



Investigation of the Burden of HIV/AIDS and Cancer in Underdeveloped, Developing and Developed Countries

İlker Etikan*, Akinleye Adewumi Adebayo and Galip Savas İlgi

Department of Biostatistics, Near East University, Cyprus

*Corresponding author: İlkerEtikan, Faculty of Medicine, Department of Biostatistics, Near East University, Nicosia-TRNC, Cyprus

Received: 📅 January 13, 2020

Published: 📅 January 24, 2020

Abstract

This study aims to examine the most dangerous cause of death in underdeveloped, developing and developed countries. The major diseases considered in this study were HIV/AIDS and Cancer. The causes of this death are selected since the year 2003-2016, the data is extracted from the World Health Organization (WHO). This research shows the level of significant difference between the most common cause of death in the three categories of countries. This test is carried out by the use of ONE-WAY ANOVA. In this case of study, it was concluded that there is a significant difference when comparing the results, except Underdeveloped and Developed countries that are; the case report of the cause of death by HIV/AIDS is low. Similarly, in the case study of the cause of death by CANCER, the results show that there is a significant difference in all when the countries' categories were compared that is; there is a high rate of the cause of death by cancer in all country categories.

Keywords: Under developed; developing; developed; HIV/AIDS; cancer; death

Introduction

Causes of death are not commonly known in developing countries because autopsy is not believable on account of religious thoughts in most cases. Hence, various means are used to collect the cases and the cause of death of a deceased. Gathering of this information serves as an important tool to detect the major cause(s) of death in a country [1]. Countries that are developing are mostly the ones with a high level of poverty and diseases. Most of these countries with a weak healthcare system often have a problem with genuine information on the cause of death in the population. But such information is so important for policy development, health programs, program monitoring, and assessment and so on. The greatest major sign of detecting the death rate of any population is the health issue or variation of a total population (N). Recorded documentation as relating to cases diagnosis and cause of deaths often carries across a country's socio-economic level. Most countries in the developed world are well equipped with effective data management record systems which make it effective to capture patients' profile and status, unlike the poor record systems that are widely available in undeveloped and developing countries.

There are variations in the diseases among the developed, developing and underdeveloped world. In developed countries, studies state that free related causes of death by diseases such as

poison and injury are clearly visible [2,3]. Also, the cause of death from self-harm or suicide is stated to be significantly higher in the developed than in developing countries from the population of people with intellectual disability which is connected to the high rates of mental health disorder found in their population study [2-6]. However, developing countries have been reported to be greatly affected by factors from lack of qualitative health care, low literacy rate, weak infrastructural facilities, and high unemployment rate which have resulted in poor health outcome of these countries [2,7,8].

In a study conducted by [6]. 66% of a sample of 374 adults in the autism spectrum with no intellectual disability, self-reported suicide mission, and suicide plans were reported to be 35%. The survey made it known that death rates, risk factors, and causes of death in developed counties remain rare due to the standard provision of their lifetime needs. The proper clinical record of data may allow data to be studied without the extra time and cost burden attached to primary data gathering. The evaluation of death ratios varies from 200-400 in many of the countries in South America, 1000 in Africa, 500 in many countries in Asia and less than 10 in some European countries, per 100,000 live births [9]. The main objective of the present study is to use datasets to report

the significant rates difference of mortality and to detect the major causes of death of people in the underdeveloped, developing and developed countries of the world. It was assumed that those in the underdeveloped and developing countries would experience higher mortality rates than those of the developed countries due to more exposure to hazard and some heavy industrial exhaust inhaled by the people and so on. Furthermore, the assumption is made that the cause of death in most underdeveloped countries is due to some primary factors and some additional factors such as gender, mental

health disorders, and medical comorbidities, cause death in most underdeveloped countries. Eventually, the various cause of death in the developed countries would be more noticeable compared to other under developing countries.

Underdeveloped country

Underdeveloped countries are categorized as the countries facing lots of unemployment which is a major problem and the main occupation in these countries is agriculture (Table 1).

Table 1: Table of undeveloped countries of the year 2003-2016.

Country	Year	Hiv/aids	Cancer
Burundi	2003	8951	4010
Burundi	2004	8888	4135
Burundi	2005	8507	4271
Burundi	2006	8093	4375
Burundi	2007	7743	4472
Burundi	2008	7215	4598
Burundi	2009	6624	4736
Burundi	2010	5990	4960
Burundi	2011	5186	5171
Burundi	2012	4653	5379
Burundi	2013	4180	5565
Burundi	2014	3748	5770
Burundi	2015	3318	5966
Burundi	2016	2867	6166
Haiti	2003	16834	7783
Haiti	2004	17152	7924
Haiti	2005	17178	8090
Haiti	2006	16798	8277
Haiti	2007	15796	8441
Haiti	2008	14512	8643
Haiti	2009	13327	8852
Haiti	2010	12262	9079
Haiti	2011	11313	9311
Haiti	2012	9983	9545
Haiti	2013	8378	9766
Haiti	2014	6882	10001
Haiti	2015	5826	10260
Haiti	2016	5336	10555
Nepal	2003	896	11921
Nepal	2004	1151	12277
Nepal	2005	1406	12612
Nepal	2006	1631	12834
Nepal	2007	1787	13054
Nepal	2008	1861	13306
Nepal	2009	1873	13588
Nepal	2010	1856	13897
Nepal	2011	1796	14269
Nepal	2012	1726	14672

Nepal	2013	1667	15139
Nepal	2014	1588	15616
Nepal	2015	1490	16125
Nepal	2016	1389	16577
Mali	2003	5786	6479
Mali	2004	5935	6582
Mali	2005	6006	6673
Mali	2006	6043	6797
Mali	2007	5799	6951
Mali	2008	5567	7082
Mali	2009	5392	7263
Mali	2010	5279	7479
Mali	2011	5101	7612
Mali	2012	4985	7748
Mali	2013	5141	7947
Mali	2014	5329	8175
Mali	2015	5287	8425
Mali	2016	5240	8715

Developing country

Developing countries are known to be low and middle-income

country, they are less economically developed countries. The term developing describes a currently observed situation and not a changing dynamic or expected direction of progress (Table 2).

Table 2: Table of developing countries of the year 2003-2016.

Country	Year	Hiv/aids	Cancer
Bangladesh	2003	46	64897
Bangladesh	2004	63	65698
Bangladesh	2005	84	67235
Bangladesh	2006	108	68679
Bangladesh	2007	135	70098
Bangladesh	2008	162	71064
Bangladesh	2009	184	72187
Bangladesh	2010	210	74368
Bangladesh	2011	235	75712
Bangladesh	2012	256	78478
Bangladesh	2013	274	80892
Bangladesh	2014	287	83582
Bangladesh	2015	300	85955
Bangladesh	2016	314	89010
Nigeria	2003	182076	58641
Nigeria	2004	191208	59137
Nigeria	2005	198088	59200
Nigeria	2006	202378	59816
Nigeria	2007	204013	60881
Nigeria	2008	205622	60751
Nigeria	2009	201599	62086
Nigeria	2010	199867	63046
Nigeria	2011	199046	64025
Nigeria	2012	196359	65444
Nigeria	2013	189357	67455

Nigeria	2014	183239	69419
Nigeria	2015	162979	72092
Nigeria	2016	134681	74811
Ukraine	2003	4169	99439
Ukraine	2004	4561	99730
Ukraine	2005	8201	100671
Ukraine	2006	8602	96725
Ukraine	2007	9023	98292
Ukraine	2008	9579	97871
Ukraine	2009	9195	90439
Ukraine	2010	9073	87346
Ukraine	2011	8855	85216
Ukraine	2012	8583	86968
Ukraine	2013	7859	86729
Ukraine	2014	6355	84283
Ukraine	2015	6937	85374
Ukraine	2016	6682	87040
Pakistan	2003	464	98058
Pakistan	2004	495	100492
Pakistan	2005	537	103104
Pakistan	2006	596	105099
Pakistan	2007	660	107171
Pakistan	2008	725	109677
Pakistan	2009	816	112164
Pakistan	2010	964	114917
Pakistan	2011	1124	117360
Pakistan	2012	1326	120173
Pakistan	2013	1543	123336
Pakistan	2014	1770	126792
Pakistan	2015	2024	130429
Pakistan	2016	2264	133701

Developed country

Developed countries are economically developed, advanced in technology and infrastructure and also industrialized nations with high per capita income level (Table 3).

Table 3: Table of developed countries of the year 2003-2016.

Country	Year	Hiv/aids	Cancer
Norway	2003	19	10875
Norway	2004	22	10819
Norway	2005	23	10859
Norway	2006	18	10899
Norway	2007	13	11017
Norway	2008	15	11074
Norway	2009	19	11141
Norway	2010	13	11260
Norway	2011	17	11310
Norway	2012	16	11315
Norway	2013	9	11292
Norway	2014	17	11250

Norway	2015	13	11368
Norway	2016	13	11546
Australia	2003	133	36957
Australia	2004	142	37481
Australia	2005	111	38082
Australia	2006	128	38776
Australia	2007	114	39686
Australia	2008	88	40802
Australia	2009	96	41550
Australia	2010	86	42608
Australia	2011	98	43514
Australia	2012	76	44306
Australia	2013	71	44978
Australia	2014	71	46003
Australia	2015	75	47254
Australia	2016	74	48601
USA	2003	14749	581872
USA	2004	14165	583341
USA	2005	13575	585665
USA	2006	13042	585955
USA	2007	12186	589233
USA	2008	11095	594672
USA	2009	10263	599545
USA	2010	9064	606408
USA	2011	8293	615080
USA	2012	7815	625893
USA	2013	7483	638630
USA	2014	7194	651188
USA	2015	7296	668687
USA	2016	7116	685162
Singapore	2003	49	4186
Singapore	2004	52	4290
Singapore	2005	51	4412
Singapore	2006	49	4527
Singapore	2007	46	4476
Singapore	2008	43	4546
Singapore	2009	42	4731
Singapore	2010	40	4858
Singapore	2011	38	5037
Singapore	2012	35	5112
Singapore	2013	36	5241
Singapore	2014	39	5318
Singapore	2015	34	5389
Singapore	2016	33	5515

Method of Data Collection

The study made use of secondary data. The deaths record in these countries namely; Burundi, Haiti, Nepal, Mali, Bangladesh, Nigeria, Ukraine, Pakistan, Norway, Australia, the United State

of America and Singapore are categorized into underdeveloped, developing and developed countries categories. There are different causes of death in the world but for these countries in these categories, two causes of death namely HIV/AIDS and Cancer were

considered. These annual number of deaths was extracted only for a period of 14 years ranging from 2003 through 2016. These countries were selected in a manner that each category (underdeveloped, developing and developed) contain four countries from different continents such as Asia, Africa, Europe, and North America.

Source of data

The main source of information is vital registration. Sources of data in the undeveloped, developing and developed countries are readily available from national vital registration. Developing and underdeveloped countries also have some vital record but the level of coverage and reliability are generally low due to some factors. For this reason, few data on causes of death are available for underdeveloped and developing countries. The main international sources for this data are the World Health Organization (WHO) Statistics Annual and the United Nations (UN) Demographic Yearbook. In the WHO Statistics Yearly, all of these show the recorded death rates by group and sex. Data are available for several of the Latin American countries, where vital registration systems are well developed. In Africa however, only Mauritius now reports regularly. Among the developing countries of Asia, data are available only for Thailand and Sri Lanka, but the data for Sri Lanka appears to

be incomplete. Lack of locally sited offices and the proximity to these offices, shortage of staff in the rural areas, etc. affect where the death certificate has to be completed by a medically qualified person and also affect the low vital registration in the developing and underdeveloped countries results.

Statistical analysis

A one-way ANOVA was conducted on IBM SPSS version 25 to compare the significant difference among the number of deaths that occurs from cancer and HIV/AIDs relative to the development status categories namely underdeveloped, developing and developed.

Analysis of number of deaths from HIV/AIDs relative to development status

The analysis of variance shows that the effect of the categories on the death cases from HIV/AIDs was significant, $F(2,165) = 16,909$, $p - value = 0.0001$ as indicated by the Table 4. A Post- Hoc analysis using the Tukey method was further used to make a pairwise comparison. The multiple comparisons show that there is a significant difference among the development status categories excluding the developed and underdeveloped countries, as shown in Table 5 (Figure 1).

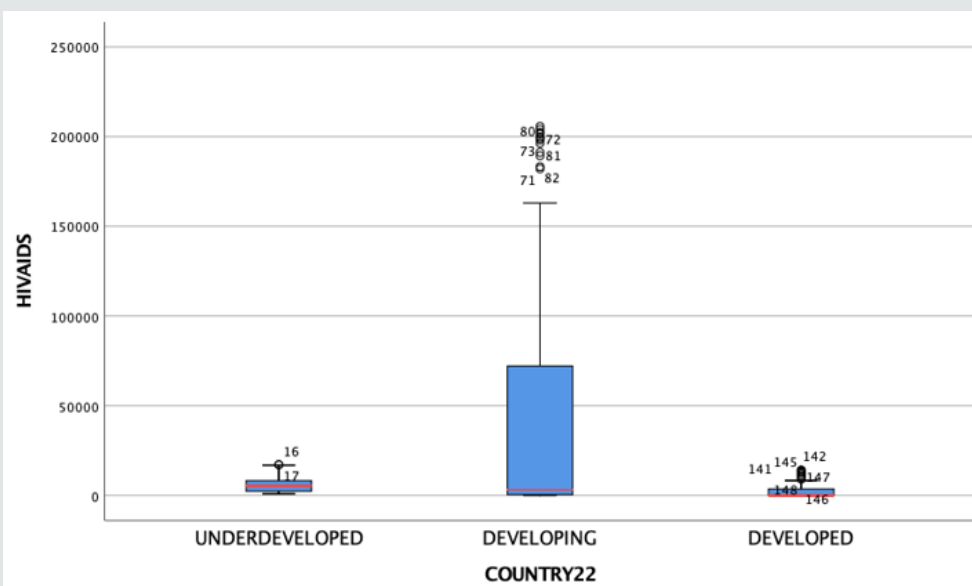


Figure 1: Box- Plot of Number of Deaths from HIV/ AIDs relative to Development Status.

Table 4: ANOVA Number of Deaths from HIV/ AIDs relative to Development Status.

Anova HIV AIDs					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	7.63E+10	2	3.82E+10	16.909	0
Within Groups	3.72E+11	165	2.26E+09		
Total	4.49E+11	167			

Table 5: Multiple Comparisons Dependent Variable: HIVAIDS Tukey HSD.

(I) Country22	(J) Country22	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Under developed	Developing	-43207.232*	8976.825	0	-64437.93	-21976.54
	Developed	3768.464	8976.825	0.907	-17462.23	24999.16

Developing	Under developed	43207.232*	8976.825	0	21976.54	64437.93
	Developed	46975.696*	8976.825	0	25745	68206.39
Developed	Under developed	-3768.464	8976.825	0.907	-24999.16	17462.23
	Developing	-46975.696*	8976.825	0	-68206.39	-25745

Analysis of number of deaths from cancer relative to development status

On the other hand, the analysis of variance shows that the effect of the categories of countries on deaths from cancer was

significant, $F(2,165) = 15.556$, $p\text{-value} = 0.0001$ (Table 6). The multiple comparisons from Tukey Post-Hoc test shows that there is a significant difference in all the categories, as shown in Table 7 (Figure 2).

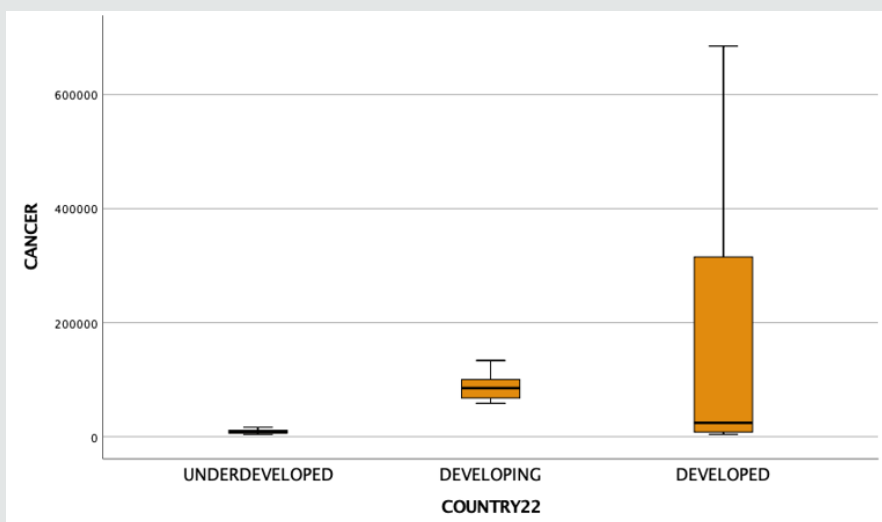


Figure 2: Box- Plot of Number of Deaths from Cancer relative to Development Status.

Table 6: ANOVA Number of Deaths from Cancer relative to Development Status.

Anova Cancer					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	7.1215E+11	2	3.56075E+11	15.556	0
Within Groups	3.77675E+12	165	22889412735		
Total	4.4889E+12	167			

Table 7: Multiple Comparisons Dependent Variable: Cancer Tukey HSD.

(I) Country22	(J) Country22	Mean Difference (i-j)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Under Developed	Developing	-77452.482*	28591.59	0.02	-145073.2	-9831.77
	Developed	-159458.500*	28591.59	0	-227079.21	-91837.79
Developing	Underdeveloped	77452.482*	28591.59	0.02	9831.77	145073.2
	Developed	-82006.018*	28591.59	0.013	-149626.73	-14385.3
Developed	Underdeveloped	159458.500*	28591.59	0	91837.79	227079.21
	Developing	82006.018*	28591.59	0.013	14385.3	149626.73

Conclusion

In the case of the cause of death, two major diseases; HIV/AIDS and Cancer are selected as the common cause of death that is rampant in the country’s categories (Underdeveloped, Developing and Developed). The test results are carried out with the One-way Analysis of variance (ANOVA). The result shows that there is a significant difference in the record of deaths by HIV/AIDS. The result posits that deaths from HIV/AIDs are more prevalent in the

developing and under developing nations in contrast to nations in the developed countries. However, regarding cancer, high mortality due to cancer was found to be common in developed countries than the underdeveloped and developing nations.

Limitations

Though this study does not take into consideration the respective population sizes of the countries considered in the

analysis, however; the HIV/AIDS mortality burden has been reported to be higher in low and medium countries in the world [10-12]. Regarding deaths from cancer, even though the study concluded that developed countries recorded higher cases of mortality [13] in their study indicated that cancer mortality between developed and developing nations is quite similar. However, the significant differences reported in our study could have been a result of other factors such as population size effect, underreporting cases especially in many developing and under developing countries. Thus, it is recommended that subsequent studies could examine more risk factors that could influence significant differences in mortality cases.

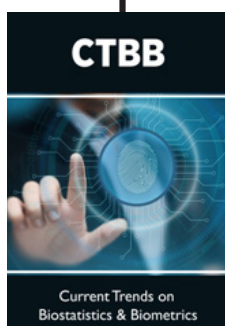
References

- Mondal R N, Rani M, Singh R B, Wilson D W (2016) Validity of Verbal Autopsy Methods for Assessment of Causes of Death in Developing Countries. *World Heart Journal* 8 (3): 219-222.
- Hirvikoski T, Mittendorfer Rutz E, Boman M, Larsson H, Lichtenstein P, et al (2015) Premature mortality in autism spectrum disorder. *The British Journal of Psychiatry* 208(3): 232-238.
- Schendel DE, Overgaard M, Christensen J, Hjort L, Jorgensen M, et al. (2016) Association of psychiatric and neurologic comorbidity with mortality among persons with autism spectrum disorder in a Danish population. *JAMA Pediatrics* 170(3): 1-8.
- Mouridsen S (2013) Mortality and factors associated with death in autism spectrum disorders: A review. *American Journal of Autism* 1: 17-25.
- Buck TR, Viskochil J, Farley M, Coon H, McMahon WM et al. (2014) Psychiatric comorbidity and medication use in adults with autism spectrum disorder. *Journal of Autism and Developmental Disorders* 44(12): 3063-3071.
- Cassidy S, Bradley P, Robinson J, Allison C, McHugh M, et al. (2014) Suicidal ideation and suicide plans or attempts in adults with asperger's syndrome attending a specialist diagnostic clinic: A clinical cohort study. *The Lancet Psychiatry* 1(2): 142-147.
- Hwang YI, Srasuebkul P, Foley KR, Arnold S, Trollor JN (2019) Mortality and Cause of Death of Australians on the Autism Spectrum. *Autism Research* 9999: 1-10.
- Crown L (2015) The health status of adults on the autism spectrum. *Autism* 19(7): 814-823.
- WHO World health report (2005) Make every mother and child count. Geneva, USA.
- Gańczak Maria, Szych Zbigniew (2017) HBV, HCV, and HIV infection prevalence among prison staff in the light of occupational risk factors. *Medycyna Pracy* 684(4): 507-516.
- Hacker MA, Malta M, Enriquez M, Bastos FI (2005) Human immunodeficiency virus, AIDS, and drug consumption in South America and the Caribbean: Epidemiological evidence and initiatives to curb the epidemic. *Revista Panamericana de Salud Pública* 18(4-5): 303-313.
- Shao Y, Williamson C (2012) The HIV-1 epidemic: low- to middle-income countries. *Cold Spring Harbor perspectives in medicine* 2(3): a007187.
- Ahmedin Jemal DVM, Freddie Bray, Melissa M Center, Jacques Ferlay, ME et al. (2011) Global Cancer Statistics. *A Cancer Journal for Clinicians* 61(2): 69-90.

 This work is licensed under Creative Commons Attribution 4.0 License

To Submit Your Article Click Here: [Submit Article](#)

DOI: [10.32474/CTBB.2020.02.000132](https://doi.org/10.32474/CTBB.2020.02.000132)



Current Trends on Biostatistics & Biometrics

Assets of Publishing with us

- Global archiving of articles
- Immediate, unrestricted online access
- Rigorous Peer Review Process
- Authors Retain Copyrights
- Unique DOI for all articles