

Research Article

The Psychology and Pharmacoepidemiology of Deaths and Homicide in Jamaica: An Empirical Assessment

Paul Andrew Bourne
Northern Caribbean University, Jamaica

Angela Hudson-Davis
Capella University, USA

Charlene Sharpe
Northern Caribbean University, Jamaica

Vincent Peterkin
Northern Caribbean University, Jamaica

Marsha Pabarue
Northern Caribbean University, Jamaica

ABSTRACT

Introduction: Jamaica has been featured among the nations with the highest crime rates in the world, and despite this reality, homicide and other deaths have never been examined for their effect on attendance at Accident and Emergency (A&E) or admissions to government and quasi-government hospitals.

Objectives: This paper evaluates the cross-elasticities of hospitalizations in Jamaica for a 10-year period; the effects of homicide and death rates in predicting attendance rate at A&E departments in government and quasi-government hospitals in Jamaica for a 10-year period; evaluate homicide, death, and maternity rates as predictors of admissions rate to government and quasi-government hospitals in Jamaica for a 10-year period; evaluate homicide, death, and maternity rates as predictive factors of psychiatric admissions rate to a national psychiatric hospital in Jamaica for a 10-year period; and to evaluate if the ln attendance at A&E departments and ln admissions at government and quasi-government hospitals are significantly influenced by psychiatric, homicide, death, and maternity rates in Jamaica for a 10-year periods.

Methods and materials: The data for this study were taken from a Jamaica Government Publication; the Ministry of Health reported attendance to A&E departments and admissions to all government hospitals including the quasi-hospital, University Hospital of the West Indies. The timeline for this research is 2006 through to 2015.

Results: The average number of visits to A&E at public hospitals and the University Hospital of the West Indies for the studied period was 794,596 ± 86,177, 95%CI: 762,417 – 826,775 compared to 189,267 ± 7,863, 95%CI: 186,331 – 192,203 admissions. The OLS table showed that the death rate is not a factor of log attendance rate at government and quasi-government hospitals in Jamaica ($P = 0.254 > 0.05$). Furthermore, a positive significant statistical correlation existed between homicide rate per 100,000 and log attendance rate per 100, beta = 1.044, $P = 0.019 < 0.05$), with the goodness of fit for the model being significant linear one ($F [2,6] = 5.927$, $P = 0.038$). In addition, the correlation between the two aforementioned variable being a moderately strong one (adjusted $R2 = 0.555$ or 55.5%).

Conclusion: Our findings support a disaggregation in screening patients who visit health care institutions based on exposure to homicide or other deaths as their impacts are different and must be addressed as such. We are prescribing that while the psychology of death is evident in this work, the matter goes beyond that to the pharmacoepidemiology of deaths.

Mesh Headings/Keywords: Attendance to A&E; Elasticity of hospitalization; Hospitalization; Probability of hospitalization; Mortality

Introduction

Mortality (or death) is a 'vital event' that is extensively studied by demographers [1-8], epidemiologists [9-13] as well as public health scholars [14]. Both the UN and WHO have provided various demographic models on mortality as early as the 1950s [15-19]. The UN and WHO defined death as "the permanent disappearance of all evidence of life at any time after birth has taken place" [12,13]. McGehee, et al. [4] modified the definition of death to exclude deaths prior to (live) births (i.e., called fetal deaths)" [4].

Mortality statistics are derived from the vital statistics registration system, the United Nations, as well as the WHO. The organizations have been using these data for decades to establish life expectancy models [13,15,16] and they continue to do so even today [20-22]. Jamaica, on the other hand, has been using mortality status for many years, although not with the objectives as that of the United Nations

or the World Health Organization.

Using mortality data for Jamaica from the 1990's, Caribbean scholars have empirically established that this information is of a moderate to high quality for this country [23-26]. However, the WHO as well as McCaw-Binns, Mullings, and Holder opined that completeness of mortality data for Jamaica is low [26-28], which is high for other Caribbean nations such as Bahamas, Barbados, Cuba, Dominica, St. Vincent and the Grenadines, and Trinidad and Tobago. Completeness of data was said to be high if it was at least 90%; moderate, 70-90% and low if it was less than 70%. A review of epidemiological and demographic literature did not reveal a single study that has examined the responsivity of hospitalization at psychiatric and maternity institutions to homicide and other deaths. With various studies data illustrating that major crimes are high in Jamaica, especially homicide [29-32] and homicide and psychiatric hospitalization [33], a study on the responsivity of admissions to a psychiatric and maternity hospital would provide insightful information on the matter of homicide and other deaths.

The search to ascertain the responsivity of hospitalization at a psychiatric and maternity institution coupled with births to homicide or other deaths were expanded to PubMed, EBSCOhost, ProQuest, and other academic databases. This research is timely as it evaluates the influence of homicide or other deaths on admissions to a maternity or psychiatric hospital as well as on births. The objectives of this paper are to evaluate: the cross-elasticities of hospitalizations for Jamaica for a 10-year period; the effects of homicide and death rates in predicting attendance rate at A&E departments in government and quasi-government hospitals in Jamaica for a 10-year period; evaluate homicide, death, and maternity rates as predictors of admissions rate to government and quasi-government hospitals in Jamaica for a 10-year period; evaluate homicide, death, and maternity rates as predictive factors of psychiatric admissions rate to a national psychiatric hospital in Jamaica for a 10-year period; and, to evaluate if the ln attendance at A&E departments and ln admissions at government and quasi-government hospitals are significantly influenced by psychiatric, homicide, death and maternity rates in Jamaica for a 10-year period.

Theoretical Framework

Koppensteiner, et al. [34] forwarded an empirical model to establish factors that account for birthweight including homicide. They used a linear model to express that homicide and other factors explain birth, equation (1):

$$Y_{iat}=\beta_0+\beta_1 HOM_{at}+d_a+d_t+u_{iat} \quad [1]$$

"where Yiat is the individual outcome variable (birthweight, gestational length, etc.) in area (municipality or neighbourhood) a, at time t, HOMat is the local homicide rate and da and dt are respectively mother's area of residence and month of conception-fixed effects, while u is an error term" [34]. This paper employs a similar model to explain the manner in which homicide or death influences hospitalization at a maternity hospital (i.e., Victoria Jubilee Hospital).

Methods and Materials

The data for this study were taken from a Jamaica Government Publication; the Ministry of Health reported attendance to A&E departments and admissions to all government hospitals including the quasi-hospital, University Hospital of the West Indies. The timeline for this research is 2006 through to 2015. Data were recorded, stored and retrieved using the Statistical Packages for the Social Sciences (SPSS) for Windows, Version 24.0. The level of significance that is used to determine statistical significance is less than 5% (0.05) at the 2-tailed level of significance. Ordinary Least Square (OLS) regression was used to ascertain the correlation of attendance, homicide, and other forms of deaths in Jamaica.

In order to assure the OLS application was appropriate for this study; all assumptions were tested before usage. In cases where variables were highly inter-correlated ($r > 0.7$), tolerance were checked and if multi-collinearity was discovered, one of the variables was dropped and used separately in a model without the highly correlated variable.

One of the assumptions of OLS were not met, linearity, and so this violation meant that the researchers log transform the variable, attendance [35-39] (Annex Figure 9). Whether it is medical research or otherwise, interpreting the correlation coefficients is important [40,41] and Evans provided a platform [42] for correlation coefficient interpretations. Evans outlined that for r [42], very weak is 0 – 0.19; weak is 0.20-0.39; moderate is 0.40 -0.59; strong is 0.60-0.79 and very strong is 0.80-1.00 as well as for r2: very weak is 0 – < 4%; weak is 4-16%; moderate is 16-36%; strong is 36-< 64% and very strong is 64-100%. For this study, Evans' perspective will be used to interpret the strength of squared r values, which is in keeping with similar positions by Howell [43,44]; and Howitt, et al. [45].

In using the OLS to model the correlations for this study, it was revealed that they are best expressed by curvilinear relationships and so the models are based on curvilinear functions and their correlations are interpreted by way of Evans and others' works. Outside of OLS, for this study additional statistical techniques were employed such as multivariate analysis of variance (MANOVA), reliabily and factor analysis.

Cross-elasticities of hospitalization

$$\eta=\frac{\%\ \Delta \text{ in admissions at national psychiatric hospital (i.e., Bellevue)}}{\%\ \Delta \text{ in admissions at national maternity hospital (i.e.,Victoria Jubilee)}}$$

Or

$$\eta=\frac{\frac{\text{Difference in Hospitalization at national psychiatric hospital (i.e., Bellevue) at time t and t+1}}{\text{Hospitalization at national psychiatric hospital (i.e., Bellevue) at time t}}\times 100}{\frac{\text{Difference in Hospitalization at national maternity hospital (i.e., Victoria Jubilee) at time t and t+1}}{\text{Hospitalization at national maternity hospital (i.e., Victoria Jubilee) at time t}}\times 100}$$

Where η is the elasticity of hospitalization

% Δ denotes the percentage change in hospitalization at

t and t +1, where time t is one year and t +1 is the following year.

$$\eta = \frac{\%\,\Delta \text{ in admissions at national maternity hospital (i.e., Victoria Jubilee)}}{\%\,\Delta \text{ in homicide}}$$

Or

$$\eta = \frac{\dfrac{\text{Difference in Hospitalization at national maternity Hospital (i.e., Victoria Jubilee) at time t and t+1}}{\text{Hospitalization at national maternity hospital (i.e., Victoria Jubilee) at time t}} \times 100}{\dfrac{\text{Difference in homicide at time t and t+1 hospital}}{\text{Homicide at time t}} \times 100}$$

$$\eta = \frac{\dfrac{\text{Hospitalization at national psychiatric hospital (i.e., Victoria Jubilee) at time t}}{\text{Difference in deaths at time t and t+1}} \times 100}{\text{Deaths at time t}}$$

Or

$$\eta = \frac{\dfrac{\text{Difference in Hospitalization at national maternity Hospital (i.e., Victoria Jubilee) at time t and t+1}}{\text{Hospitalization at national psychiatric hospital (i.e., Victoria Jubilee) at time t}} \times 100}{\dfrac{\text{Difference in deaths at time t and t+1}}{\text{Deaths at time t}} \times 100}$$

Interpretations of elasticities results

Ƞ > 1: elastic hospitalization or highly responsive hospitalization meaning that a one percentage change in the denominator will result in a more than 1 percentage change in the numerator;

Ƞ < 1: inelastic hospitalization or lowly responsive hospitalization which denotes that a one percentage change in the denominator will result in a less than 1 percentage change in the numerator;

Interpreting signs of the elasticities

Negative sign means substitution effect or one product can operate outside of the other;

Positive sign means complementary effect or one product operates jointly with another

Substitution effect

Ƞ > - 1: This is a substitution effect that is highly responsive

Ƞ < - 1: This is a substitution effect this is lowly responsive

Complementary effect:

Ƞ > + 1: This is a complementary effect that is lowly responsive

Ƞ < +1: this is a complementary effect that is highly responsive

Death rate

Psychiatric hospitalization rate

$$\text{Death rate} = \frac{\sum \text{Death at time t}}{\sum \text{Mid} - \text{year population at time t}} \times 1000$$

$$\text{Homicide rate} = \frac{\sum \text{Homicide at time t}}{\sum \text{Mid} - \text{year population at time t}} \times 1,00,000$$

Homicide rate

$$\text{Homicide rate} = \frac{\sum \text{Homicide at time t}}{\sum \text{Mid} - \text{year population at time t}} \times 1,00,000$$

Note: The rates are displayed in the Annex.

$$\textbf{Probability of Attendance} = \frac{\sum \text{Attendance at hospital for time period t}}{\text{Mid} - \text{year population at time t}}$$

$$\textbf{Probability of Admission} = \frac{\sum \text{Admission at hospital for time period t}}{\sum \text{Attendance at hospital for time period t}}$$

Results

Table 1 presents attendance and admissions to Accident and Emergency departments at government and quasi-government hospitals in Jamaica, 2006-2015, along with various descriptive statistics. The average number of visits to A&E at public hospitals and the University Hospital of the West Indies for the studied period was 794,596 ± 86,177, 95%CI: 762,417 – 826,775 compared to 189,267 ± 7,863, 95%CI: 186,331 – 192,203 admissions. The mean number of deaths was 18,549 ± 1,765,95%CI: 17,890 – 19,208 compared to 1,324±228,95%CI: 1,239 – 1,409 reported cases of homicides. In the first five years (2006-2010), the mean number of visits to A&E at government hospitals including the University Hospital of the West Indies was 835,694±84,393, 95%CI: 722,510-948,878 compared to

Table 1: Attendance and admissions to Accident and Emergency departments at government hospitals in Jamaica, 2006-2015.

Year	Attendance	Admission	Mid-year Population	Homicide	Other Deaths
2006	7,24,030	1,74,704	26,53,042	1,340	15,321
2007	8,03,433	1,92,798	26,62,481	1,574	16,614
2008	9,15,995	1,80,438	26,71,934	1,601	16,371
2009	9,42,523	1,92,826	26,81,386	1,680	17,467
2010	7,92,489	1,79,890	26,90,824	1,428	17,007
2010	7,49,036	1,95,483	26,99,838	1,125	16,926
2012	8,59,666	2,00,578	27,07,805	1,095	16,998
2013	7,84,748	1,93,913	27,14,734	1,200	15,427
2014	6,70,360	1,90,703	27,20,554	1,005	18,146
2015	7,03,683	1,91,340	27,93,335	1,192	18,157
Total: μ ± σ	794,596 ± 86,177	189,267 ± 7,863		1,324 ± 228	18,549 ± 1,765
2006-2010:μ ± σ	835,694 ± 84,393	184,131 ± 7,623		1,524 ± 127	19,967 ± 1,030
2011-2015:μ ± σ	753,499 ± 68,131	194,403 ± 3,663		1,123 ± 74	17,131 ± 1,040

Table 2: Probabilities of attendance and admission to government hospitals in Jamaica, 2006-2015.

Year	Probabilities	
	Attendance [P(A)]	Admission [P(Z)]
2006	0.2729	0.2413
2007	0.3018	0.2400
2008	0.3428	0.1970
2009	0.3515	0.2046
2010	0.2945	0.2270
2010	0.2774	0.2610
2012	0.3175	0.2333
2013	0.2891	0.2471
2014	0.2464	0.2845
2015	0.2519	0.2719

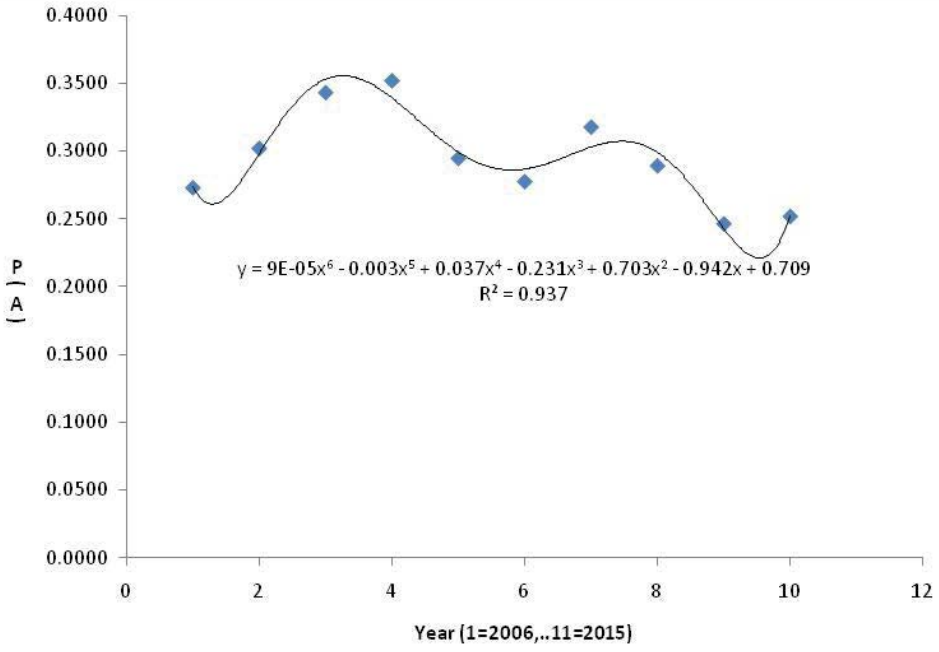
753,499 ± 68,131, 95%CI: 662125 - 844,872 in the latter five years (2011-2015). The results signify that the number of people visiting the A&E departments at government hospitals and the University Hospital of the West Indies (i.e., UHWI) has fallen by 9.8%, which is the reverse for admissions to the same institutions. For the second 5-year period, the mean number of people admitted to A&E government hospitals including UHWI was 194,403 ± 3,663, 95%CI: 189,491-199,316, which represents a 5.6% increase over the first 5-year period (i.e., 184,131 ± 7,623, 95%CI: On the other hand, the mean number of homicide for the two periods (i.e., 2006-2010; 2011-2015) declined by 26.3%, which was the total reverse for other deaths, an increase of 3.5%.

Table 2 presents the probabilities of attendance and admissions to government hospitals including the University Hospital of the West Indies (i.e., quasi-government hospital, UHWI). The Table illustrates that probabilities of visits to accident and emergency departments at government hospitals and UHWI lies between and include 0.2464 to 0.3515 (i.e. $0.2464 \leq P(A) \leq 0.3515$), indicating that at most 35.2% of people in Jamaica visit accident and emergency departments at various government and quasi-government hospitals. A graphical display of the probabilities of attendance at government and quasi-government hospitals in Jamaica is depicted on Figure 1.

Table 3 presents a cross-elasticity of attendance at government and quasi-government hospitals in Jamaica from 2006-2015. It can be deduced from the calculations that attendance at government and quasi-government hospitals is equally responsive and irresponsive to deaths. The negative values suggest that there is a corresponding effect between

Table 3: Cross-elasticity of attendance and death, 2006-2015.

Year	Attendance (A)	Death (A)	% change in A	% change in D	Cross-elasticity of A
2006	7,24,030	15321	-	-	-
2007	8,03,433	16614	10.967	8.439	1.299
2008	9,15,995	16371	14.01	-1.463	-9.579
2009	9,42,523	17467	2.896	6.695	0.433
2010	7,92,489	17007	-15.918	-2.634	6.044
2011	7,49,036	16926	-5.483	-0.476	11.512
2012	8,59,666	16998	14.77	0.425	34.721
2013	7,84,748	15427	-8.715	-9.242	0.943
2014	6,70,360	18146	-14.576	17.625	-0.827
2015	7,03,683	18157	4.971	-100.00	-0.05



P(A) denotes the probability of attendance to A&E at government and quasi-government hospitals

Figure 1: Frequency distribution of probabilities of attendance at accident and emergency departments at government and quasi-government hospitals, 2006-2015.

attendance at government and quasi-government hospitals and deaths, which is mostly irresponsive (i.e., 2014, 2015) and responsive (i.e., 2008) to deaths.

Admissions at government and quasi-government hospitals in Jamaica are mostly responsive to death (i.e., 2007-2012) – Table 4, with minor complementary effects (i.e, operating at the same time) between admissions at government and quasi-government hospitals and other deaths.

Table 4: Cross-elasticity of admissions to government hospitals and death in Jamaica, 2006-2015.

Year	Admission (M)	Death (D)	% change in M	% change in D	Cross-elasticity of M
2006	174.704	15,321	-	-	-
2007	192.798	16,614	10.3569	8.4394	1.2272
2008	180.438	16,371	-6.4109	-1.4626	4.3831
2009	192.826	17,467	6.8655	6.6948	1.0255
2010	179.890	17,007	-6.7086	-2.6335	3.5474
2011	195.483	16,926	8.6681	-0.4763	-18.1997
2012	200.578	16,998	2.6064	0.4254	6.1271
2013	193.913	15,427	-3.3229	-9.2423	0.3595
2014	190.703	18,146	-1.6554	17.6249	-0.0939
2015	191.340	18,157	0.3340	-100.000	-0.0033

Attendance at government and quasi-government hospitals in Jamaica is rarely jointly related with homicide; but most of the data are supporting responsivity of attendance at government and quasi-government hospitals with homicide (Table 5).

Admissions at government and quasi-government hospitals in Jamaica are mostly irresponsive to homicide, with there being equal number of cases of joint effect (i.e., complementary effect) as substitution effect. The joint effects suggest that admissions at government and quasi-government hospitals are operating in tandem with homicide (Table 6). From the data the likelihood is low that homicide is causing a more than 1% change in admissions at government and quasi-government hospitals.

The majority of the instances computed in this study support joint effect (i.e., complementary effect) between psychiatric admissions at government and quasi-government hospitals in reference to homicide. Although psychiatric admissions at government and quasi-government hospitals are mostly irresponsive to changes in homicide, statistical evidence emerge indicating substitution effect and inverse effect between both phenomena (Table 7).

Table 8 presents a summative description of admissions at government maternity hospital in Jamaica and homicide

Table 5: Cross-elasticity of attendance to government hospitals and homicide in Jamaica, 2006-2015.

Year	Attendance (A)	Homicide (H)	% change in A	% change in D	Cross-elasticity
2006	724,030	1,340	-	-	-
2007	803,433	1,574	10.9668	17.4627	0.628
2008	915,995	1,601	14.0101	1.7154	8.167
2009	942,523	1,680	2.8961	4.9344	0.587
2010	792,489	1,428	-15.9183	-15.0000	1.061
2011	749,036	1,125	-5.4831	-21.2185	0.258
2012	859,666	1,095	14.7697	-2.6667	-5.539
2013	784,748	1,200	-8.7148	9.5890	-0.909
2014	670,360	1,005	-14.5764	-16.2500	0.897
2015	703,683	1,192	4.9709	18.6070	0.267

Table 6: Cross-elasticity of admission to government hospitals and homicide in Jamaica, 2006-2015.

Year	Admission (M)	Homicide (H)	% change in M	% change in D	Cross-elasticity
2006	174,704	1,340	-	-	-
2007	192,798	1,574	10.3569	17.4627	0.593
2008	180,438	1,601	-6.4109	1.7154	-3.737
2009	192,826	1,680	6.8655	4.9344	1.391
2010	179,890	1,428	-6.7086	-15.0000	0.447
2011	195,483	1,125	8.6681	-21.2185	-0.409
2012	200,578	1,095	2.6064	-2.6667	-0.977
2013	193,913	1,200	-3.3229	9.5890	-0.347
2014	190,703	1,005	-1.6554	-16.2500	0.102
2015	191,340	1,192	0.3340	18.6070	0.018

Table 7: Cross-elasticity of admission to national government psychiatric hospital and homicide in Jamaica, 2006-2015.

Year	Psychiatric (P)	Homicide (H)	% change in P	% change in H	Cross-elasticity
2006	1,110	1340	-	-	-
2007	965	1574	-13.0631	17.4627	-0.748
2008	972	1601	0.7254	1.7154	0.423
2009	1,087	1680	11.8313	4.9344	2.398
2010	1,045	1428	-3.8638	-15.0000	0.258
2011	957	1125	-8.4211	-21.2185	0.397
2012	995	1095	3.9707	-2.6667	-1.489
2013	991	1200	-0.4020	9.5890	-0.042
2014	1,005	1005	1.4127	-16.2500	-0.087
2015	994	1192	-1.0945	18.6070	-0.059

Table 8: Cross-elasticity of admission to national government maternity hospital and homicide in Jamaica, 2006-2015.

Year	Maternity (Z)	Homicide (H)	% change in Z	% change in H	Cross-elasticity
2006	14,101	1340	-	-	-
2007	15,841	1574	12.3396	17.4627	0.707
2008	14,928	1601	-5.7635	1.7154	-3.360
2009	16,635	1680	11.4349	4.9344	2.317
2010	15,885	1428	-4.5086	-15.0000	0.301
2011	15,888	1125	0.0189	-21.2185	-0.001
2012	16,452	1095	3.5498	-2.6667	-1.331
2013	16,895	1200	2.6927	9.5890	0.281
2014	15,229	1005	-9.8609	-16.2500	0.607
2015	16,688	1192	9.5804	18.6070	0.515

Table 9: Cross-elasticity of admission to national government maternity hospital and death in Jamaica, 2006-2015**.**

Year	Maternity (Z)	Death (D)	% change in Z	% change D	Cross-elasticity
2006	14,101	15321	-	-	-
2007	15,841	16614	12.3396	8.4394	1.462
2008	14,928	16371	-5.7635	-1.4626	3.941
2009	16,635	17467	11.4349	6.6948	1.708
2010	15,885	17007	-4.5086	-2.6335	1.712
2011	15,888	16926	0.0189	-0.4763	-0.040
2012	16,452	16998	3.5498	0.4254	8.345
2013	16,895	15427	2.6927	-9.2423	-0.291
2014	15,229	18146	-9.8609	17.6249	-0.559
2015	16,688	18157	9.5804	0.0606	158.042

from 2006-2015. Hospitalization at government maternity facility in Jamaica is primarily irresponsive to death, with infrequent cases of joint effect between both variables.

Hospitalization at the government maternity institution in Jamaica is substantially highly responsive to death, with infrequent incidences occurring when there is a joint irresponsive effect between admissions at the government maternity department and death (Table 9).

Hospitalization at a psychiatric government institution in Jamaica is highly responsive to death (Table 10), suggesting that death accounts for more than percentage change in admissions at the government psychiatric facility.

$$\mathbf{H_0}: \log A_t \neq f\left(D_t, H_t\right) \quad [1]$$

Where H_o is the null hypothesis of log attendance rate at government and quasi-government hospitals in Jamaica is

not a function of the death rate per 1,000 (D_t) in time period t and the homicide rate per 100,000 (H_t) in time period t.

Table 11 presents the OLS for log attendance rate and explanatory variables for Jamaica. The OLS table showed that the death and homicide rates predictive factors of log attendance rate at government and quasi-government hospitals in Jamaica, supporting the best fit of a linear model ($F[1,24]=27.208$, $P < 0.0001$. The explanatory factors (i.e., homicide and death rates) are moderately strongly associated with log attendance rate (adjusted $R^2 = 0.636$). Hence, we reject the null-hypothesis because collectively homicide and death rates are factors of attendance to government and quasi-government hospitals in Jamaica. As such, we will construct a function for log attendance rate at government and quasi-government hospital in Jamaica. We can conclude, therefore, from the robust statistical testing, that homicide and death rates are resulting in an exponential rise in attendance at government and quasi-government hospitals in Jamaica. Furthermore, using the collinearity diagnostics, a homicide was strongly correlated with log attendance (0.76) compared to a weak correlation between death rate and log attendance (0.24), with the correlation between homicide and death rate being 59%. It can be deduced from the aforementioned that homicide rate is a significant predictor of attendance at A&E government and quasi-government hospitals in Jamaica, with some of the other deaths relating to homicide. Multicollinearity is not a problem in the examination of the aforementioned model (tolerance =1.9), and so we present the model that encapsulates attendance rate in Jamaica:

$$\log A_t = \beta_0 + \beta_1 H_t + \beta_2 D_t + \varepsilon \quad [2]$$

$$\log A_t = \beta_0 + \beta_1 H_t + \beta_2 D_t + \varepsilon \quad [3]$$

$$f(A_t) = 10^{(\beta_0 + \beta_1 H_t + \beta_2 D_t + \varepsilon)} \quad [4]$$

$$f(A_t) = 10^{(1.388 + 0.006 H_t - 0.029 D_t + \varepsilon_t)} \quad [5]$$

$$H_0 : \log Z_t \neq f(D_t, H_t, M_t) \quad [6]$$

Where H_o is the null hypothesis of log admissions rate at government and quasi-government hospitals in Jamaica (log Z) is not a function of the death rate per 1,000 (D_t) in time period t and the homicide rate per 100,000 (H_t) in time period t; and maternity rate per 1,000 (M_t).

It can be concluded from the statistical analysis that ln admissions rate at government and quasi-government hospitals in Jamaica is significantly fitted by death, homicide, and maternity rates by a linear model ($F [2, 23] = 5.111$, $P=0.007$) as seen in Table 12. A moderately strong statistical correlation existed between explanatory variables and ln admissions rate (adjusted $r^2 = 0.537$). Multicollinearity is not a problem in the examination of this model, because the highest tolerance was three (3). Both homicide and death rates contributed more to the model than maternity rate; the correlation between homicide and log admission was 35% as well as for the death rate and the correlation between ln admission and maternity rate being 30%, with death and maternity rates have the strongest statistical correlation, 55%. Hence, we reject the null hypothesis. Furthermore, death rate has the greatest effect on log admissions rate followed by maternity rate. Thus, the hypothesis is captured in Equation (7):

$$f(Z_t) = 10^{(\beta_0 + \beta_1 D_t + \beta_2 H_t + \beta_3 M_t + \varepsilon)} \quad [7]$$

$$f(Z_t) = 10^{(\beta_0 + \beta_1 D_t + \beta_2 H_t + \beta_3 M_t + \varepsilon)} \quad [8]$$

$$f(Z_t) = 10^{(0.840 - 0.013 D_t - 0.00008 Ht + \beta_3 Mt + \varepsilon)} \quad [9]$$

Table 10: Cross-elasticity of admission to national government psychiatric hospital and death in Jamaica, 2006-2015.

Year	Psychiatric	Death	% change A	% change D	Cross-elasticity
2006	1,110	15321			
2007	965	16614	-13.0631	8.4394	-1.548
2008	972	16371	0.7254	-1.4626	-0.496
2009	1,087	17467	11.8313	6.6948	1.767
2010	1,045	17007	-3.8638	-2.6335	1.467
2011	957	16926	-8.4211	-0.4763	17.681
2012	995	16998	3.9707	0.4254	9.335
2013	991	15427	-0.4020	-9.2423	0.043
2014	1,005	18146	1.4127	17.6249	0.080
2015	994	18157	-1.0945	0.0606	-18.056

Table 11: OLS of log attendance on explanatory variables for Jamaica.

Independent	Unstandardized Coefficients		Standardized Coefficients	t	P	95%CI
	B	Std. Error	Beta			Lower - Upper
Constant	1.388	0.116		11.99	<0.0001	1.105 - 1.671
Death rate per 1,000	-0.029	0.011	-0.413	-2.523	0.019	-0.053 - 0.05
Homicide rate per 100,000	0.006	0.001	1.044	6.372	<0.0001	0.004 - 0.008

$$P_t = \beta_0 + \beta_1 D_t + \beta_2 H_t + M_t + \varepsilon \quad [10]$$

Where H_o is the null hypothesis of psychiatric hospitalization rate at a government hospital in Jamaica (P_t) is not a function of the death rate per 1,000 (D_t) in time period t; homicide rate per 100,000 (H_t) in time period t; and maternity rate per 1,000 (M_t)

We can conclude that $P_t = \beta_0 + \beta_1 D_t + \beta_2 H_t + M_t + \varepsilon$ [11]

$$f(P_t) = -19.947 + 1.539 D_t + 0.094 H_t + 7.042 M_t + \varepsilon \quad [12]$$

The three explanatory factors on psychiatric rate are best fitted by a linear model (F [2,23] =4.037, P=0.019) as seen in Table 12. The three explanatory factors are strongly associated with psychiatric admissions at the national psychiatric facility in Jamaica (adjusted $r^2 = 0.945$). Of the explanatory factors, maternity had the strongest influence on psychiatric rates admission followed by the death rate and then homicide rate.

Multivariate analysis

$$H_o : A_t \neq f(H_t, P_t, D_t, M_t) \quad [13.1]$$

$$H_o : A_t \neq f(H_t, P_t, D_t, M_t) \quad [13.2]$$

where H_o is the null hypothesis of attendance rate at A&E in government and quasi-government hospitals in Jamaica (A_t) is not affected by death rate per 1,000 (D_t) in time period t; homicide rate per 100,000 (H_t) in time period t; maternity rate per 1,000 (M_t), and psychiatric hospitalization rate per 1,000 in time period t in Jamaica for a 10-year period.

$$H_o : Z_t \neq f(H_t, P_t, D_t, M_t) \quad [13.3]$$

where H_o is the null hypothesis of attendance rate at A&E in government and quasi-government hospitals in Jamaica (A_t) is not a function of the death rate per 1,000 (D_t) in time period t; homicide rate per 100,000 (H_t) in time period t; maternity rate per 1,000 (M_t), and psychiatric hospitalization rate per 1,000 in time period t in Jamaica for a 10-year period.

Multivariate analysis was used to examine the interactivity among the explanatory variables (i.e., homicide, psychiatric, death and maturity rates) and their effect on the dependent variables (attendance, A_t, and admission rate, Z_t).

Using multivariate regression (Annex Table 12), collectively, there is a significant statistical correlation with the explanatory variables (i.e., homicide, death, maternity and psychiatric rates) and attendance at A&E as well as admissions at government and quasi-government hospitals in Jamaica, with the correlated being a relatively strong one (adjusted $r^2 = 0.666$). However, individually, Table 13 shows that admission to the national psychiatric hospital rate was not correlated with attendance rate at A&E departments ($P = 0.338$); death rate was not correlated with attendance rate at A&E departments ($P = 0.326$) as well as maternity rate was not correlated with attendance rate at A&E departments ($P = 0.158$). Individually, however, homicide rate has a significant correlation with attendance rate at A&E ($P < 0.0001$). Therefore, the general model is a linear one that expressed predictors of attendance rate at A&E in Jamaica, expressed in Equation [15]:

$$f(A_t) = \beta_0 + \beta_1 H_t + \beta_2 P_t + \beta_3 D_t + \beta_4 M_t + \varepsilon \quad [15.1]$$

where $f(A_t)$ is the function of attendance at A&E rate at government and quasi-government hospitals in Jamaica, β_0 is the constant and $\beta_{1\text{-}4}$ are coefficients for each variable, these are expressed in Equation 15.2:

$$f(Z_t) = \beta_0 + \beta_1 H_t + \beta_2 P_t + \beta_3 D_t + \beta_4 M_t + \varepsilon \quad [15.2]$$

Based on the multivariate regression analysis table (Annex Table 12), collectively, there is a significant statistical correlation with the explanatory variables (i.e., homicide, death, maternity and psychiatric rates) and attendance at A&E as well as admissions at government and quasi-government hospitals in Jamaica, with the correlated being a relatively strong one (adjusted $r^2 = 0.624$). However, individually, Table 13 shows that admission to the national psychiatric hospital rate was not correlated with admissions rate at government and quasi-government hospitals in Jamaica ($P = 0.971$) as well as homicide and admissions rate at government and quasi-government hospitals in Jamaica ($P = 0.522$). Death rate was correlated with admissions rate at government and quasi-government hospitals in Jamaica ($P = 0.045$) as well as maternity rate was not correlated with attendance rate at A&E departments ($P = 0.003$). It is deduced from the statistical analyses that homicide contributes the most to attendance at A&E, while maternity the most to admissions and death

Table 12: Parameter Estimates of selected explanatory variables on particular dependent variables.

Dependent Variable	Parameter	B	Std. Error	t	P	95%CI	Partial Eta squared
						Lower - Upper	
In Admission rate	Intercept	0.840	0.088	9.573	<0.0001	0.657 - 1.024	0.821
	Maternity rate per 1,000	0.017	0.012	1.389	0.180	-0.008 - 0.0242	0.088
	Homicide rate per100,000	-7.665E-5	0.000	-0.217	0.831	-0.001 - 0.001	0.002
	Death rate per 1,000	-0.013	0.005	-2.536	0.020	-0.024 - -0.002	0.243
Psychiatric Rate per 100,000	Intercept	-19.947	3.514	-5.676	.000	-27.362 - -12.533	0.000
	Maternity rate per 1,000	7.042	0.483	14.579	.000	6.023 - 8.062	0.395
	Homicide rate per 100,000	0.094	0.013	6.987	.000	.066 - .123	0.041
	Death rate per 1,000	1.539	0.184	8.384	.000	1.152 - 1.926	0.313

Table 13: Multivariate analysis of selected independent variables on log attendance to A&E and admission to government and quasi-government hospitals in Jamaica.

Dependent Variable	Parameter	B	Std. Error	t	P	95% CI Lower - Upper	Partial Eta square
Attendance at A&E Rate	Intercept	11.093	15.892	0.698	0.492	-21.9 - 44.1	0.022
	Homicide rate per 100,000	0.394	0.070	5.637	<0.0001	0.2 - 0.5	0.591
	Psychiatric rate per 100,000	-0.228	0.233	-0.979	0.338	-0.7 - 0.3	0.042
	Death rate per 1,000	-0.948	0.944	-1.004	0.326	-2.9 - 1.0	0.044
	Maternity Rate	2.448	1.676	1.461	0.158	-1.0 -5.9	0.088
Admission Rate	Intercept	5.622	1.331	4.223	<0.0001	2.9 - 8.4	0.448
	Homicide rate per 100,000	-0.004	0.006	-0.651	0.522	-0.02- 0.01	0.019
	Psychiatric rate per 100,000	-0.001	0.020	-0.037	0.971	-0.04 - 0.04	0.000
	Death rate per 1,000	-0.168	0.079	-2.127	0.045	-0.33 - -0.004	0.171
	Maternity Rate	0.461	0.140	3.285	0.003	0.17 - 0.75	0.329

Table 14: Factor Correlation Matrix.

		Death rate per 1000	Homicide rate per 1,00,000	Psychiatric rate per 1,00,000	Attendance rate	Maternity rate per 1,000	Admission rate
Correlation	Death rate per 1,000	1	6.36E-01	0.478	0.267	-0.47	-0.714
	Homicide rate per 100,000	0.636	1	0.513	0.765	-0.05	-0.401
	Psychiatric rate per 100,000	0.478	0.513	1	0.205	-0.308	-0.412
	Attendance rate	0.267	0.765	0.205	1	0.287	0.183
	Maternity rate per 1,000	-0.47	-0.05	-0.308	0.287	1	0.694
	Admission rate	-0.714	-0.401	-0.412	0.183	0.694	1
P value	Death rate per 1,000		<0.0001	0.006	0.089	0.007	<0.0001
	Homicide rate per 100,000	<0.0001		0.003	<0.0001	0.402	0.019
	Psychiatric rate per 100,000	0.006	0.003		0.153	0.059	0.016
	Attendance rate	0.089	<0.0001	0.153		0.073	0.18
	Maternity rate per 1,000	0.007	0.402	0.059	0.073		<0.0001
	Admission rate	<0.0001	0.019	0.016	0.18	<0.0001	

having the second most impact on admissions. Therefore, the general model is a linear one that expressed predictors of admissions rate at government and quasi-government hospitals in Jamaica, which is captured in Equation [16]:

$$(Z_t) = \beta_0 + \beta_1 H_t + \beta_2 P_t + \beta_3 D_t + \beta_4 M_t + \varepsilon \qquad [16.1]$$

where $f(Z_t)$ is the function of admissions rate at government and quasi-government hospitals in Jamaica, β_0 is the constant and $\beta_{1\text{-}4}$ are coefficients for each variable, these are expressed in Equation 16.2:

$$f(Z_t) = 5.622 - 0.004H_t - 0.001P_t - 0.168D_t + 0.461M_t + \varepsilon \quad [16.2]$$

The correlations of the explanatory factors (i.e. death, homicide, psychiatric and maternity rates) and dependent variables (i.e. attendance at A&E rate and admissions rate) are presented in Table 14. From Table 14, moderate-to-strong statistical correlation existed between death rate and homicide rate (r=0.636, *P*< 0.0001), homicide rate and attendance at A&E rate (r=0.765, P < 0.0001), psychiatric rate and homicide rate (r=0.513, P=0.003), maternity rate and admission rate (r=0.694, P<0.0001), and admission rate and death rate (r=0.714, P<0.0001).

Discussion

Mortality (or death) including homicide (or murder) is well studied in demography, public health, and criminology [2,10,30-33,46-50]. Although the afore mentioned phenomenon has been studied for decades, the effect of homicide or other deaths on health care utilization has never been empirically examined in the English-Speaking Caribbean. The present research offers an empirical base for understanding the role of homicide and other deaths on the psychology and pharmacoepidemiology of people, particularly Jamaicans, and by doing so it provides critical information to public health planners, demographers and other health specialists on a new theoretical perspective that could be used to guide their thoughts and actions from here onwards.

Health care utilization in government and quasi-government hospitals has been fluctuating for the studied period (2006-2015). It can be deduced from the probabilities

of attendance at government and quasi-government hospitals in Jamaica that at least 1 in every 4 Jamaican visits the accident and emergency department (i.e., A&E) on an annual basis and 1 out of every 5 is admitted at the institution following medical examination on attendance at A&E. Homicide has a strong positive significance association with attendance at A&E in Jamaica, which offers some insights into the psychological and psychiatric impact of murders on the human's physiology. Although Gairin et al., empirically establish a correlation [51] between attendance to A&E and suicide, which speaks to the psychiatric state of people who visit A&E. This research found that homicide accounts for increased number of people visiting A&E, and that other deaths have a psychiatric effect on people. This research went further than that of Gairin et al., establishing that while homicide will cause people to visit A&E [51], it will not account for them being admitted, unlike psychiatric issues and other deaths.

Clearly, violence is closely associated with visits to A&E department and this speaks to its influence on the physiology of people, which correlates with the established literature [29,52,53]. Even though violence, especially homicide, in Jamaica influences visitations to government and quasi-government health care institutions, which is the case as outlined by the World Health Organization [53], it accounts for long-term hospitalization compared to other death. In fact, other deaths and pregnancy have been associated with long-term effect on the psychiatric state of people. So, while data on attendance and admissions at hospitals provide an outlook of the health status of the population, it envelopes critical information for crime prevention policy framework, which is already recognized in the literature [54-56]. This reality broadens the discourse of health data from health to criminology, to sociology, to the psychology of human behaviour. This paper has empirically established that there is psychiatric effect of death on living humans that is profound, which is reflected in admissions to hospital after an A&E assessment to include psychiatric hospitalization.

Unlike other studies on violence and health [29,53], this one goes further by uncategorical forwarding here that the physiology of death as well as psychology of death on human behaviour are different based on the nature of the death. The findings that emerged from this work support a conclusion that homicide has shorter term impact on human existence compared to other deaths. While deaths resulting from violence will commence a physiology visitation to an A&E department, it is other deaths that produce the psychiatric disorders by way of hospitalization to a mental health facility. Wright, et al. presented the intercorrelation between violence and attendance [57] to A&E in Scotland, which is evident in Jamaica and this provides some context of the social psychology of violence and relations with human's physiology.

While Wright, et al. did not examine the psychology and psychiatry of violence, this paper has empirically established such an association [57]. It means, therefore, while violence accounts for more than a one to one relationship with hospitalization, other deaths within the society have far reaching effect on the psychology and psychiatric state of living being. The findings from this study support a deduction that not all deaths affect living humans the same way and that all deaths should not be classified collectively in examining criminology, psychology, and the treatment of people who enter A&E for health care. The rationale for this conclusion is a clear case that deaths have a certain effect on the mind, which is already contextualized by Feifel [58] and Stillion, et al. [59].

Like Feifel opined [58], death can serve life as is clearly presented in this paper and as was demonstrated by the American Psychology Association [60] as it relates to coping strategies in addressing death, dying, and bereavement [61]. Although the psychology of death has been extensively studied [61-64], it is extremely difficult for humans to effectively accept death with its reality despite even ideas such as 'staring at the sun: overcoming the terror of death by Yalom [64]. There is a negative psychology to death that cannot be denied and while we seek to mitigate its long-lasting effect on the mind of people, understanding it as presented herein is the first stage of Wong's prescription on the therapeutic aspect in dealing with death [65]. Our findings support a disaggregation in screening patients who visit health care institutions based on exposure to homicide or other deaths as their impacts are different and must be addressed as such. We are prescribing that while the psychology of death is evident in this work the matter extends to the pharmacoepidemiology of deaths and bereavement.

Conclusion

The statistical evidence of this current work supports a rationale for the introduction of homicide and other deaths in the study of medicine, especially public and mental health. The deduction of the psychology and psychiatry of homicide and other deaths is valid and that homicide must be brought into medicine particularly from the vantage point of pharmacology, with equal emphasis on epidemiology to merge into pharmacoepidemiology.

REFERENCES

1. Caldwell JC. Demographers and the study of mortality: Scope, perspectives, and theory. *Ann N Y Acad Sci* 2001; 954: 19-34.

2. Gompertz B. On the Nature of the Function Expressive of the Law of Human Mortality; and on a New Mode of Determining the Value of Life Contingencies, Philosophical Transactions of the Royal Society 1825; 115: 513-585.

3. Keyfitz N. Choice of Function for Mortality Analysis: Effective Forecasting Depends on a Minimum Partameter Representation, in Vallin J, JH, Pollard, Heligman L. Methodologies for the Collection and Analysis of Mortality Data. IUSSP, Ordina Editions. Liege, Belgium. 1984; 225-241.

4. McGehee MA, Hall SD, Murdock SH. Rural and Urban Death Rates by Race/Ethnicity and Gender, Texas: 1990 and 2000. *J Multicult Nurs Health* 2004; 10: 13-20.

5. Newell C. Methods and model in demography. New Jersey: John Wiley and Sons.1988.
6. Preston SH. Use of direct and indirect techniques for estimating the completeness of death registration system. In data bases for mortality measurement Papers of the meeting of the United Nations/World Health Organization working group on data bases for measurement of levels. Trends and differentials in mortality. Bangkok 20-23, October 1981. New York: United Nations. 1984.
7. Preston S, Heuveline P, Guillot M. Demography: Measuring and modeling population process. New Jersey: Wiley-Blackwell. 2000.
8. Stockwell EG, Swanson DA, Wilks JW. The age-cause proxy relationship in infant mortality. Social Biology, 1987; 34: 249-253.
9. Bellani G, Laffey JG, Pham T, Fan E, Brochard L, et al. Epidemiology, Patterns of Care, and Mortality for Patients with Acute Respiratory Distress Syndrome in Intensive Care Units in 50 Countries. *JAMA* 2016; 315: 788-800.
10. Gabriel SE, Michaud K. Epidemiological studies in incidence, prevalence, mortality, and comorbidity of the rheumatic diseases. *Arthritis Res Ther* 2009; 11: 229.
11. Scott S, Duncan SR, Duncan CJ. Infant Mortality and Famine: A Study in Historical Epidemiology in Northern England. *J Epidemiol Community Health* 1979; 49: 245-252.
12. United Nations. Principles for a vital statistics system. Statistical Papers, Series M, 1953; 19.
13. World Health Organization (WHO). Official records of the World Health Organization, No. 28. Third World Health Assembly, 1950.
14. Wingard DL. The sex differential in mortality rates: Demographic and behavioral factors. *Am J Epidemiol* 1982; 115: 205-216.
15. United Nations. Age and Sex Patterns of Mortality: Model Life Tables for Under-Developed Countries.1955.
16. United Nations. Manual III: Methods for Population Projections by Sex and Age. United Nations Publications. 1956.
17. United Nations. Methods for Estimating Basic Demographic Measures from Incomplete Data: Manuals and Methods of Estimating Populations. 1967.
18. Murray CJL, Ahmad OB, Lopez AD, Salomon JA. WHO System of Model Life Tables. 2016.
19. Coale AJ, Demeny P. Regional Model Life Tables and Stable Population, Princeton University Press, Princeton. 1996.
20. United Nations. World population prospects. New York.2012.
21. United Nations. United Nations demographic yearbook. New York 2013.
22. World Health Organization. Life expectancy at birth. 2015.
23. Mathers C, Fat D, Inoue M, Rao C, Lopez AD. Counting the dead and what they died from: An assessment of the global status of cause of death data. *Bull World Health Org* 2005; 83: 172-173.
24. Binns AM, Fox K, Williams KE, Ashley DE, Irons B. Registration of births, stillbirths and infant deaths in Jamaica. *Int J of Epidemiol* 1996; 25: 807-813.
25. McCaw Binns A, Holder Y, Spence K, Strachan G, Nam V, et al. Multi-source method for determining mortality in Jamaica: 1996 and 1998. Consultant Report to the Pan American Health Organization. 2002.
26. McCaw Binns A, Mullings J, Holder Y. The Quality and Completeness of 2008 Perinatal and Under-five Mortality Data from Vital Registration, Jamaica. *West Indian Med J* 2015; 64: 3-16.
27. World Health Organization (WHO). World health statistics 2010. Geneva: WHO. 2010.
28. World Health Organization. World health statistics 2012. Geneva: WHO. 2012.
29. Bourne PA, Solan I. Health, violent crimes, murder and inflation: public health phenomena. *J Behav Health* 2012; 1: 59-65.
30. Bourne PA, Hudson-Davis A, Sharpe-Pryce C, Francis C, Solan I**,** et al. Homicide, rape and carnal abuse in Jamaica, 1970-2013: The New Health Pandemics. *Int J Emerg Ment Health* 2015a; 17: 588-597.
31. Bourne PA, Hudson-Davis A, Sharpe-Pryce C, Francis C, Solan I, et al. The Effects of Homicides and Economics on Human and Social Biology: A Mental Health Challenge for a Society? *Int J Emerg Ment Health* 2015b; 17: 495-501.
32. Bourne PA, Hudson-Davis A, Sharpe-Pryce C, Solan I, Nelson S, et al. Homicide, sexual homicide and rape: A comparative analysis of Jamaica and New York, 1970-2013. *World Journal of Pharmacy and Pharmaceutical Sciences* 2015c; 4: 231-260.
33. Bourne PA, Hudson-Davis A, Does Homicide Influence Psychiatric Hospitalization to a Mental Health Facility? A Mathematical Approach. *J Ment Disord Treat* 2016; 2: 109
34. Koppensteiner MF, Manacorda M. Violence and Birth Outcomes: Evidence from Homicides in Brazil. 2015.
35. Cohen J, Cohen P. Applied multiple regression/correlation analysis for the behavioral sciences, 2nd ed. New Jersey: Lawrence Elbraum Associates. 1983.
36. Hu TW. Econometrics: An introductory analysis, 2nd. ed. Baltimore: University Park Press.1982.
37. Hill RC, Griffiths WE, Judge GG. Undergraduates econometrics, 2nd. M.A: John Wiley and Sons. 2001.
38. Lewis-Beck M. Applied regreesion: An introduction. London: Sage.1980.
39. Maddala GS. Introduction to econometrics, 2nd ed. New York: Macmillan Publishing company. 1992.
40. Divaris K, Vann WF, Baker AD, Lee JY. Examining the accuracy of caregivers' assessments of young children's oral health status. *J Am Dent Assoc* 2012; 143: 1237-1247.

41. Hinkle DE, Wiersma W, Jurs SG. Applied Statistics for the Behavioral Sciences, 5th ed. Boston: Houghton Mifflin.2003.

42. Evans JD. Straightforward Statistics for the Behavioral Sciences. Brooks/Cole Publishing; Pacific Grove, Calif. 1996.

43. Howell DC. Fundamental statistics for the behavioural sciences. Belmont, CA: Wadsworth. 2007.

44. Howell DC. Statistical methods for psychology (7th ed.). Belmont, CA: Wadsworth. 2010.

45. Howitt D. Cramer D. Introduction to statistics in psychology (5th ed.). Harlow, UK: Pearson.2011.

46. Desai P, Hanna B, Melville B, Wint BA. Infant mortality rates in three parishes of western Jamaica, 1980. *West Indian Med J* 1983; 32: 83-87.

47. Harriott A. Introduction. In: Harriott A, Brathwaite F, Wortley S, eds. Crime and criminal justice in the Caribbean. Kingston: Arawak Publishers. 2004a; 1-7.

48. Harriott A. The Jamaican crime problem: Some policy consideration. In: Harriott A, Brathwaite F, Wortley S, eds. Crime and criminal justice in the Caribbean. Kingston: Arawak Publishers. 2004b; 238-264.

49. Harriott A. Fear of criminal victimization in reputedly violent environment. In: Harriott A, Brathwaite F, Wortley S, eds. Crime and criminal justice in the Caribbean. Kingston: Arawak Publishers. 2004c; 57-86.

50. March C, Bourne PA. The Influence of Macroeconomic Factors on Murders in Jamaica: Should the Police Be Cautious in Interpreting the Murder Statistics? *Asian Journal of Business Management* 2011;3 4: 257-277.

51. Gairin I, House A, Owens D. Attendance at the accident and emergency department in the year before suicide: retrospective study. The British Journal of Psychiatry, 2003; 183: 28-33.

52. Ford K, Quigg Z, Wood S, Grant C, Hughes K. A case study to demonstrate the use of health data in violence prevention within the voluntary and community sector: Local Solutions. Centre for Public Health, Liverpool John Mores University. 2015.

53. World Health Organization. World report on violence and health. Geneva: WHO. 2002.

54. Ford K, Wood S, Hughes K, Quigg Z. Accident and Emergency department data sharing to support violence prevention in Wigan. Liverpool: Centre for Public health, Liverpool John Moores University. 2014a.

55. Ford K, Wood S, Hughes K, Quigg Z. Accident and Emergency department data sharing to support violence prevention in Lambeth. Liverpool: Centre for Public health, Liverpool John Moores University. 2014b.

56. Ford K, Wood S, Hughes K, Quigg Z. Accident and Emergency department data sharing to support violence prevention in Wirral. Liverpool: Centre for Public health, Liverpool John Moores University. 2014c.

57. Wright J, Kariya A. Assault patients attending a Scottish accident and emergency department. *J R Soc Med* 1997; 90: 322-326.

58. Feifel H. Psychology and death. Meaningful rediscovery. *Am Psychol* 1990; 45: 537-543.

59. Stillion J, Attig T. Death, dying and bereavement: Contemporary perspectives, institutions and practice. New York: Springer Publishing Company.2015.

60. American Psychology Association. Death and dying. 2016.

61. McCoyd JL, Walter CA. Grief and loss across the lifespan: A biopsychological perspective, 2nd ed. New York: Springer Publishing Company. 2015.

62. Kubler-Ross E. On death and dying. New York, NY: Macmillan.1969.

63. Kubler-Ross E. On death and dying, 40th anniversary edition. Abingdon, UK: Routledge. 2009.

64. Yalom ID. Staring at the sun: Overcoming the terror of death. San Francisco, CA: Jossey-Bass. 2008.

65. Wong PT. Meaning Therapy: An integrative and positive existential psychotherapy. *J Contemp Psychother* 2010; 40: 85-93.

ADDRESS FOR CORRESPONDENCE:
Paul Andrew Bourne, Adjunct Lecturer, Northern Caribbean University, Jamaica, West Indies, Tel: 1 876 5663088; Email: pbourne@stu.ncu.edu.jm

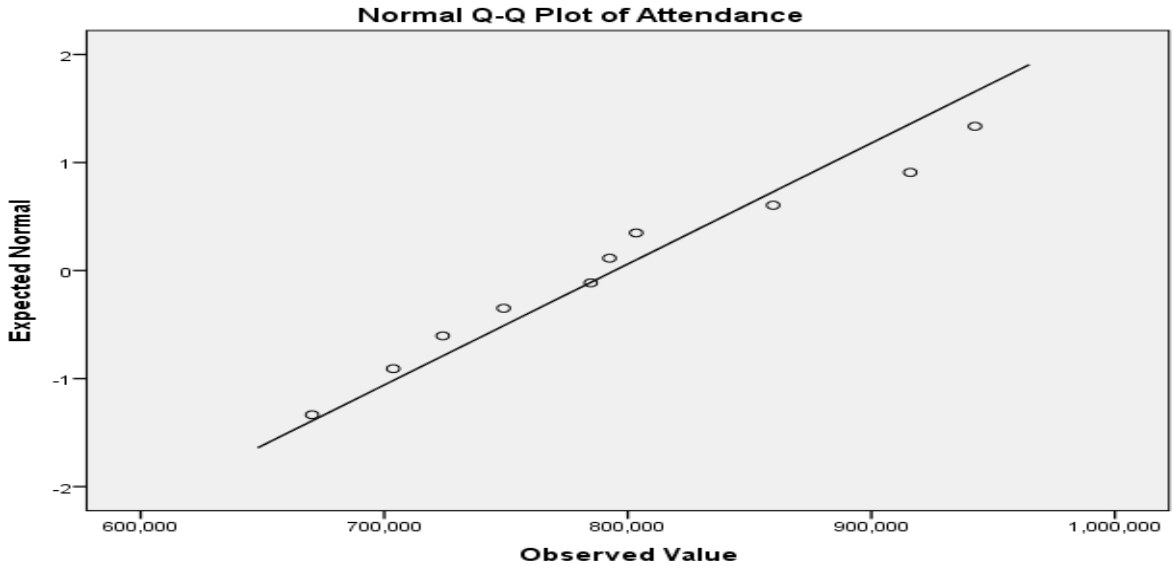
Submitted 08 August 08, 2016
Accepted 07 December, 2016

Annex

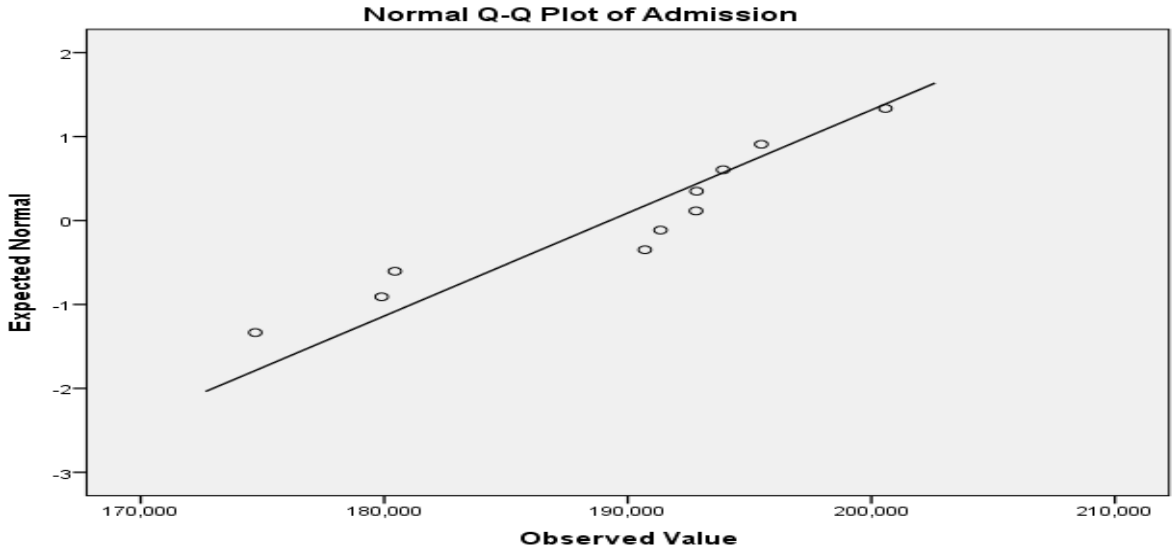
Descriptive statistics for attendance at A&E and admissions to government as well as quasi-government hopitals in Jamaica for the period 2006-2015 are presented in Annex Table 1. Using descriptive values for attendance at A&E, based on the value for the skewness (0.379) and the large variance (742, 642, 4045.4), there are clear statistical evidence that errors are present in the data, but that these are contained and should be noted. Furthermore, the kurtosis value for attendance at A&E (-0.915) indicates a flattening of the values away from the centre. Despite this fact, enough statistical proof is there that the distribution is a relatively normal one (Figure 1). This means that the datapoints are relatively close to the mean value represented by the straight line in the graph. Nevertheless, we must be mindful of errors within the datapoints which is captured by the large variance and standard error of the mean. Likewise the same situation exists for admissions at government and quasi-government hospitals in Jamaica, with a higher skewness value suggesting more errors in this variable compared to that of attendance, which is also evident from the test of normality, in which the values are more away from the mean value represented by the straight line (Figure 2).

Annex Table 1: Descriptive statistics for attendance and admissions to government as well as quasi-government hospitals in Jamaica, 2006-2015.

			Statistic	**Std. Error**
Attendance	Mean		794596.3	15733.6
	95% Confidence Interval for Mean	Lower Bound	762417.4	
		Upper Bound	826775.2	
	Median		788618.5	
	Variance		7.426424045.4	
	Std. Deviation		86176.7	
	Minimum		670360.0	
	Maximum		942523.0	
	Skewness		0.379	0.427
	Kurtosis		-0.915	0.833
Admission	Mean		189267.3	1435.5
	95% Confidence Interval for Mean	Lower Bound	186331.3	
		Upper Bound	192203.3	
	Median		192069.0	
	Variance		61822437.7	
	Std. Deviation		7862.7	
	Minimum		174704.0	
	Maximum		200578.0	
	Skewness		-0.619	0.427
	Kurtosis		-0.758	0.833



Annex Figure 1: Testing of normality to datapoints.

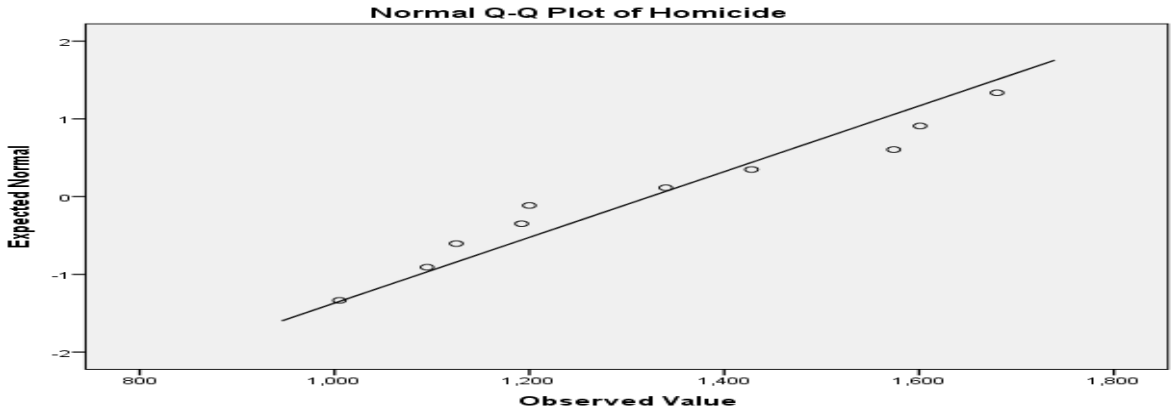


Annex Figure 2: Testing of normality of the distribution.

Annex Table 2 summarizes the descriptive statistics for homicide and other deaths in Jamaica for the periods 2006-2015. A relatively high standard error of the mean indicates errors with the datapoints, which is supported by the high variance. However, the skewness value was relatively close to zero for other deaths indicating the almost normal distribution of this variable (Annex Figure 3). The skewness for homicide, while being relatively close to zero, was greater than that for homicide, suggesting less normality of the distribution (Annex Figure 4). Furthermore, even though other deaths reflect a relative normal distribution, it had more errors therein compared to homicide, which is noted in the larger variance and standard error of the mean. Based on the skewness, the errors are noted; but they are tolerable for usage.

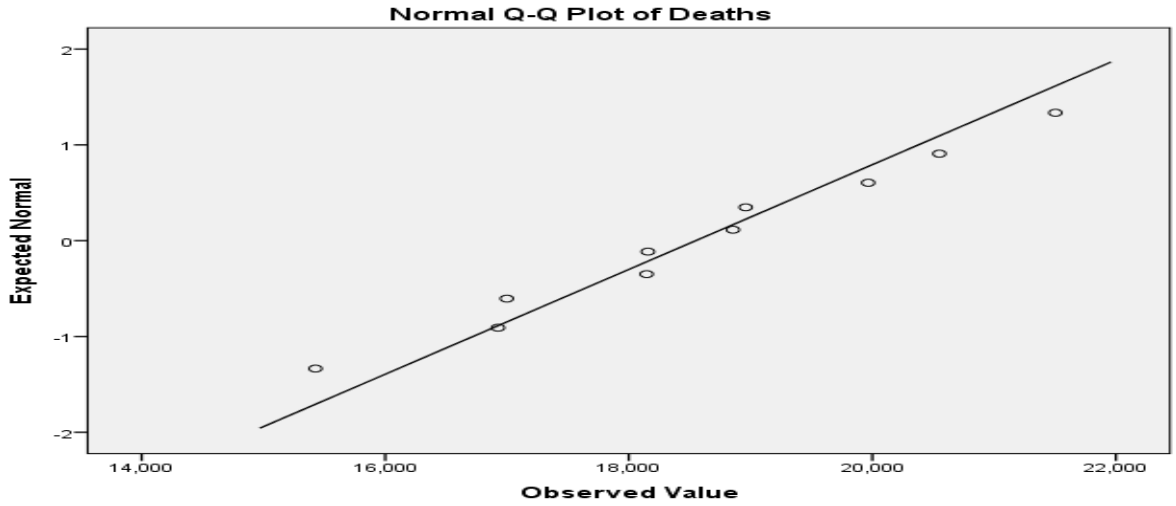
			Statistic	Std. Error
Homicide	Mean		1324.0	74.8
	95% Confidence Interval for Mean	Lower Bound	1154.8	
		Upper Bound	1493.2	
	Median		1270.0	
	Variance		55960.0	
	Std. Deviation		236.6	
	Minimum		1005	
	Maximum		1680	
	Range		675	
	Skewness		0.248	
	Kurtosis		-1.469	1.334
Deaths	Mean		18548.8	578.3
	95% Confidence Interval for Mean	Lower Bound	17240.5	
		Upper Bound	19857.1	
	Median		18506.0	
	Variance		3344805.5	
	Std. Deviation		1828.9	
	Minimum		15427	
	Maximum		21503	
	Skewness		-0.041	0.687
	Kurtosis		-0.359	1.334

Annex Table 2: Descriptive statistics of homicide and other deaths in Jamaica, 2006-2015.



Testing the Normality Assumption

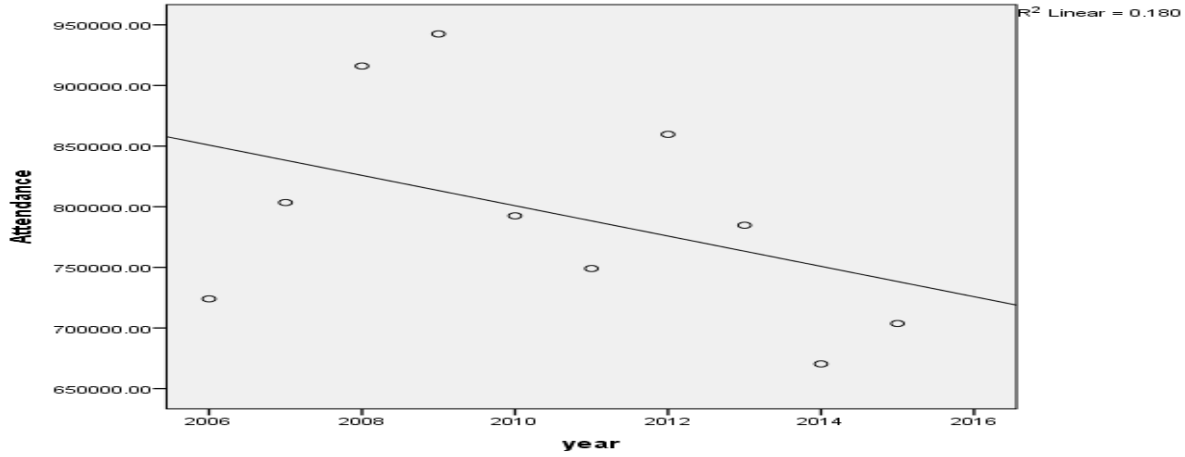
Annex Figure 3: Testing of normality of the distribution for admission.



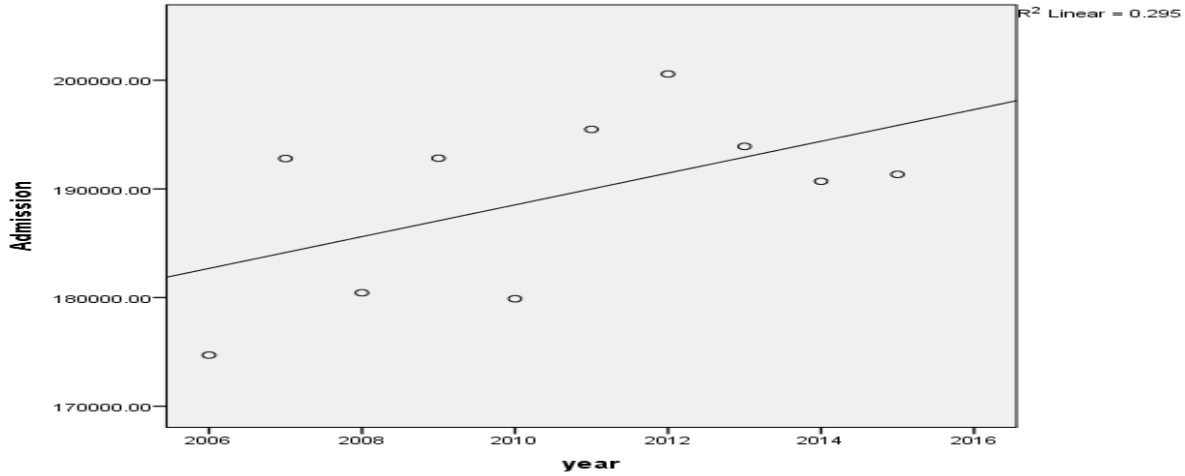
Annex Figure 4: Testing of normality of the distribution for admissions.

Testing the Linearity Assumption

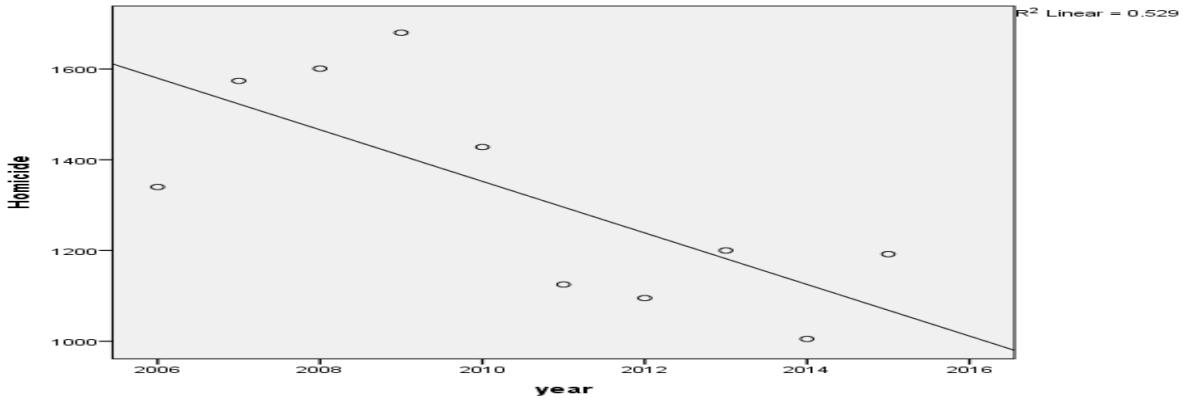
Based on the squared r value, there is a weak linear distribution of attendance and admission, which is more than that for admission. It can be deduced from attendance and by extension admissions that these variables required transformation.



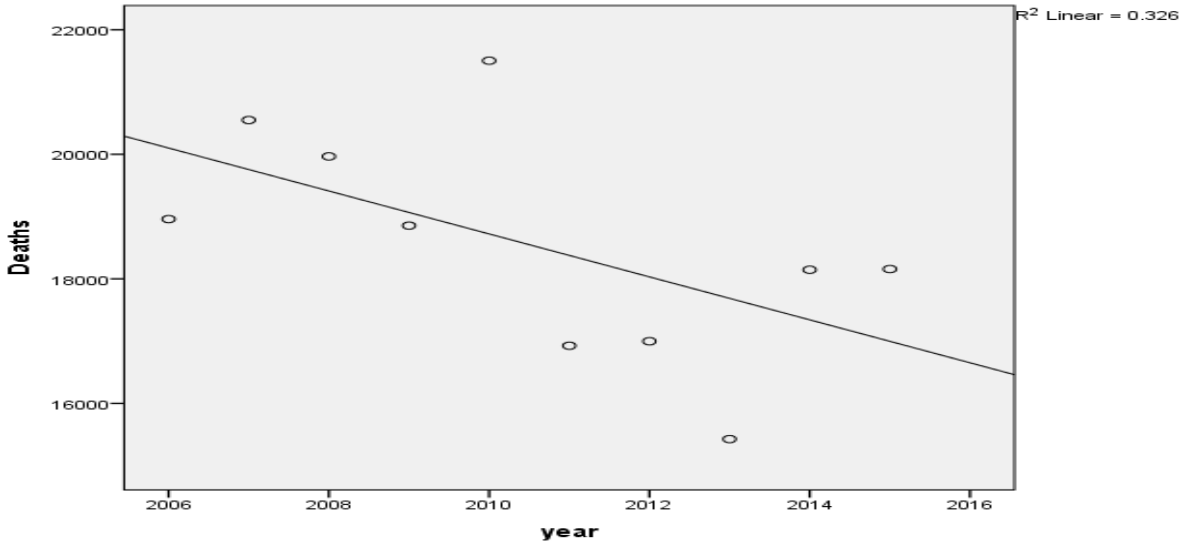
Annex Figure 5: Linearity of Attendance.



Annex Figure 6: Linearity of Admission.



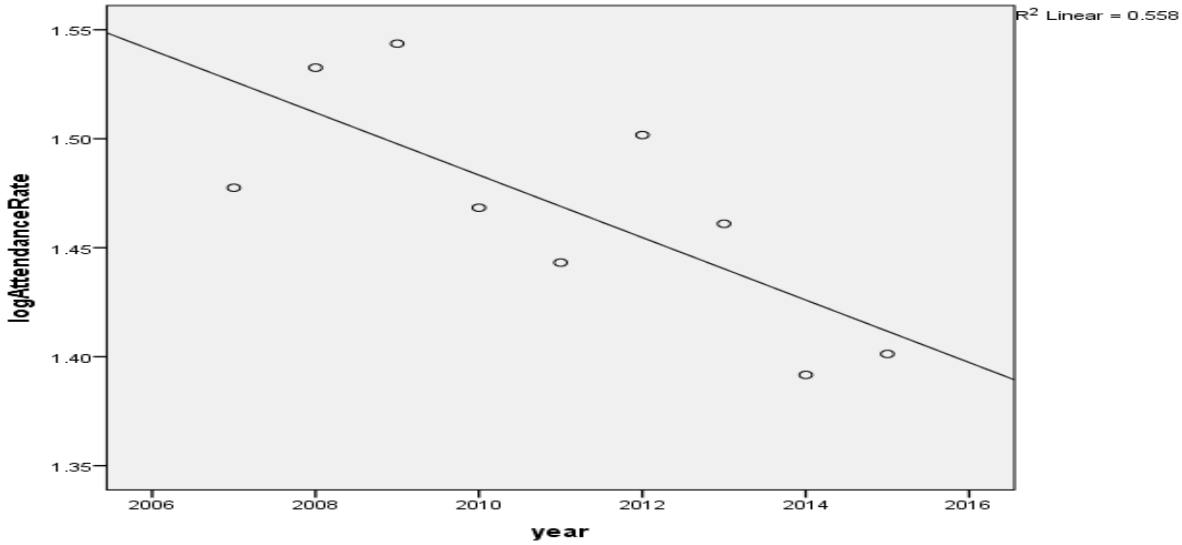
Annex Figure 7: Linearity of Homicide.



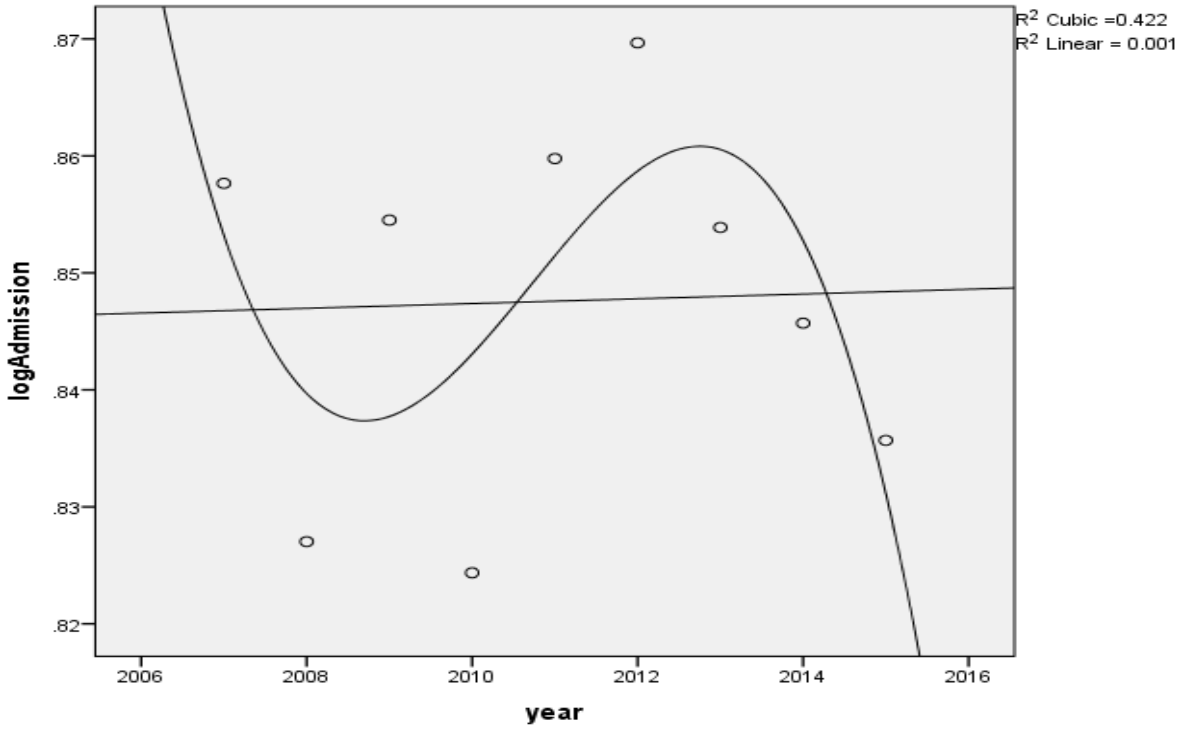
Annex Figure 8: Linearity of Other Deaths.

Transformation of Attendance

By way of transformation, it can be deduced that attendance when transformed it is ideal for ordinary least square regression.



Annex Figure 9: log Attendance rate and superimposed function.



Annex Figure 10: Log Admission rate and superimposed function.

Effect		Value	F	Hypothesis df	Error df	P
Intercept	Pillai's Trace	0.630	17.905[b]	2.000	21.000	<0.000
	Wilks' Lambda	0.370	17.905[b]	2.000	21.000	<0.000
	Hotelling's Trace	1.705	17.905[b]	2.000	21.000	<0.000
	Roy's Largest Root	1.705	17.905[b]	2.000	21.000	<0.000
Homicideratеper100000	Pillai's Trace	0.827	50.041[b]	2.000	21.000	<0.000
	Wilks' Lambda	0.173	50.041[b]	2.000	21.000	<0.000
	Hotelling's Trace	4.766	50.041[b]	2.000	21.000	<0.000
	Roy's Largest Root	4.766	50.041[b]	2.000	21.000	<0.000
Psychiatricrateper10000 0	Pillai's Trace	0.102	1.186[b]	2.000	21.000	0.325
	Wilks' Lambda	0.898	1.186[b]	2.000	21.000	0.325
	Hotelling's Trace	0.113	1.186[b]	2.000	21.000	0.325
	Roy's Largest Root	0.113	1.186[b]	2.000	21.000	0.325
Death rate per 1000	Pillai's Trace	0.210	2.790[b]	2.000	21.000	0.084
	Wilks' Lambda	0.790	2.790[b]	2.000	21.000	0.084
	Hotelling's Trace	0.266	2.790[b]	2.000	21.000	0.084
	Roy's Largest Root	0.266	2.790[b]	2.000	21.000	0.084
Maternity Rate	Pillai's Trace	0.397	6.925[b]	2.000	21.000	0.005
	Wilks' Lambda	0.603	6.925[b]	2.000	21.000	0.005
	Hotelling's Trace	0.660	6.925[b]	2.000	21.000	0.005
	Roy's Largest Root	0.660	6.925[b]	2.000	21.000	0.005

a. Design: Intercept + Homicide rate per 100,000 + Psychiatric rate per 100,000 + Death rate per 1,000 + Maternity rate
b. Exact statistic

Annex Table 11: Multivariate Tests[a].

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	P
Corrected Model	Attendance at A&E Rate	229.492[a]	4	57.373	13.958	<0.0001
	Admission Rate	1.360[b]	4	0.340	11.792	<0.0001
Intercept	Attendance at A&E Rate	2.003	1	2.003	0.487	0.492
	Admission Rate	0.514	1	0.514	17.833	<0.0001
Homicide rate per 100,000	Attendance at A&E Rate	130.607	1	130.607	31.774	<0.0001
	Admission Rate	0.012	1	0.012	0.423	0.522
Psychiatric rate per 100,000	Attendance at A&E Rate	3.938	1	3.938	0.958	0.338
	Admission Rate	3.891E-5	1	3.891E-5	0.001	0.971
Death rate per 1,000	Attendance at A&E Rate	4.145	1	4.145	1.008	0.326
	Admission Rate	0.130	1	0.130	4.523	0.045
Maternity Rate	Attendance at A&E Rate	8.772	1	8.772	2.134	0.158
	Admission Rate	0.311	1	0.311	10.793	0.003
Error	Attendance at A&E Rate	90.431	22	4.110		
	Admission Rate	0.635	22	0.029		
Total	Attendance at A&E Rate	23529.145	27			
	Admission Rate	1314.616	27			
Corrected Total	Attendance at A&E Rate	319.922	26			
	Admission Rate	1.995	26			

a. R Squared = 0.717 (Adjusted R Squared = 0.666)
b. R Squared = 0.682 (Adjusted R Squared = 0.624)

Annex Table 12: Tests of Between-Subjects Effects.