

http://ijssrr.com editor@ijssrr.com Volume 8, Issue 5 May, 2025 Pages: 1-9

The Impact of Air Freight and the Human Development Index: The Volume of Freight, Health, Knowledge and Standard of Living Across Countries

Yin Hei Chan; Hoi Yan Cheung

Island School, Hong Kong

E-mail: chanyinhei@gmail.com

http://dx.doi.org/10.47814/ijssrr.v8i5.2701

Abstract

Existing literature mostly focused on the relationship between freight and standard of living of individual countries (Leite et al., 2022; Sarram & Ivey, 2017). Moreover, many studies merely emphasized the impact of air freight and air quality (Facanha & Horvath, 2007; Ramani, Jaikumar & Charman, 2019), but not the overall quality of living of humans across countries. This current study filled the literature gap by investigating some of the factors that might predict the Human Development Index (HDI) of 94 countries by including air freight as one of the independent variables. The HDI can be seen as the average achievement of three basic aspects of human development, namely health, knowledge and standard of living (United Nations Development Programme, 2023). Three factors were included in the analysis to predict the HDI values: air freight, computers, communication and other services and the number of infant deaths. Air freight involved volume of freight, express and diplomatic bags carried on every freight stage. The results showed that the three independent variables significantly explained approximately 39% of the total variance in the HDI. Though air freight was not the strongest predictor of the HDI, results showed that higher volume of freight was significantly related to higher HDI.

Keywords: Air Freight; Computers; Communication; HDI; Quality of Life

Introduction

This study aimed to investigate the relationship between people's quality of life and the volume of air freight, as well as number of infant deaths and computer, communication and other services across countries. Every human being wants a high quality of life, but how do we know if we are achieving that? The easiest answer is to compare ourselves with others. The United Nations Development Programme (UNDP) created the Human Development Index (HDI) to measure "achievement in the living standard of a population in terms of attainment levels of different quality-of-life attributes" (Chakravarty, 2003, p. 99). To obtain the HDI, each year the UNDP measures the average achievement of around 190 countries



on three dimensions, namely a long healthy life, being knowledgeable and having an acceptable standard of living (UNDP, 2023). As seen from the figure below, the HDI has been calculated in such a way.



Figure 1: Calculating the human development index (UNDP, 2024)

It is important to measure people's quality of life because life expectancy and happiness could be related to quality of life (Kaplan, 2002). A person with a good quality of life has a sense of fulfilment and satisfaction with multiple aspects of his or her life (Theofilou, 2013). Most of the studies that have investigated the factors that contribute to a good quality of life have been related to health. For example, Wijk (2005) indicated that allergic rhinitis and asthma decreased patients' overall quality of life, whereas Obasi et al. (2012) found that exercise and meditation improved people's quality of life. Besides health and medical issues, Liu et al. (2020) showed that sustainable construction, defined as a construction process with the basic objective of sustainable development, had a positive impact on people's quality of life. When sustainable construction encompasses the concept of sustainable development, it can improve the environment, energy efficiency and care for future generations, and thus could improve people's overall quality of life.

Another area of research on quality of life is related to the economy. For example, Haq and Zia (2013) indicated that the economic status of households and communities was significantly related to human well-being and thus people's quality of life in Pakistan. Interestingly, Esposto and Zaleski (1999) showed that economic freedom enhanced the quality of life across nations and also improved the quality of life in the long run. Stroup (2007) examined the relationships among economic freedom, democracy and quality of life and found that greater economic freedom enhanced health, education and disease prevention. Moreover, other factors may also affect quality of life of individuals. For example, COVID-19 (Shek, 2021), culture (Utsey et al., 2001) and environment (Keles, 2012).

The above studies investigated various factors that were found to be associated with quality of life in specific countries. This study examined the quality of life across countries in terms of three variables: air freight, computers, communication and other services and the number of infant deaths.

Method

Four variables and 94 countries were included in this study (as shown in Appendix). Table 1 shows that definitions of all the variables included in this study. First, the 2021 HDI was included, the data for which were collected by the UNDP (2023). As mentioned, the HDI measures health, education, income and allows comparisons to be made between different countries. Originally, the HDI was first found in the annual Human Development Reports produced by UNDP and the reports were devised and launched in 1990 (Wikipedia, 2024).

The next variable was air freight in 2021, and the data were collected from the World Bank (2023). This variable measured the volume of freight, express and diplomatic bags carried on every



freight stage (World Bank, 2023) of different countries. This data was measured in metric tons times kilometers travelled and it showed the volume of freight, express, and diplomatic bags carried on each flight stage (World Bank, 2023). The reason for choosing this variable because, as mentioned, most studies found that air freight would lower the quality of life of people. Thus, this study would want to use a different perspective in examining the relationship.

The third variable, computers, communication and other services in 2021, was also collected from the World Bank (2023). This variable is defined as "international telecommunications and postal and courier services; computer data; news-related service transactions between residents and non-residents; construction services; royalties and license fees; miscellaneous business, professional and technical services; and personal, cultural and recreational services" (World Bank, 2023). Calculation of this variable could be referred to World Bank (World Bank Group, 2024). Studies have indicated the positive relationship between computers and technologies on older adults and patience (Belkacem et al., 2020; Slegers, van Boxtel & Jolles, 2008). The final variable was the number of infant deaths in 2021, collected from the UNDP (2023), and this number indicated the number of infants dying before reaching one year of age. Studies have shown the negative relationship between death and quality of life (Phyo et al., 2020). Based on the above literature, the third and fourth variables were chosen as control variables in this study.

Data from UNDP and World Bank was opened to the public. Thus, the data should not contain any sensitive or ethical issues. Ninety-four countries with all four variables available were included in the analyses. Countries were not included in this study when data from even one variable was missing. Statistical Product and Service Solutions (SPSS) was used to examine the data.

Variables	Definitions
1. HDI – Human Development Index	Measures health, knowledge and living standard
2. Volume of freight	Express and diplomatic bags carried on every freight stage
3. Computers, communication and other services	International telecommunications and postal and courier services; computer data; news-related service transactions between residents and non-residents; construction services; royalties and license fees; miscellaneous business, professional and technical services; and personal, cultural and recreational serv
4. Number of infant deaths	The count of deaths occurring to an infant, before reaching the age of one.

Table 1: Definitions of variables

Both data from UNDP and World Bank is considered as reliable. According to UNDP (2018), data was collected from over 120 countries each year for many years and leaders of different countries would use the data to make important decisions. In terms of World Bank, after data was collected, applying statistical analysis must be both reliable and relevant and that the data must be compiled correctly, following standard practices and methodology (World Bank, 2024).

Results

As mentioned in the beginning of this paper, it is important to investigate the relationship between freight and people's standard of living, namely the HDI. Limited studies focused on this relationship and the results below aimed to fill the research gap. The analyses below will show if the relationship is positively or negatively related.



First of all, Table 2 shows the means, standard deviations and standard error means of the variables of the 94 countries and one-sample T test was applied from SPSS. Means for the HDI, air freight, computers, communication and other services and infant deaths were 0.76, 1662.29, 41.83 and 29207.76 respectively.

	Mean	Std. Deviation	Std. Error Mean
HDI	0.76	0.14	0.01
Air freight	1662.29	5629.10	580.60
Computers, communication and others	41.83	18.33	1.89
Infant deaths	29207.76	92301.92	9520.22

1 able 2: Mean, standard deviation and standard error mean (n=94	Table 2: Mean,	standard	deviation	and	standard	error mea	an (n=94)
--	----------------	----------	-----------	-----	----------	-----------	-----------

Correlation and regression analyses were conducted to examine the relationships between the four variables. According to Table 3 (applying Bivariate Correlation from SPSS), all three variables were significantly correlated with the HDI. Air freight as well as computers, communication and other services had significant and positive correlations with the HDI, with r = .23 and .47, respectively. Conversely, the number of infant deaths had a significant and negative correlation with the HDI, with r = -.40. The variable of computer, communication and other services was moderately correlated with the HDI. The number of infant deaths was also moderately correlated with the HDI. However, the correlation was negative. Moreover, air freight was also positively correlated with the HDI but the relationship was weak.

Table 3: Correlations among the four variables

	1	2	3	4
1. HDI	1.00			
2. Air freight	.23*	1.00		
3. Computers, Communication	.47**	.09	1.00	
4. Infant deaths	40**	02	08	1.00

*p < .05; ** p < .01; ***p < .001

A regression analysis was performed with the 'enter' method. Overall, as shown in Table 4, 39% of the total variance in the HDI was significantly predicted by air freight, computers, communication and other services and the number of infant deaths. The slopes for air freight and computers, communication and other services were positive whereas the slope for the number of infant deaths was negative.

The unstandardized beta (B) showed the slope of the line between the HDI and the other three variables. The standard error for the unstandardized beta (SE B) and the standard deviation for a mean are similar. When the number is larger, the points are more spread out from the regression line. When the numbers are more spread out, the less likely that significance will be found. In terms of standardized beta (β) , it is similar to a correlation coefficient, ranging from 0 to 1 or 0 to -1, based on the direction of the relationship. Stronger relationship has a value of 1 or -1. (Complete Dissertation, 2024).

Table 4: Reg	ression a	analysis	for	predicting	HDI
--------------	-----------	----------	-----	------------	-----

Variables	В	SE B	β
Air freight	4.65E-6	.00	.19*
Computers, communication and others	.00	.00	.42**
Number of infant deaths	-5.48E-7	.00	37**
Note $R^2 - 30 \cdot *n < 05 \cdot **n < 01 \cdot ***n < 01$	001		

°°°°p < .001 Note. $K^2 = .39$; *p < .05; [™] p < .01;



There seemed to be no interaction effect (air freight and computers, communication and other services) on the HDI. The method of Univariate from SPSS was applied. Overall, after running some correlation and regression analyses, this research could provide a better understanding of the relationship between the HDI and air freight specifically, as well as the relationships among the four variables, namely the HDI, air freight, computers, communication and other services and number of infant deaths.

Discussion

According to Nguyen (2024), the volume of air freight is very important because it could generate income and jobs and promote international trade and other economic sectors. In addition, there has been an increase in the demand of air transport because of sending time-sensitive products (Choi, 2023). Thus, it is significant to find out if the volume of air freight could bring negative impacts to individuals across countries. However, the correlation between the HDI and air freight was low (r = .23) in this study. Correlation between the HDI and computers, communication and other services was moderate (r = .47), and the correlation between the HDI and the number of infant deaths was negative (r = .40). Though the correlation between the HDI and air freight was not as strong as computers, communication and other services and the number of infant deaths, the relationship was still significant. The paragraphs below tried to explain the relationships.

Interestingly, based on the results of the current study, air freight was able to positively predict the HDI across countries, suggesting that people's quality of life or their standard of living was enhanced in countries with higher volumes of air freight. A higher volume of freight indicates that more products are imported into and exported out of the country. Chang and Ying (2008) found significant relationships among trade openness, air freight and GDP per capita for African countries. For example, when a country had policies that encouraged positive trade, the volume of air freight increased, which raised the country's GDP. As mentioned in Alexander and Merket's study (2021), air freight has been connected to economic growth of the US. The increase of air freight has been related to silicon material and consumer electronics (such as the iPhone, laptop computers and other high-tech audio-visual equipment) shipments. These trading could enhance the economy and the purchase these products could increase the living standard of people. Overall, when people have more earning power, they have more purchasing power, including in areas such as education, health and medication and housing. All of these factors could enhance the HDI of people across countries.

Unlike Leite et al.'s study (2022) which examined the relationship between urban freight transport and residents' quality of life in Brazil and found that freight transport negatively affected society and the environment due to the increase in congestion and pollution in residential areas. Leite et al.'s study (2022) investigated people's quality of life by distributing questionnaires to them. The study indicated that urban freight transport "significantly increasing the movement of goods, which also increased carriers' travel times and traffic congestion, among other externalities...is responsible for numerous negative impacts, such as noise, safety, obstructions for pedestrians, damaging and invading urban infrastructure, loss of time and energy, emission of greenhouse gases, and congestion" (p. 5255). Therefore, citizens' quality of life was badly impacted by having more freight transport. Temjanovski and Jovanov (2020) similarly found that air freight caused a decrease in people's quality of life due to air pollution negatively affecting the environment and human health. "The increased traffic flow caused by freight movement burden cities and reduce the quality of life of its inhabitants" (Temjanovski & Jovanov, p. 119). Other negative effects of freight transport included greenhouse gas emissions, noise pollution and habitat fragmentation.

Another predictor of the HDI found in this study was computers, communication and other services. As mentioned, this variable was related to international telecommunications, computer data and



business, professional and technical services. Salvesen and Renski (2003) indicated that high-technology firms in the computer and telecommunications industries have been a fast-growing sector of the domestic economy, and can attract many scientists, engineers and technicians to the area, which can lead to an increase in job opportunities and higher incomes. Hence, the living standards of people in such areas could be enhanced. Moreover, Ratheeswari (2018) information communication technologies (ICT) are influencing people in every aspect of life, especially in improving "teaching and learning and its importance for teachers in performing their role of creators of pedagogical environments" (p. 45). As one of the indexes of HDI is knowledge/education, the variable of computers, communication and other services could enhance the HDI across countries.

Finally, the number of infant deaths negatively predicted the HDI: the lower the number of infant deaths, the higher the HDI. In fact, many studies have shown the relationship between HDI and infant and child mortality rates and these rates are major contributors to overall global mortality (Khazaei & Ayubi,2016; Lee et al., 1997). The number of deaths may reflect the medical and health services of a country. When a country is poor and does not have good medical and health services, its medical technology may be inadequate and there may not be sufficient resources for infant healthcare. Thus, the HDI in that country will be low as health is one of the dimensions in measuring the HDI. Hertz, Hebert and Landon (1994) studied infant mortality across countries and found that the percentage of households without sanitation facilities showed the strongest association with infant mortality. The poorer the country, the higher the infant mortality rate and the lower the quality of life. Overall, as Khazaei and Ayubi (2016) explained, health measure (especially mortality rate) is a significant indicator of economic growth encourages accumulation of health capital. These were all plausible reasons for the negative relationship between the HDI and the number of infant deaths across countries.

Conclusion

To no surprise, the number of infant death rate and computer and communication services were found to be significant in predicting the HDI, demonstrating that in order for people to have high standard of living, we should not ignore these two independent variables. However, different from other studies, this study has shown that the volume of air freight could actually increase the HDI of people across countries and the HDI is measured by people's health, knowledge and standard of living. When most empirical studies have indicated the negative consequences that air freight and the aviation industry have brought to people, the results of this study have provided new perspective to this issue.

This cross-country study investigated the relationships among the HDI, air freight, computers, communication and other services and the number of infant deaths in 94 countries in 2021. The data was collected from the World Bank and the UNDP. There were limitations in this study. For example, only 94 countries were included and this research merely focused on a specific year. Moreover, only 4 variables were included for investigation.

In terms of further studies, researchers could include more variables from other datasets from different organisations and could also apply data from other time periods (such as years 2011 and 2001) and to examine whether the relationships among these variables of this study are consistent. Also, a comparative analysis of the relationships across different regions or income groups could be done in the future. For example, finding out how high-income and low-income countries correlate with the four variables. Researchers could explore other variables that might influence the HDI or conducting similar studies in different regions or time periods. Overall, it is beneficial to countries and their citizens to open up their economy and forge connections with other places because this can enhance citizens' standard of living and quality of life.



References

- Alexander, D. W., & Merkert, R. (2021). Applications of gravity models to evaluate and forecast US international air freight markets post-GFC. *Transport Policy*, 104, 52-62.
- Belkacem, A. N., Jamil, N., Palmer, J. A., Ouhbi, S., & Chen, C. (2020). Brain computer interfaces for improving the quality of life of older adults and elderly patients. *Frontiers in Neuroscience*, 14, 1-11.
- Chakravarty, S. R. (2003). A generalized human development index. *Review of Development Economics*, 7(1), 99-114.
- Chang, C. P., & Ying, Y. H. (2008). The generative power of air freight in the trade openness economic growth nexus in African countries. *South African Journal of Economics*, 76(3), 493-512.
- Choi, J. H. (2023). The value of time and the impact on the air freight product portfolio A study of the South Korean market 2017–2021. *Journal of Air Transport Management*, 109.
- Complete Dissertation (July 24, 2024). *Regression Table*. Retrieved from: https://www.statisticssolutions.com/regression-table/
- Esposto, A. G., & Zaleski, P. A. (1999). Economic freedom and the quality of life: An empirical analysis. *Constitutional Political Economy*, 10, 185–197.
- Facanha, C., & Horvath, A. (2007). Evaluation of life-cycle air emission factors of freight transportation. *Environmental Science and Technology*, 41(20), 7138-7144.
- Haq, R., & Zia, U. (2013). Multidimensional wellbeing: An index of quality of life in a developing economy. *Social Indicators Research*, 114, 997-1012.
- Hertz, E., Hebert, J. R., & Landon, J. (1994). Social and environmental factors and life expectancy, infant mortality, and material mortality rates: Results of a cross-national comparison. *Social Science & Medicine*, 39(1), 105-114.
- Kaplan, R. M. (2002). Quality of life: an outcome perspective. Archives of Physical Medicine and Rehabilitation, 83(2), S44-S50.
- Keles, R. (2012). The quality of life and the environment. *Procedia Social and Behavioral Sciences*, 35, 23-32.
- Khazaei, S., & Ayubi, E. (2016). Variations of infant and under five child mortality rates around the world, the role of human development index. *International Journal of Pediatrics*, 4(5), 1671-1677.
- Lee, K. S., Park, S. C., Khoshnood, B., Hsieh, H. L., & Mittendorf, R. (2019). Human development index as a predictor of infant and maternal mortality rate. *The Journal of Pediatrics*, 131(3), 430-433.
- Leite, C. E., Granemann, S. R., Mariano, A. M., & de Oliveira, L. K. (2022). Opinion of residents about the freight transport and its influence on the quality of life: An analysis for Brasília (Brazil). *Sustainability*, 14(9), 5255.
- Liu, Z., Pyplacz, P., Ermakova, M., & Konev, P. (2020). Sustainable construction as a competitive advantage. *Sustainability*, 12(15), 5946.
- Nguyen, Q. H. (2024). Modeling the volatility of international air freight: A case study of Singapore using the SARIMAX-EGARCH model. *Journal of Air Transport Management*, 117.



- Obasi, C. N., Brown, R., Ewers, T., Barlow, S., Gassman, M., Zgierska, A., Coe, C. L., & Barrett, B. (2012). Advantage of meditation over exercise in reducing cold and flu illness is related to improved function and quality of life. *Epidemiology and Impact of Respiratory Virus Infections*, 7(6), 938-944.
- Phyo, A. Z. Z., Freak-Poli, R., Craig, H., Gasevic, D., Stocks, N. P., Gonzalez-Chica, D. A., & Ryan, J. (2020). Quality of life and mortality in the general population: a systematic review and meta-analysis. *BMC Public Health*, 20(1596).
- Ratheeswari, K. (2018). Information communication technology in education. *Journal of Applied and advanced research*, 3(1), 45-47.
- Ramani, T., Jaikumar, R., & Charman, N. (2019). Air quality and health impacts of freight modal shifts: Review and assessment. *Transportation Research Record*, 2673 (3), 153-164.
- Salvesen D., Renski H. (2003, January). *The importance of quality of life in the location decisions of new economy firms*. Chapel Hill: Center for Urban and Region Studies, University of North Carolina at Chapel Hill.
- Sarram, G., & Ivey, S. S. (2017). Evaluating a survey of public livability perceptions and quality-of-life indicators: Considering freight-traffic impact. *International Conference on Sustainable Infrastructure*, 86-98.
- Shek, D. T. L. (2021). COVID-19 and quality of life: Twelve reflections. *Applied Research in Quality of Life*, 16, 1-11.
- Slegers, K., van Boxtel, M. P. J., & Jolles, J. (2008). Effects of computer training and internet usage on the well-being and quality of life of older adults: A randomized, controlled study. *The Journal of Gerontology*, 63(3), P176-P184.
- Stroup, M. D. (2007). Economic freedom, democracy and quality of life. *World Development*, 35(1), 52-66.
- Theofilou, P. (2013). Quality of life: Definition and measurement. *Europe's Journal of Psychology*, 9(1), 150-162.
- Temjanovski, R., & Jovanov, T. (2020). Transforming freight mobility in the cities and promoting of green logistics. *Macedonian International Journal of Marketing*, 6 (11), 113-121.
- UNDP (2023, September 9). *Human development index*. Retrieved from: https://hdr.undp.org/data-center/human-development-index#/indicies/HDI.
- UNDP (2024, August 2). *Human development report 2023/2024 technical notes*. Retrieved from: chrome-extension://efaidnbmnnibpcajpcglclefindmkaj/https://hdr.undp.org/sites/default/files/2023-24_HDR/hdr2023-24_technical_notes.pdf.
- UNDP (2018, March 22). UNDP as 'knowledge frontier'. Retrieved from: https://www.undp.org/blog/undp-knowledge-frontier.
- Utsey, S. O., Bolden, M. A., Brown, C. F., & Chae, M. H. (2001). Assessing quality of life in the context of culture. n L. A. Suzuki, J. G. Ponterotto, & P. J. Meller (Eds.), *Handbook of multicultural assessment: Clinical, psychological, and educational applications* (2nd ed., pp. 191–216). Jossey-Bass/Wiley.



- Wikipedia (2024, August 5). *Human Development Index*. Retrieved from: https://en.wikipedia.org/wiki/Human_Development_Index.
- Wikj, R. G. V. (2005). Assessment of quality of life. Advantages and pitfalls. *Clinical and Experimental Allergy Reviews*, 5(1), 32-35.

World Bank (2024, August 3). About us. Retrieved from: https://data.worldbank.org/about.

- World Bank (2023, September 17). *Air transport, freight (million ton-km)*. Retrieved from: https://data.worldbank.org/indicator/IS.AIR.GOOD.MT.K1.
- World Bank Group (2024, August 5). *Computer, communications and other services (% of commercial service imports.* Retrieved from: https://data.worldbank.org/indicator/TM.VAL.OTHR.ZS.WT.

Appendix

Countries included in this study: Argentina, Armenia, Australia, Austria, Bangladesh, Belarus, Belgium, Bhutan, Bolivia, Brazil, Bulgaria, Burkina Faso, Cameroon, Canada, Chile, China, Columbia, Congo, Dem. Rep., Costa Rica, Croatia, Cyprus, Ecuador, Egypt, Arab Rep., El Salvador, Eswatini, Ethiopia, Fuji, Finland, France, Georgia, Germany, Greece, Guatemala, Guyana, Honduras, Iceland, India, Indonesia, Israel, Italy, Japan, Jordon, Kazakhstan, Kenya, Korea, Dem. People's Rep., Kuwait, Latvia, Lebanon, Madagascar, Malawi, Malaysia, Malta, Marshall Island, Mauritius, Mexico, Mongolia, Morocco, Mozambique, Namibia, Nepal, Netherlands, New Zealand, Nigeria, Oman, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Poland, Portugal, Qatar, Romania, Russia, Sao Tome and Principe, Saudi Arabia, Serbia, Seychelles, Singapore, South Africa, Spain, Sudan, Sweden, Switzerland, Tajikistan, Thailand, Trinidad and Tobago, Tunisia, Ukraine, United Kingdom, United States, Uzbekistan, Zambia

Copyrights

Copyright for this article is retained by the author(s), with first publication rights granted to the journal.

This is an open-access article distributed under the terms and conditions of the Creative Commons Attribution license (http://creativecommons.org/licenses/by/4.0/).