12.907534	12.907534	12.907534	12.907	
3	Argentina	South America	ARG	Infants attended by skilled health staff (% of total)	SH.STA.BHFC.ZS	97.100000	98.200000	97.000000	99.600000	99.600000	98.400000	93.900000	93.900000	93.900	
4	Argentina	South America	ARG	CO2 emissions (metric tons per capita)	EN.ATM.CO2E.PC	4.296015	4.277882	4.350886	4.216361	4.314434	4.227539	4.089472	3.987234	3.987	

Fig. 1. World Development indicators

First to understand the gross Primary School Enrolment around the globe in the past years, I plotted a graph of the performance of each country.

### Difference in primary school enrolments round the world.

Country Vs Gross Primary School Enrolment

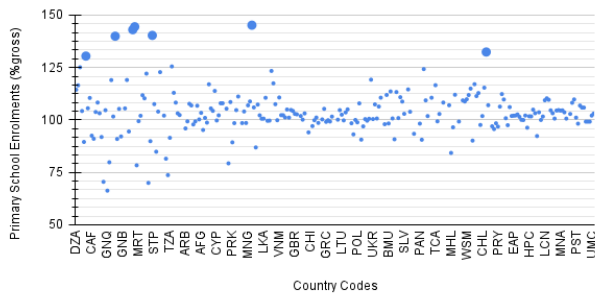


Fig. 2. Countries Vs Primary School Enrolment(percentage gross)

As you can tell, it is hard to read and compare amongst countries since there are about 195 countries in the world. So to make the graph more readable and comparable I grouped all the countries according to their respective continents and plotted a graph between the Primary School Enrolment(gross Percentage) and Continents.

By first glance you can tell that North and South American Countries on an average, have a higher Primary School

### Difference in primary school enrolments around the world

Average Primary School Enrolment vs Continents

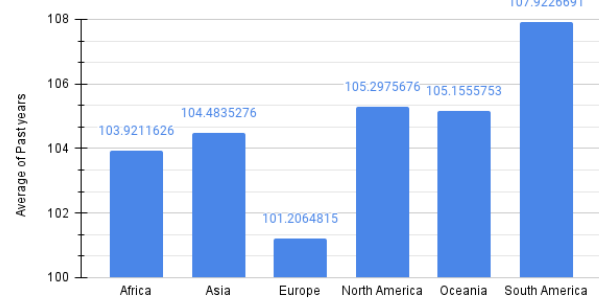


Fig. 3. Continents vs Primary School Enrolment(gross percentage)

Enrolment (Gross Percentage) than the rest of the world. To see why that is, I compared and correlated the different developmental indicators of a country and the primary school enrolment (gross percentage) data.

For correlating between the given attributes I ran a Pearson's Correlation test between each of the given attributes and primary school enrolment data.

Pearson's Correlation Test is a measure of linear correlation between two data-sets. It is the ratio between the covariance of the two variables and the product of their standard deviations. This means, it is essentially a normalized measure of covariance, so the result will always be a value between -1 and 1. The formula for Pearson's correlations test is:

$$\rho_{xy} = \frac{\text{Cov}(x, y)}{\sigma_x \sigma_y}$$

where:

$\rho_{xy}$  = Pearson product-moment correlation coefficient

$\text{Cov}(x, y)$  = covariance of variables  $x$  and  $y$

$\sigma_x$  = standard deviation of  $x$

$\sigma_y$  = standard deviation of  $y$

Now that I have the correlation coefficients of each attribute I can take away the ones that are most correlated to Primary school enrolment data. From this I can see which of these attributes are most commonly the highest correlated attributes amongst all the countries. To do this we run the script:

```
In [166]: #gets most correlated attribute for each country
most_cor_dic = {}
for i in temp(0, len(input_df)):
    temp = input_df.iloc[i]
    if temp['Country Name'] not in list(most_cor_dic.keys()):
        #the country is not present --> we add a new value in the dictionary for that country and init with this corr value
        corr = scipy.stats.pearsonr(temp[time_columns], output_dic[temp['Country Name']])[0]
        temp_dic = {'Country': temp['Country Name'], 'Attribute': temp['Series Name'], 'Correlation': corr}
        most_cor_dic[temp['Country Name']] = temp_dic
    else:
        #compare previous correlation value and replace old correlation/attribute, if new attribute is more correlated
        old_corr = most_cor_dic[temp['Country Name']]['Correlation']
        new_corr = scipy.stats.pearsonr(temp[time_columns], output_dic[temp['Country Name']])[0]
        if (abs(new_corr) > abs(old_corr)):
            most_cor_dic[temp['Country Name']]['Attribute'] = temp['Series Name']
            most_cor_dic[temp['Country Name']]['Correlation'] = new_corr
```

Fig. 4. Method to find most correlated values.

Our output would look like this:

```

In [167]: most_cor_dico
Out[167]: {'Argentina': {'Country': 'Argentina',
  'Attribute': 'Domestic credit provided by financial sector (% of GDP)',
  'Correlation': -0.927561666532724},
  'Australia': {'Country': 'Australia',
  'Attribute': 'Immunisation, measles (% of children ages 12-23 months)',
  'Correlation': 0.995192330934076},
  'Brazil': {'Country': 'Brazil',
  'Attribute': 'Revenue, excluding grants (% of GDP)',
  'Correlation': 0.98992298103324},
  'China': {'Country': 'China',
  'Attribute': 'Revenue, excluding grants (% of GDP)',
  'Correlation': -0.891629190838282},
  'France': {'Country': 'France',
  'Attribute': 'Immunisation, measles (% of children ages 12-23 months)',
  'Correlation': 0.995079817867647},
  'Germany': {'Country': 'Germany',
  'Attribute': 'Immunisation, measles (% of children ages 12-23 months)',
  'Correlation': 0.993729228923223},
  'India': {'Country': 'India',
  'Attribute': 'Immunisation, measles (% of children ages 12-23 months)',
  'Correlation': 0.993729228923223}}

```

Fig. 5. Most correlated values.

This is a heat map representing the most positively and negatively correlated attributes to primary school enrolment(gross percentage):

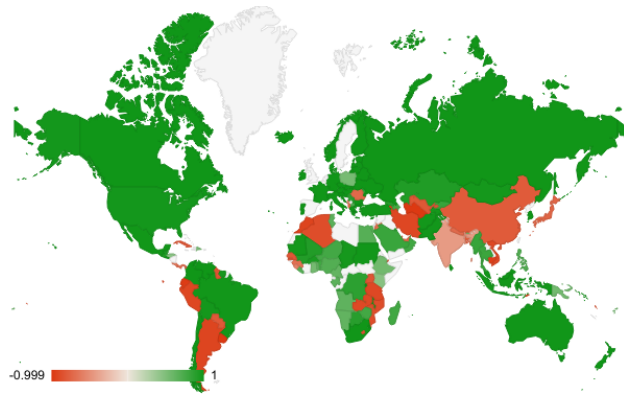


Fig. 6. Heat map of most correlated attributes to Primary School Enrolment.

With the help of this data, now I can find what attributes most commonly the highest correlated attributes to Primary School Enrolment (percentage gross) data, amongst all the countries. To see this we can plot the graph:

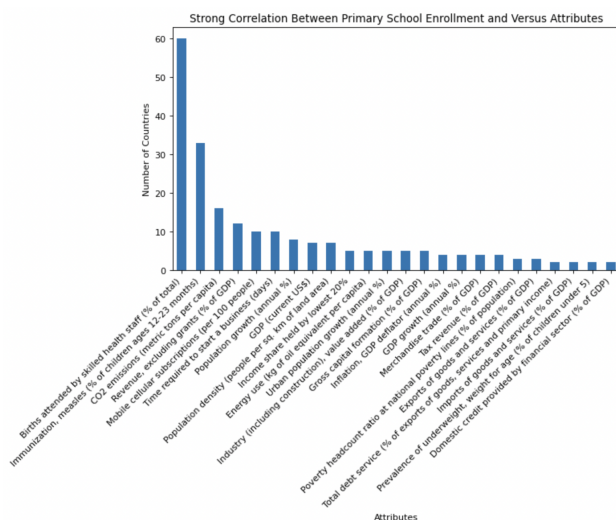


Fig. 7. Most commonly correlated attribute to primary school enrolment.

As you can tell the most commonly correlated attribute amongst all the countries is "Birth attended by skilled health

care staff(percentage of total)" in 60 countries, followed by "Measles Immunization (percentage of children ages 12-23 months)" in 33 countries.

*Why are these attributes such strongly correlated to primary school enrolment?*

Lets start analysing with the most commonly correlated attribute :

1. "Births attended by Skilled Healthcare professional".

Having a Skilled Healthcare Professional is critical to maternal and newborn mortality and morbidity. Traditional birth attendants (TBAs) unable to effectively save women's lives in most cases because they must find the treatment for different difficulties and are not always in the position to provide adequate solutions. In rural locations and community settings, where most women from developing nations give birth, qualified midwives and doctors are frequently unavailable. There are multiple reasons why this could be correlated with Primary School Enrolment data. Here are a few of them: 1. Some parents who choose not to have a skilled healthcare professional present at birth might not be believers in the healthcare system. If this is the case, it is also highly likely that they might not believe in the schooling techniques that are readily used in the classrooms altogether, which leads to them not getting their child enrolled in any primary school. 2. Some parents who come from a low-income background might not have the luxury to get a skilled healthcare professional to be present at birth. If this is the case it also possible that the parents might not have enough money for primary school education and would rather just get the kids enrolled in free public school when they get older or skip education entirely and have them start working small jobs whenever they become of age. 3. Some parents live in remote areas where hospitals and skilled health care professionals are a scarcity or not available at all. This general lack of infrastructure could also mean that primary schools in the areas are not readily available.

2. "Measles Immunization (percentage of children ages 12-23 months)".

Immunization is a process that prepares the body to battle major infections that may occur in the future. Because infections are especially deadly for babies, they must be protected as soon as possible. Your kid will need multiple different shots to be properly protected, thus they must complete their childhood immunisation regimen. Immunization is a simple and cost-effective way to protect children from serious diseases. It not only protects individuals, but it also helps to protect the greater society by minimising disease spread. Vaccines fight certain illnesses by stimulating the immune system. When a vaccinated person is exposed to some diseases, their immune system is better equipped to respond, preventing the disease from forming or significantly reducing the severity of the disease. ("Immunisation is important for children", 2022) Measles is a highly contagious respiratory infection. It causes symptoms such as rashes and colds throughout the body. Measles (also known as rubella) is caused by a virus, so there is no special cure. The virus has to take its path. Hence vaccination against Measles is very important specially for young children. There are multiple reasons why this could be correlated with Primary School Enrolment data. Here are a few of them: 1. Some parents who choose not to get their kids vaccinated due to personal religious or healthcare

beliefs might not believe in the schooling system altogether. They might also want their child to be raised and educated with similar values which are different from the ones taught in the schooling system. Hence the child might not get enrolled in any primary school. 2. Some parents live in areas where healthcare facilities are not readily available. These parents might find it difficult to get their children vaccinated. This lack of infrastructure could also mean that there is a lack of primary schools in the area. 3. Some parents might not be aware of getting their child vaccinated at all. These could be parents coming from a largely uneducated background. This lack of awareness might also mean that they are unaware of the importance of getting Primary education. This leads to their child not getting enrolled in any primary school.

## Conclusion and Recommended solutions

As discussed earlier, Early Childhood Education is possibly the most important piece in the building blocks of a child's overall development. Not only does it benefit the child's development, but it also benefits the parents and society as a whole. As our analysis has stated there is a strong correlation between healthcare and education, i.e. parents that can provide their children with better healthcare are more likely to get them enrolled in primary education. Some ways in which we can affect the primary school enrolments are:

1. Provide infrastructure. There is a need to make more accessible Hospitals and Schools for every citizen.
2. Provide free or cheap care. Education and healthcare are basic requirements that not only lead to a better quality of life but help in the further development of society as a whole.
3. Spreading awareness. There is an urgent need to spread awareness regarding the importance of healthcare and education, especially for young parents. The dos and don'ts should be widespread and easily available to them.
4. Provide better quality care. With better quality healthcare and education, parents are more likely to enrol their kids on primary school also provides them with a more healthy lifestyle. This can be done by raising the standards for healthcare and educational professionals.
5. Incentivise healthcare and educational practices. Professionals such as teachers and doctors should get incentives to practice their profession. This would encourage citizens to follow such a line of work and in turn, lead to a better quality of life.

## Limitations

Certain limitations come with this data set and the tools used in its analysis. These limitations are:

1. Since the data was collected by the world bank there are certain limitations that come with it. They could be; inaccuracies, while putting down a number, mathematical errors, etc.
2. During data cleaning, the countries with missing data for primary school enrolment were removed to make this analysis possible.
3. When making visualizations countries that are not part of a continent or are divided between continents were either assigned a continent or removed from the analysis completely.

4. Since a Pearson's Correlation test was done on the data to correlate between the given attributes. The limitations that come with that test are applicable here as well.
5. The heat map that is represented in fig.6 is not ideal for colour blind individuals.
6. While data cleaning certain unrelated attributes with negligible or irrelevant correlation was removed from the analysis.
7. The recommendations that are made in the conclusion are personal and can be open for interpretation. They are also only a few of many that can be made to reach the expected solutions.

## Data Ethics

The data used for this research was collected by the world bank, hence this research is based on the ethical framework provided by them. This framework consists of 12 codes of conduct:

1. Benefits : The motive behind this research was to find ways to improve enrollment in primary schools for children. The benefits of which impact not only to the child but society in general.
2. Inclusiveness: This analysis was carried out to benefit the general audience. Designed and developed in a way that guarantees results that reflect the needs and values of individuals and communities who are expected to use or benefit it.
3. Fairness: This analysis was designed, developed and deployed in a fair and non-discriminatory way. This analysis aims to avoid any anti-competitive or unfair business practices that unreasonably impede access and adoption.
4. Transparency: Since this data is open source from world bank the affected individuals, communities, and stakeholders were provided with access to information sufficient to understand the risks, opportunities, and impacts of the analysis.
5. Informed Consent: Since this data is open source the affected communities were provided with the right to give meaningful informed consent before making analysis.
6. Validation: The claimed outcomes of the analysis is validated by training and confirmation against scenarios and data sets appropriate to the envisioned purpose.
7. Security: Since the data is open source, this analysis was designed, developed and used in line with technical and organizational safeguards sufficient to assure its secure use and protect against misuse.
8. Responsibility: The analysis complies with applicable law and respects human rights. The risks, impacts, and opportunities of the analysis is mentioned.
9. Accountability: This analysis is accountable for the performance and foreseeable ethical implications it develops and for managing, evolving and emerging issues from continuous analysis improvement.
10. Governance: This analysis maintains governance and management systems appropriate to the purpose and potential impacts to assure reasonable control. It also seeks to avoid, minimize, and mitigate potential risks and impacts, including environmental, social, governance, and privacy risks and impacts.
11. Proportionality: Application of these Principles is scaled to risks and adverse impacts of the analysis.
12. Continuity: Any transfer of this analysis, including any licensing or joint venture arrangement, or any change in



control transaction, should be made with due regard for the continued application of these Principles.

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