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Ecological Footprint Consumption Leads to Low Life Expectancy: Evidence from Developing Countries

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ABSTRACT

Health is significant for economic development, and it contributes to achieving sustainable development and health outcomes. Result shows that health has contributed much to development and health outcomes. This study examines the effect of ecological footprint consumption and government health expenditures on life expectancy at birth in certain developing economies. A panel data set of 17 selected developing countries is used from the time span of 2002 to 2020. Findings are based on the fixed effects technique. Major socio-economic determinants of life expectancy are ecological footprints, gross domestic product, government health expenditures, urban population, unemployment, and infant mortality rate. The results show that ecological footprints, unemployment rate, and mortality rate decrease life expectancy. Whereas, health expenditures, gross domestic product, and urban population increase the life expectancy at birth. This study suggests the proper utilization of government health expenditures to decrease mortality rates in developing countries. Moreover, there is a serious need to increase employment opportunities for high life expectancy. Finally, more renewable energy resources for low environmental damage are necessary.

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INTRODUCTION

Every human wishes for a high living standard having socio-economic capital in this universe (Lei et al., 2009). Life expectancy at birth indicates human development, which is, by some means, associated with income level; however, nations having low income levels but with high human proficiencies and with skilful management of resources have observed high developments (Yavari & Mehrnoosh, 2006). The development basically creates ways for development for people they lead strong and healthy lives. Life expectancy has been tending to increase in all cultures (Dowd et al., 2010). The life expectancy has increased rapidly due to the overall improved health facilities in the 20th century. Higher growth is the result of higher life expectancy. A lot of factors disturb life expectancy at birth. Diverse theories and models indicate that improved life expectancy is an appealing issue for population studies; however, studies like Grosse and Aufiey (1989) and Kakawani (1993) conclude that socio-economic reasons contribute a lot to determining life expectancy.

GDP determines life expectancy very notably (Grosse & Auffery, 1989; Kakawani, 1993). Observed statistics indicate that spending on public health, education, living style, income, and environmental pollution determine health and substantially the life expectancy at birth, and are causes for reduction in early deaths. Researchers show that health care expenditures in most nations hardly get value for money. As a societal factor, CO2 emissions affect health by polluting the air in the environment. High life expectancy indicates superior health, which shrinks the unemployment rate in the economy. Developed and developing nations of the world are being faced by issues relating to unemployment. Life expectancy determines economic development and public health predominantly. Factors[1] affect life expectancy in developing countries in a positive and negative ways. This research chiefly aims to investigate how socio-economic and environmental factors have influenced the life expectancy at birth in some economies of Asia. High population growth, CO2 emissions, spending on health, inflation, unemployment, poverty, urbanization, having

[1] Socio, economic, political, cultural, behavioral and environmental

safe drinking water, etc., affect the people's health. A healthy population contributes a lot to economic development. This study attempts to highlight these factors that have a great influence on life expectancy.

Current studies regarding life expectancy have proposed that some factors[2] influence life expectancy in some countries. So, we will see the influence of ecological footprints and GDP with other factors on life expectancy by applying the random effects method in the current study. This study seems to contribute to existing literature by many folds. Firstly, here we highlight causes of life expectancy in developing countries, by including ecological footprint consumption per capita, which is a better environmental degradation. Secondly, we incorporate domestic general government health expenditures and unemployment. By reviewing the literature, we found hardly any studies showing the influence of ecological footprint consumption on life expectancy. However, we make an empirical analysis of factors affecting life expectancy. It will give recommendations with the estimated evidence concerning this field and will positively contribute to the literature. EF is a broad and foremost way to measure environmental damage, with greenhouse gas emissions. Rees (1992) has recognized it and improved by Rees and Wackernagel (1996). EF describes social requirements on normal environments, as it measures, by creating added extras of the natural accounting system, all sources of nature require care for the economy. The ecological footprint of an economy generally indeed productive land and aquatic areas to support societies' consumption and to absorb human pollution, through widespread technology.

As a proxy of environmental degradation, ecological footprints. It mainly deals with the natural resource usage by individuals. This ecological footprint consumption affects life expectancy, and it shows the influence of pollution on life expectancy. Data on the ecological footprint of global economies in Asian economies highlights an increasing tendency. However, this tendency is specific to Bahrain and Kuwait.

The life expectancy is well thought-out as a substitute for health, as it indicates as expected age of persons which can be found out. Life expectancy at birth can have an influence on economic growth. The data trend shows the lowest life expectancy was observed in Pakistan (66.94) in 2017. However high trend is observed in Singapore (82.89) in 2017. Gupta et al. (2003) show that government expenditure on health and education, pointers of learning achievement, and health output are associated in a positive way. Spending on health is usually a definite action made by people and institutions with the help of paramedical, medical, and technological means to restore, enhance, or sustain health. In the data of Bangladesh, lowermost (0.42 %) government spending was observed in 2016. Though government spending seemed high in Jordan.

LITERATURE REVIEW

We discussed studies explained previously, determining life expectancy at birth. These studies investigate the connection the life expectancy and socio-economic factors. Wilkinson (1992) shows that people having higher incomes would enjoy medical services and better health, and national mortality would be decreased. Yavari and Mehrnoosh (2006) analyzed the socio-economic issues that affected life expectancy in African countries. Regression results found that health expenditures and literacy tended to increase life expectancy. However, the number of people per doctor decreased life expectancy. The study concluded that human development required an increasing investment in the socio-economic sectors. Kabir (2008) also examined the reasons for life expectancy in 91 developing nations. The author has used disaggregated probit regression. The result showed that health expenditures hardly determined life expectancy.

However, Lei et al. (2009) focused on reasons for life expectancy in China. The results showed that floor space for rural residents and GDP per capita led to an increase in life expectancy. However, the illiteracy rate led to a decline in life expectancy. Furthermore, the proposed model could be considered as a fast instrument to project life expectancy. Bayati et al. (2013) estimated a health production function by using data for 21 EMR countries from 1995 to 2007 and used a fixed-effect model. Like Yavari and Mehrnoosh (2006), Bayati et al. (2013) indicated that income per capita increased life expectancy. Moreover, the education index, food obtainability, urbanization level, and employment ratio increased life expectancy. The study suggested that health policymakers must emphasize economic growth and the development level. Keita (2013) analyzed the factors affecting life expectancy in African countries. Similar to Yavari and Mehrnoosh (2006), the author has used pooling, fixed-effect, long difference, and system GMM methods.

[2] Such as population growth, Co_2 emissions, public health spending, inflation, unemployment, poverty, urbanization and access to safe drinking water

GDP per capita increased life expectancy gain, as follows to Yavari and Mehrnosh (2006) and Kabir (2008). Moreover, adult literacy, having improved sanitation and safe water, also increases health advantages.

Singariya (2013) explored several socio-economic causes that were linked with life expectancy at birth and affected the fifteen Indian states. By using secondary data, the study showed that increased per capita income increased life expectancy, as shown by Yavari and Mehrnoosh (2006) and Bayati et al (2013). Moreover, consumption spending, housing availability, electrification, and telephone accessibility would lead to an increase the life expectancy. Gilligan and Skrespnek (2015) focused on factors that affected life expectancy by using panel data. A mixed-effects linear model showed that GDP, vaccination averages, and urbanization determined life expectancy. The study concluded that variations in life expectancy were observed between poor and rich economies. As compared to others, Ali and Ahmed (2014) examined reasons for life expectancy in Oman. The authors have used time series data. ARDL results revealed that foodstuff making, school enrollment led to an increase in life expectancy. Again, Deshpande et al. (2014) examined the connection between healthcare expenditure and national life expectancy in developing economies. The study result showed no significant relation between healthcare spending and life expectancy, but found this in developed countries. In developed countries, spending seemed more effective.

Jaba et al. (2014) showed the link between health care expenditure and life expectancy at birth by using data for 175 countries from 1995 to 2010. Like Kabir (2008), this study showed an important link between health spending and life expectancy. Shahbaz et al. (2015) analyzed causes of life expectancy with economic misery in Pakistan from 1972–2012. Like Kabir (2008) and Ali and Ahmad (2014), the authors have used the ARDL bounds testing approach to cointegration to find out the long run association of the variables. Moreover, health spending and food availability improved life expectancy. Dissimilar to others, high misery deteriorated life expectancy. By following Bayati et al. (2013), urbanization enhanced life expectancy while illiteracy declined it. Monsef and Mehrajardi (2015) focused on life expectancy that affected 136 economies from 2002 to 2010. The study results suggested that unemployment and inflation led to a decrease the life expectancy. But the gross capital formation and gross national income increased life expectancy. The urbanity seemed to be as main socio-environmental factor that caused mortality. Hassan et al. (2017) worked on environmental degradation that has become a threat to human lives. Environmental degradation produced by human actions resulted in deterioration of human health and was the result of air and water pollution. It was found that environmental degradation and pollution were a great reason for a quarter or all deaths, up to 234 times as many premature deaths as happened in conflicts annually.

Gogoi and Barman (2018) focused on the life expectancy of Assam. The authors have used the Chiang method of the abridged life table. Life expectancy at birth was found as 68.88 years and 71.76 years for Assam and India, respectively. Although the life expectancy of Assam has been observed improving over time but it was not suitable in the case of the country. Paramita et al. (2020) worked on life expectancy and chosen clusters of Indonesian provinces with comparable features by collecting 2015 data. The authors have used structural equation modeling to select domains that require working on from theoretical models. Results found that education, expenditures, workforce, healthcare facilities, and environment determined life expectancy. The study made suggestions for formulating cooperation policies intended to enhance life expectancy.

Our research is an extended form of the earlier studies mentioned above and specifically research done by Kabir (2008), Bayati et al. (2009), Singariya (2013), Jaba et al. (2014), Shahbaz et al. (2015), Monsef and Mehrajardi (2015), and Hassan et al. (2017). In our study, however, the dependent variable is life expectancy. We have used the ecological footprint, which is a better measure of environmental degradation and is not used in the work in the studies mentioned above. For appropriate results, we have used the fixed effect technique, which is a more appropriate approach in this study.

METHODOLOGY

Data Sources

We examine the association of life expectancy and socio-economic factors in developing economies. So, unstructured panel data from 2002 to 2020 were drawn. 17 developing countries like Bangladesh, India, Indonesia, Malaysia, Pakistan, Sri Lanka, Singapore, Thailand, the Philippines, Brunei Darussalam, Bahrain, Iran, Jordan, Kuwait, Mongolia, Vietnam, and China. The data about socio-economic factors is taken from different sources. These data sources follow World Development Indicators and World Governance Indicators. The data for the ecological footprint is drawn from Global Footprint Network. We have used the log of GDP per capita, ecological footprint consumption, log of Government health spending (% of GDP), and the urban population. Unemployment rate and infant mortality rate are also used. μ is the error term.

Model Specification

The practical requirement of the model follows from the General Cobb-Douglas production function. We have found out the influence of socio-economic factors affecting life expectancy. The model is given as:

$$LLEXP_{it} = \beta_0 + \beta_1 LEF_{it} + \beta_2 LGDP_{it} + \beta_3 GHEXP_{2it} + \beta_4 URBNP_{it} + \beta_5 UNEMP_{it} + \beta_6 IMRTR_{it} + \mu it \quad (1)$$

Where the subscript "i" means the chosen states (i = 1…17 for selected developing economies), however, "t" indicates time specification. While Ln *LEF* gauges the log ecological footprints, whereas LGDPit indicates the log gross domestic product. Financial development is shown by *FDit*, while *TOPNit* indicates the trade openness. Moreover, Government health expenditures have been represented by GHEXP*it*. Finally, URBNP*it* and *IMRTRMit* measure the urban population and infant mortality, respectively. We have taken the log form of some of the variables to convert the variables into percentage form and to get improved values of the coefficients of the concerned variables

RESULTS AND DISCUSSION

In Table 1, we have checked the unit root in panel data by using Levin, Lin & Chu, I P, Shin W-stat, ADF - Fisher Chi-square, and PP v- Fisher Chi-square. Test statistics for LEF, LGDP, and GHEXP at the level form are not significant. Though these are significant at 1st difference. Furthermore, variables like LLEXP, URBNP, UMEMP, and IMRTR are stationary at the level.

Table 1: Results of Panel unit methods

Variables	probability	Levin, Lin & Chu t*	IP & Shin W-stat	ADF - Fisher Chi-square	PP - Fisher Chi-square
LLEXP	At level	0.0000	0.0000	0.0000	0.0000
LEF	At level	0.0066	0.4634	0.4236	0.0388
	At Ist difference	0.0000	0.0000	0.0000	0.0000
LGDP	At level	0.0737	0.9914	0.8147	0.9990
	At Ist difference	0.0000	0.0000	0.0000	0.0000
GHEXP	At level	0.4224	0.9163	0.6672	0.1356
	At Ist difference	0.0000	0.0000	0.0000	0.0000
URBNP	At level	0.0000	0.0016	0.0000	0.0000
UNEMP	At level	0.0001	0.0129	0.0017	0.0000
IMRTR	At level	0.0000	0.0002	0.0000	0.0000

Table 2: Descriptive statistics

Variables	N	Minimum	Maximum	Mean	Standard deviation
LLEXP	289	1.7959	1.9183	1.8571	0.0260
LEF	289	-0.24474	1.0731	0.3952	0.3577
LGDP	289	2.7201	4.7385	3.6571	0.5667
GHEXP	289	0.4247	6.3742	1.8788	1.0406
URBNP	289	18.19600	100.0000	57.1635	25.5627
UNEMP	289	0.3980	15.3000	4.6628	3.51303
IMRTR	289	2.2000	87.8000	22.7156	18.8471

In Table 2, Results show that the mean value of health expenditures is 1.8788. Similarly, the mean of GDP is 3.6571. On average, the unemployment rate is 4.67 %. On the other hand, log ecological footprint consumption has a supreme dissimilarity in the data. LEF has its minimum value is -0.2447 and a maximum value is 1.0731. On average, the infant mortality rate is 17 per 1000.

For choosing FEM or REM, focus has been made on the Hausman test.

Chi2 =99.73

Probability of chi2 0.0000

The p- p-value by Hausman favors the fixed effect technique.

Table 3: Factors affecting life expectancy using the fixed effects technique

Variables	Coefficients	Std. Error	t--statistics
LEFPC	-0.0108*	0.0043	-2.54
LGDPPC	0.0197*	0.0048	4.05
GGHEXP	0.0017*	0.0005	3.26
URBPOP	0.0005 *	0.0001	5.08
UNEMR	-0.0007*	0.0003	-2.62
IMRTR	-0.0010*	0.0001	-15.54
C	1.7804	0.0173	102.69
R_2 Within	0.87		
R_2 between	0.67		
R_2 overall	0.68		

*indicates a 1 percent level of significance.

The above table indicates the result of socio-economic factors affecting life expectancy. The impact of log life expectancy is statistically significant. The result highlights that a one percent increase in ecological footprints per capita will decrease 0.0108 percent of life expectancy at birth. This is due to the fact that the polluted environment affects the health tends to decrease the life expectancy. The result is supported by Monsef and Mehrjardi (2015), Bayati et al. (2013), and Ali and Ahmed (2014).

GDP can also determine life expectancy. The result highlights the positive coefficient of GDP. Increased GDP will result in an increase of 0.0197 percent in life expectancy. It seems that increasing growth is favorable for life expectancy at birth in developing countries. It indicates that people easily spend more income on a better living standard, which has a great impact on the health of people. The result is supported by Hassan et al. (2017). In addition to GDP, the coefficient of variable health expenditures is positive and statistically significant. The coefficient shows that a unit increase in health expenditures will result in an increase in life expectancy at birth by 0.0017 percent. Health expenditure is thought to be a measure of health facilities for the general public. The reason can be that much spending on health results in good health facilities provided by the general public. And resultantly, individuals' medical treatment improves their life expectancy at birth. Effective response of funding and resource allocation towards health is found in studies. This result is supported by Bayati et al. (2013) and Hassan et al. (2017).

The urban population positively affects life expectancy. The value of the coefficient is positive. A one percent increase in urban population increases 0.0005 % in life expectancy at birth. A high urban population increases the chances of more skilled and educated persons in the economy having strong expenditures and finances. And all this increases life expectancy at birth. The coefficient of unemployment is negative and statistically significant. One unit increase in unemployment will tend to decrease by -0.0007 % in life expectancy at birth. High unemployment decreases the chances of employment for people in the economy. Those having low income are unable to fulfill their needs. These financially weak people are unable to make expenses on education, health and nutrition. And all this decreases life expectancy at birth. Bayati et al. (2013) reveals that reduction of unemployment has a positive and significant impact on life expectancy.

The infant mortality rate also affected life expectancy. The coefficient shows that one unit increase in mortality rate resulted in decreased life expectancy at birth by 0.0010 percent. It is because of that low health expenditures result in infants' deaths and this causes for decreased life expectancy at birth. The result is favored by Gogoi and Barman (2018).

CONCLUSIONS AND RECOMMENDATIONS

Health is the most emerging and severe issue that the world is facing now. This research aims to understand the causes of life expectancy at birth. For this purpose, we made use of data from 2002 to 2020. Ecological footprint consumption has a negative effect on life expectancy at birth as it creates pollution in the atmosphere. These polluted environments are the major cause of natural disasters and result in lower life expectancy in developing nations. The study results conclude that GDP positively affects life expectancy, as a financially strong population has access to higher nutritional, health, and housing facilities, which result in a higher standard. Moreover, Health care expenditures affect positively the life expectancy because these expenditures result in high-quality health facilities and ultimately increase life expectancy. The results show that population positively affects life expectancy. More urban population leads to a larger labor force, which works more productively and makes a contribution towards growth, and this increases the chances to avail many healthy things and increases life expectancy.

The study results suggest that educational and health facilities must be available to all segments of the population and high spending on health to develop the economy. It is also suggested that the provision of more employment opportunities to the population to decrease the unemployment burden. There is a dire need for more funds allocation to research and development to develop the health-related technologies for better health opportunities and life expectancy at birth. Finally, much focus on clean energy usage for low environmental degradation and for high life expectancy should be the first priority.

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