

Trend in World Poverty

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Abstract

World data related to poverty in time series are studied, analyzed and some statistical models are developed using SPSS and Excel software. Based on the models, trends of the world poverty phenomena are drawn. Trend lines drawn with poverty factors confirm that world 'extreme poverty' is on the track of receding consistently.

Keywords: Trend; Global Poverty; Statistical Models; Extreme Poverty; Poverty Intensity; Illiteracy; Undernourishment; Morality; Unsafe Water; Unsafe Sanitation; Track of receding

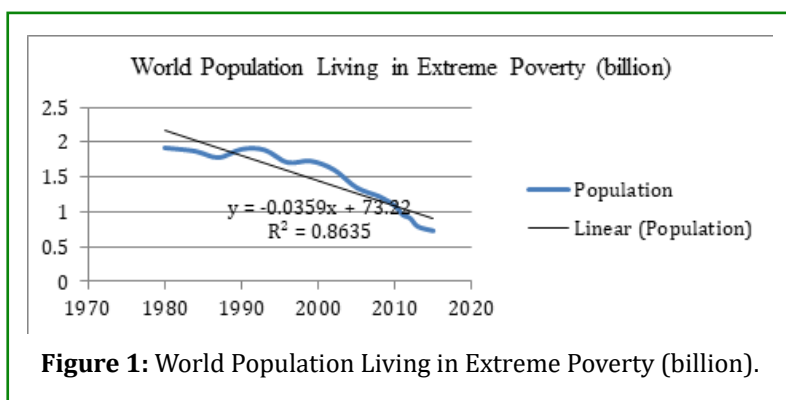
Introduction

According to the World Bank, Extreme Poverty [1] is defined as living with less than 1.90\$ per day (in 2011 International Dollar). International dollars are adjusted for price differences across countries and across time. In 2018, extreme poverty mainly refers to an income below the international poverty line of \$1.90 per day (in 2011 prices, equivalent to \$2.16 in 2019), set by the World Bank. In October 2017, the World Bank updated the international poverty line, a global absolute minimum, to \$1.90 a day. Basic data obtained from "Our World in Data" and also World Bank.

World Poverty

World Population Living in Extreme Poverty

Extreme poverty is defined as living on less than 1.90 international-\$ per day. International-\$ are adjusted for price differences between countries and for price changes over time (inflation). The huge majority of the world today is very poor. About 85% (6.523 billion 2019)) of the world live on less than \$30 per day and 63% (4.835 billion) live on less than \$10 per day. If this should change it will require very substantial economic growth of the economies that are home to the poorest billions of people in the world [2].



Statistical model:

World Population in Extreme Poverty (in billion) = - 0.0359 * year + 73.22

$R^2 = 0.8635$; n = 15; Time 1980 - 2015

Prediction: No people in Extreme Poverty by 2040

Every year, the number of people in the world being reduced from extreme poverty is 0.0359 billion. Using the model, it

can be predicted that by 2040 there will be no people in the extreme poverty.

Poverty % of Population

According to World Bank, the countries with the highest poverty rates in the world are shown in the following table (Table 1).

Sl. No	Country	Poverty Rate (%)
1	South Sudan	82.3
2	Equatorial Guinea	76.8
3	Madagascar	70.7
4	Guinea-Bissau	69.3
5	Eritrea	69
6	Sao Tome and Principe	66.7
7	Burundi	64.9
8	Democratic Republic of the Congo	63.9

Table 1: Countries with the Highest Poverty Rates in the World.

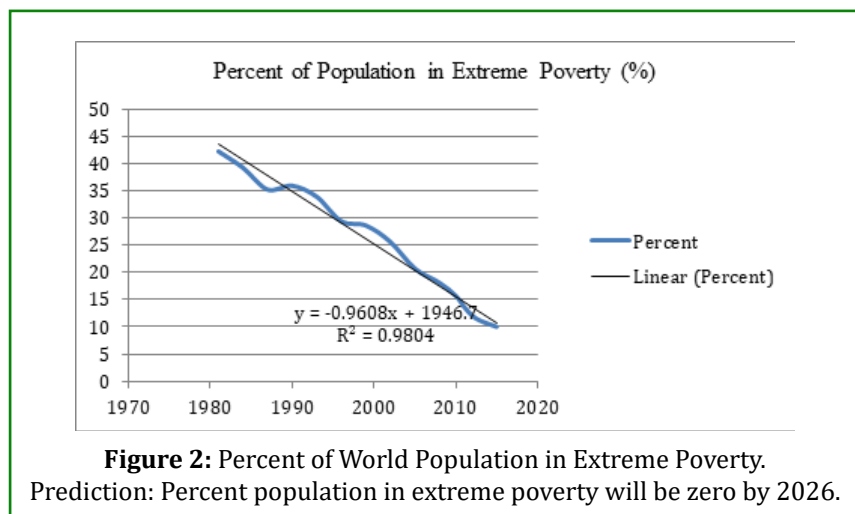
See the following figure (Figure 2). Every year about one percent of the extreme poverty population is being reduced. The trend of reducing the extreme poverty population is consistent. If this trend continues, extreme poverty people will be over by 2026. The statistical model developed in this

regard is a very good. R^2 value is very high 0.98 close to one. The model is as follows:

Statistical model

Percent of World Poverty People = - 0.09608 * Year + 1946.7

$R^2 = 0.98$; n = 15; time 1981 - 2015



Percent of world population in extreme poverty is receding. The percentage of this reduction is 0.96% per year. Also it is observed that this reduction in extreme poverty is consistent.

Poverty Intensity/Poverty Gap

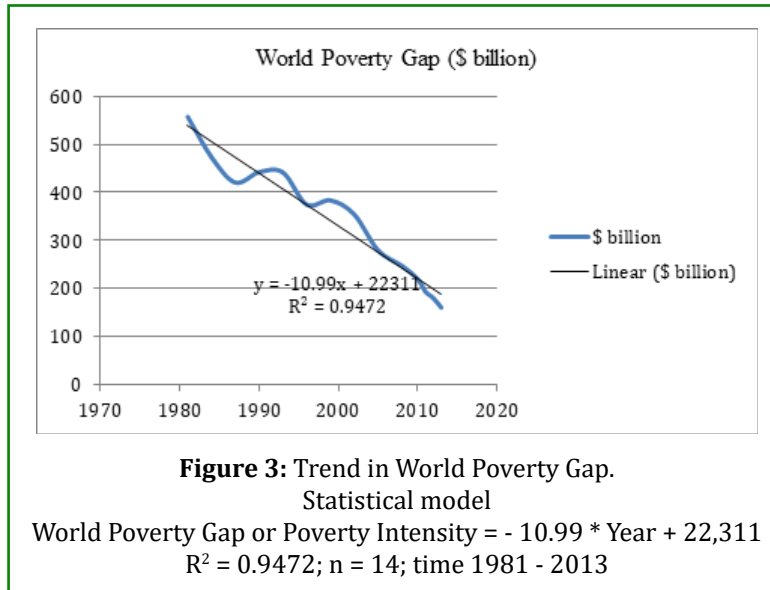
The poverty gap is the amount of money that would be theoretically needed to lift the incomes of all people in

extreme poverty up to the international poverty line of \$1.90 a day [3] these estimates are expressed in international dollars using 2011 PPP conversion rates. This means that figures account for differences in prices levels, as well as for inflation. Poverty gap is also known as poverty intensity.

It is interesting to note that the poverty gap is reducing in the world by 10.99 billion dollars every year. This trend is

consistent. This trend is noted from the model developed using the world poverty data from 1981-2013. Based on the

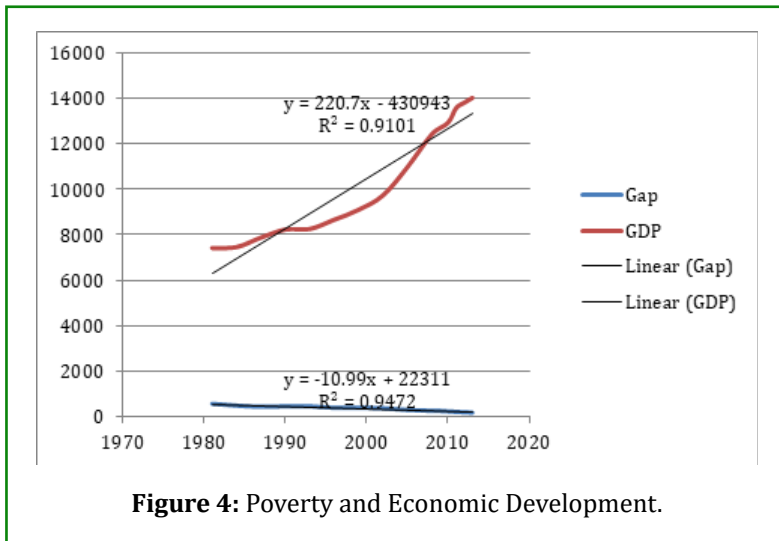
model, it can be predicted that world poverty gap (poverty intensity) will go by the year 2031.



Poverty and Economic Development

Poverty intensity and GDP per capita are drawn in the following figure. It is seen that both are running almost parallel. This proves that there a relation between the two.

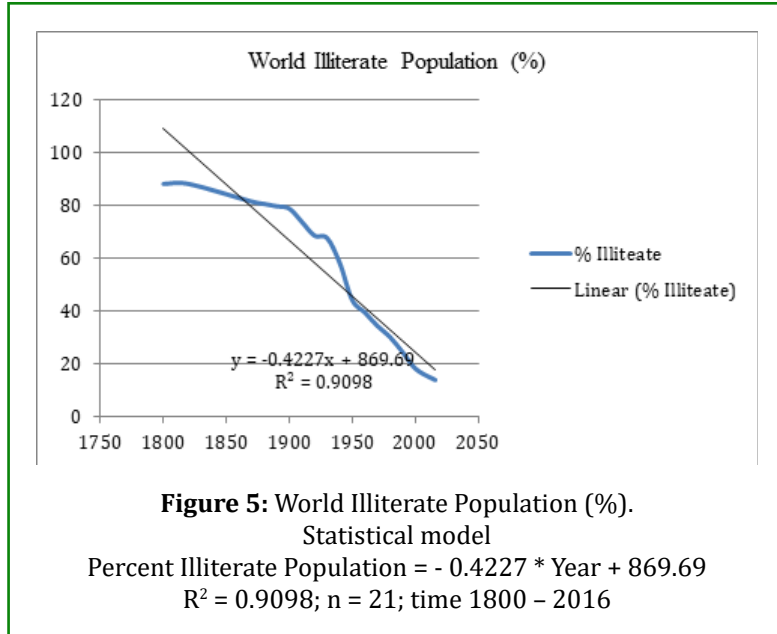
Furthermore, on a correlation test it has been found that the correlation coefficient between the two is -0.97261 which is very high and minus. This shows when economic development takes place, poverty is reduced. This is true.



Poverty and Illiteracy

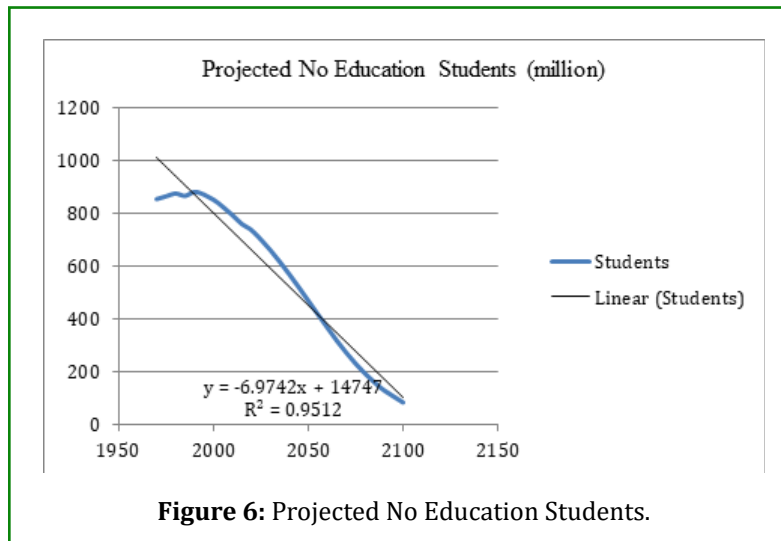
There is a relationship between level of education and poverty. The National Institute for Literacy estimates that 43% of adult with very low literacy skills live in poverty. About 70% of adult welfare recipients have lower level literacy skill

on the National Assessment of the Adult Literacy (NAAL). Illiteracy affects all areas of life. Those with low literacy skills are far more likely to live in poverty, face health problems because they can't read prescription labels or instructions, and grow isolated in a world increasingly dependent on computers. Jul 9, 2558 BE [4].



The trend of illiterate population of the world is consistently decreasing/ every year the percentage of illiterate population

is reduced by 0.4227%. Using the model, it may be predicted that illiterate population will be over by the year 2058 [5].



Max Roser and Esteban Ortiz-Ospina (2016) made a prediction of no education of the population for a long time up to the year 2100 as shown in figure 6 above.

Poverty and Undernourishment

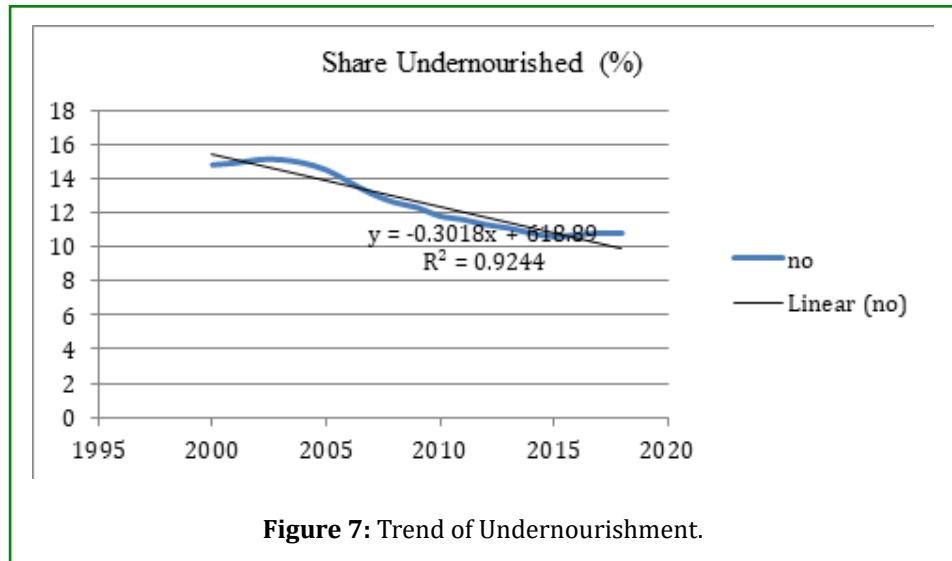
Undernourishment is a characteristic of poverty. Hence

analysis of this topic should be a part of poverty.

Share of Undernourishment

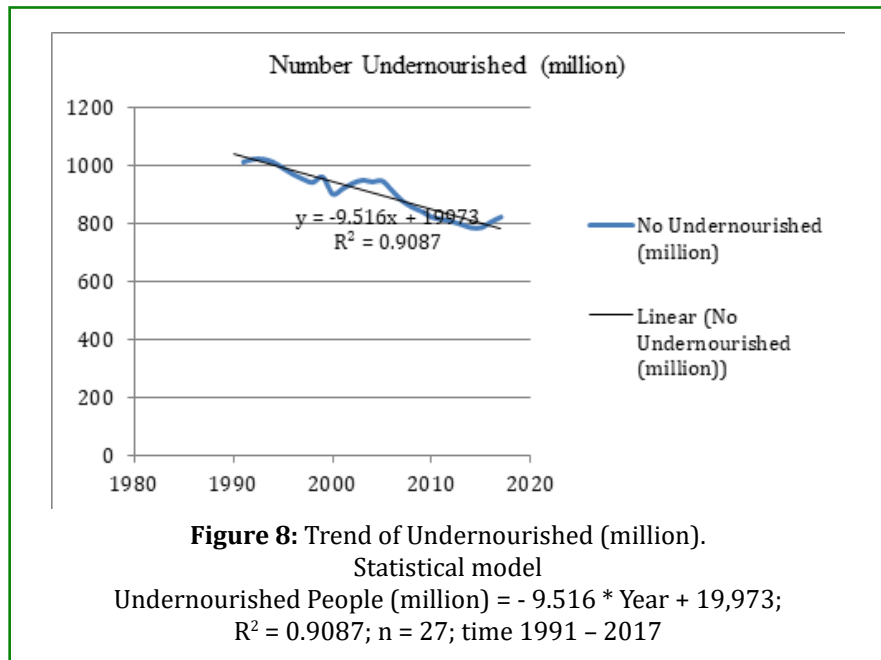
Statistical model

Percent Undernourishment = - 0.3018 * Year + 618.89
 $R^2 = 0.9244$; n = 19; time 2000 – 2018



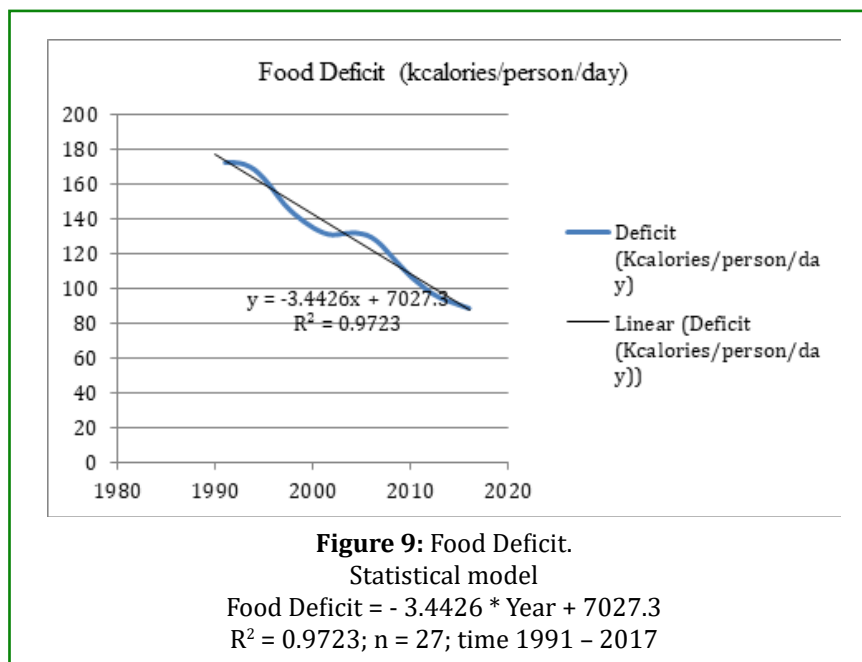
Every year, 0.3018 percent undernourishment is reduced. As can be seen from figure 8, the trend is decreasing.

Volume of Undernourishment (million)



Every year number of undernourished people in the world is reduced by 9.516 million. The trend is decreasing.

Food Deficit



Every year, food deficit by the extent of 3.4426kcalories/ person/day is reduced and the trend is decreasing and consistent. It is a very good sign.

Poverty and Mortality

Child Mortality Rate (Low Income)

Poverty and child mortality (which is an item in the health

sector), are strongly related. Look at the table 2 where child mortality by income level is shown for 1990 and 2017 [6]. By our definition, Extreme Poverty is defined as the income less than \$ 1.90. This extreme poverty falls in 'low income'. It is seen that child mortality rate is the highest in the low income group for both the years 1990 and 2017. In fact the same is the trend for all the years in between 1990 and 2017. Further analysis is provided in the figure (Figure 10).

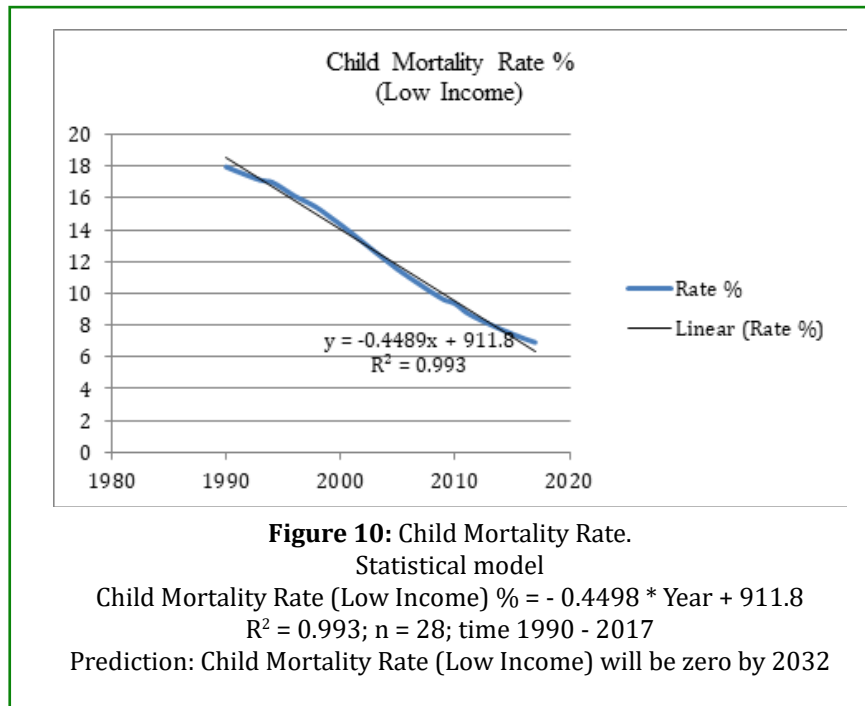
Income Group	1990	2017
Low income	17.95%	6.91%
Lower Middle Income	12.16%	4.85%
World	9.32%	3.91%
Upper Middle Income	5.21%	1.37%
High Income	1.34%	0.54%
Total	45.98%	17.58%

Table 2: Child Mortality by Income Level.

Child mortality is declining. In 1990, the rate low income (other groups also) was 17.95%. In 2017, it has come to 6.91%. The same trend prevails for all other years in between. However, child mortality rate remained highest, even higher than the world average. Child mortality rate in the low income group which reflects the extreme poverty

also, is decreasing by 0.4489% per year consistently.

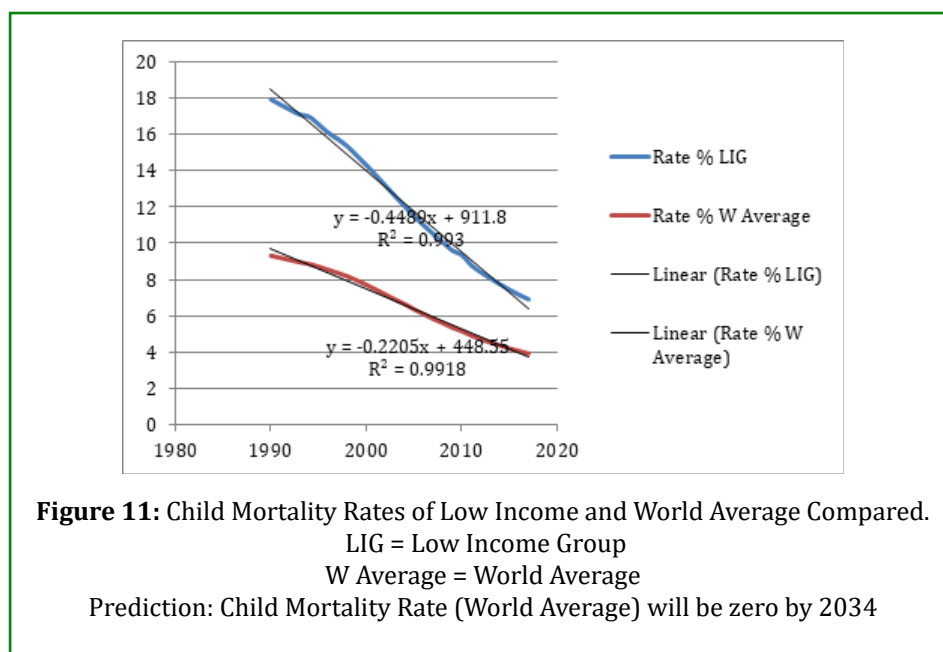
From the statistical model which is a very good fitting, it can be predicted that the child mortality in the extreme poverty group will be zero by the year 2032. This will be a marvelous achievement. The same trend is true for all other groups also.



Poverty: Child Mortality Rates (Low Income and World Average Compared)

Rates for low income group are always higher than those of the world average. In rates of child mortality for low income group and world average run almost parallel to each other. However rates for low income group run faster.

Mortality rates of low income group have been explained. Now we shall analyze the child mortality rates for world average to compare with those of low income group. World average child mortality rates are also consistently lower than those of low income group rates. In 1990, the world average child mortality was 9.32%. In 2017 it came down to 3.91. The same trend is observed for all other years.



Child mortality rates for low income group and world average both have consistently decreasing trend. The world average child mortality rates decreased by 0.2205% per year. Using the statistical model, it can be predicted that the world average child mortality rate will become zero by the year 2034. This will be a marvelous achievement. All the people and the concerned international organizations such as WHO and WB deserve highest appreciation.

Maternal Mortality

A maternal death refers to the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy. In (figure 12), maternal mortality rate is drawn. Maternal Mortality is an indicator of poor income group.

Maternal Mortality Rate	1990	2015
High Income	0.49%	0.56%
Upper Middle Income	9.01%	4.96%
Lower Middle Income	62.34%	55.83%
Low Income	28.16%	38.65%
Total	100.00%	100.00%

Table 3: Maternal Mortality Rates.

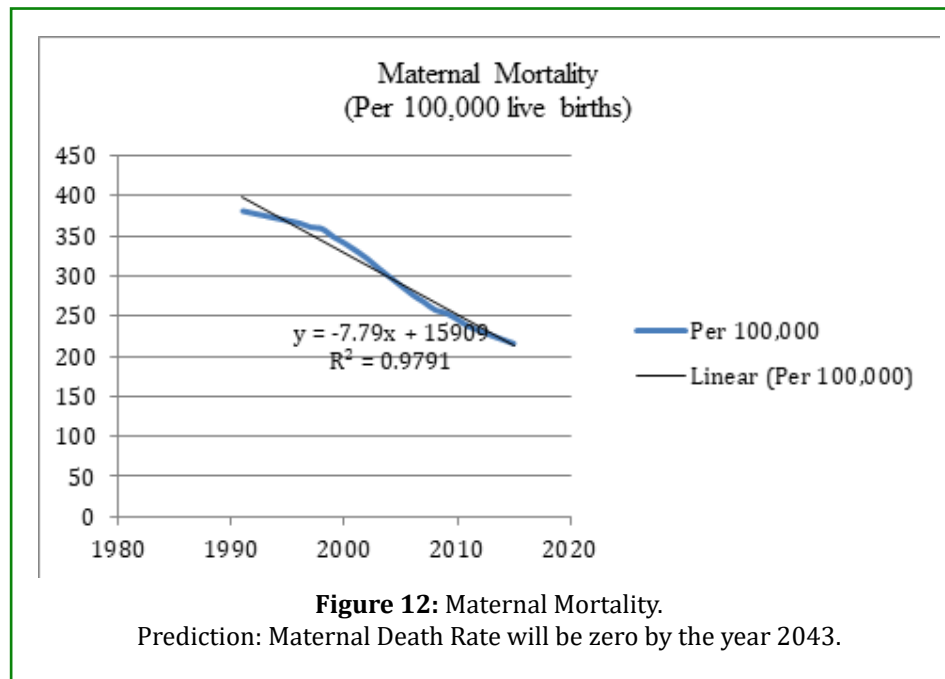
Maternal Mortality Rates for world during 1990 and 2015 are shown. In both the years, mortality for low income group increased when expressed in percentage form. For the absolute numbers, look at the figure 12. Maternal death rates using absolute numbers are shown in the statistical model

(figure 12). Every year, 7.79 maternal deaths per 100,000 live births are occurring.

Statistical model

Maternal Death Mortality = $- 7.79 * \text{Year} + 15,909$

$R^2 = 0.9791$; $n = 26$; time 1990 - 2015



It can be seen from the figure that per year maternity mortality rate will be reduced by 7.79 live births. Furthermore, it can be predicted that maternal mortality will be zero by the year 2043.

Unsafe Water and Unsafe Sanitation

Unsafe Water

Unsafe water is a typical to poor people. As per data from Our World in Data, the following information is appropriate in the context [7].

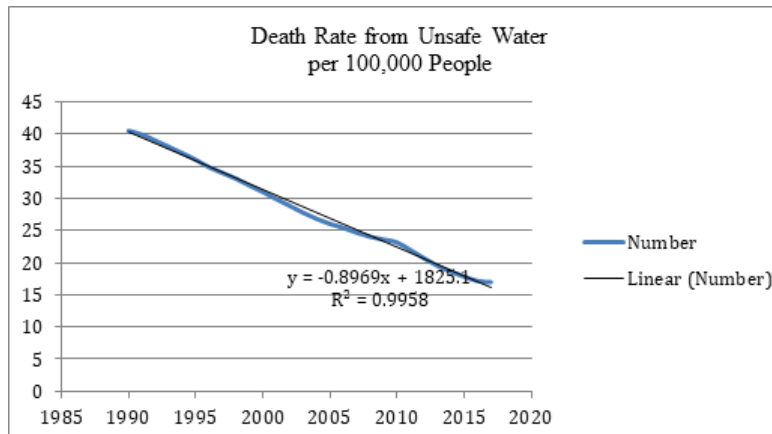


Figure 13: Death Rate from Unsafe Water.
Statistical model
Death Rate due to Unsafe Water = $-0.8969 * \text{Year} + 1825.1$
 $R^2 = 0.9958$; $n = 28$; time 1990 - 2017

Use of unsafe water is improving world over. About 0.8969 deaths per 100,000 people is being reduced every year. The trend of death rate due to use of unsafe water is decreasing. Unsafe water is responsible for 1.2 million deaths each year. 6% of deaths in low-income countries are the result of unsafe water sources.

666 million (9% of the world) does not have access to an improved water source.

2.1 billion People (29% of the world) do not have access to safe drinking water.

Unsafe Sanitation

The following cross-sectional data information is available from the 'Our World in Data'. These are relevant to poverty.

Unsafe sanitation is responsible for 775,000 deaths each year.

5% of deaths in low-income countries result from unsafe sanitation

2.4 billion People (one-third of the world) do not have access to improved sanitation.

4.5 billion People (60% of the world) do not have access to safely managed sanitation.

15% of the world still practice open defecation.

40% of the world does not have access to basic hand washing facilities.

Unsafe sanitation has a significant impact on childhood stunting.

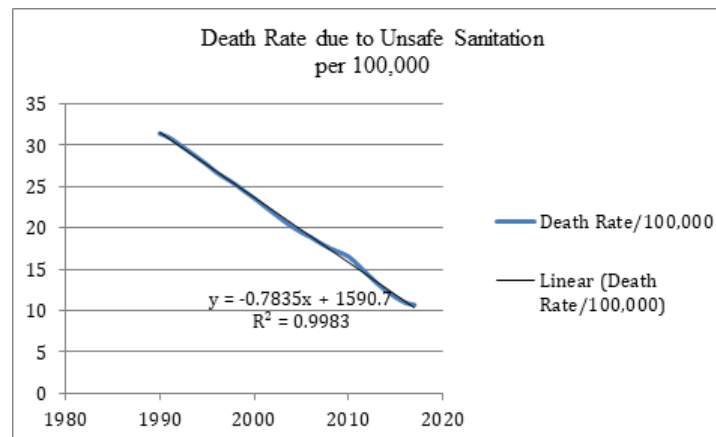


Figure 14: Death Rate from Unsafe Sanitation.
Statistical model
Death due to Unsafe Sanitation = $-0.7835 * \text{Year} + 1590.7$; $R^2 = 0.9797$; $n = 28$; time 1990 - 2017

The trend is reduction of death rate due to unsafe sanitation. Worldwide on average, 0.7835 deaths are reduced per year per 100,000 populations. It can be predicted that death rate due to unsafe sanitation will be zero by the year 2031.

World Hunger Index

The background information of the world hunger index is as follows: The index score comprises of four key hunger indicators: prevalence of undernourishment; childhood wasting; childhood stunting; and child mortality. It's measured on a 100-point scale where 0 is the best score

(no hunger) and 100 the worst. A score ≥ 50 is defined as 'extremely alarming'; 35-50 as 'alarming'; 20-35 as 'serious'; 10-20 as 'moderate' and under 10 as 'low'. Information in respect of only four countries Bangladesh, India, Pakistan and Nepal is available.

The graphical presentation is made in figure 15. It shows that all countries exhibit decreasing trends. This means that hunger index is decreasing. This in turn means that hunger situation is improving. This is a good sign. But all the mentioned countries at present are at serious stage (20-35).

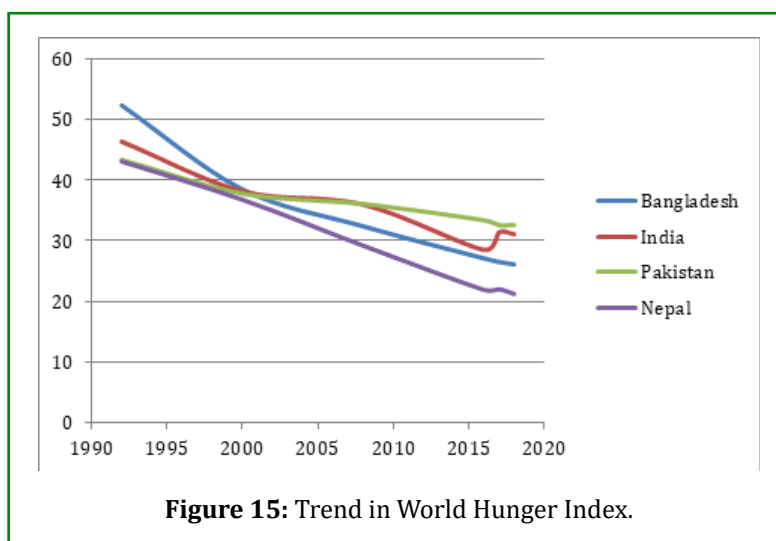


Figure 15: Trend in World Hunger Index.

Conclusion and Recommendation

No.	Poverty Factors	Conclusions	Remark
1	World Poverty		
a	World Population Living in Extreme Poverty	Every year, the number of people in the world being reduced from extreme poverty is 0.0359 billion.	Prediction: Using the model, it can be predicted that by 2040 there will be no people in the extreme poverty.
b	Poverty % of Population	Every year about one percent of the extreme poverty population is being reduced. The trend of reducing the extreme poverty population is consistent.	Prediction: If this trend continues, extreme poverty people in the world will be over by 2026.
c	Poverty Intensity/ Poverty Gap	It is interesting to note that the poverty gap is reducing in the world by 10.99 billion dollars every year, This trend is consistent. This trend is noted from the model developed using the world poverty data from 1981 - 2013.	Prediction: Based on the model, it can be predicted that world poverty gap (poverty intensity) will go by the year 2031.

2	Poverty and Economic Development	There a relation between the two. Furthermore, on a correlation test it has been found that the correlation coefficient between the two is -0.97261 which is very high and minus. This shows when economic development takes place, poverty is reduced.	
3	Poverty and Illiteracy	Every year the illiterate population is reduced by 0.4227 %.	Prediction: Using the model, it may be predicted that the world illiterate population will be over by the year 2058.
4	Poverty and Mortality		
a	Child Mortality Rate (Low Income)	Child mortality rate in the low income group which reflects the extreme poverty also, is decreasing by 0.4489% per year consistently.	Prediction: It can be predicted that the child mortality rate in the extreme poverty group will be zero by 2032.
b	Child Mortality Rates (Low Income and World Average Compared)	The world average child mortality rates decreased by 0.2205% per year.	Prediction: Using the statistical model, it can be predicted that the world average child mortality rate will become zero by the year 2034.
c	Maternal Mortality	It can be seen from the figure that per year mortality rate will be reduced by 7.79 live births per year.	Prediction: It can be predicted that maternal mortality will be zero by the year 2043.
5	Unsafe Water and Sanitation		
a	Unsafe Water	The trend of death rate due to use of unsafe water is decreasing.	Prediction: Death rate due to use of unsafe water will be zero by the year 2035.
b	Unsafe Sanitation	Death rate due to unsafe sanitation is reduced by 0.785 per year per 100,000 population	Prediction: Death rate due to unsafe sanitation will be zero by the year 2031.
6	World Hunger Index	Hunger situation is improving.	

Table 4: Conclusions.

Trend lines drawn with poverty factors confirm that world 'extreme poverty' is on the track of receding consistently. For this marvelous work, all the global people and the concerned organizations such as World Health Organization and World Bank deserve high appreciation.

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