

Psychiatric Induced Births in Jamaica: Homicide and Death Effects on Pregnancy

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Abstract

For this paper, the researchers have narrowed the gap in the health literature by addressing the following.

Objectives: Evaluate the role of homicide on admissions to a maternity hospital (or during pregnancy), Assess whether or not deaths can induce pregnancy or birth, Determine the responsivity of hospitalization at a mental health facility among pregnant women; & Calculated the responsivity of hospitalization to a maternity institution based on changes in homicide or deaths. The data for this study were taken from a Jamaica Government Publication. Data were also obtained from the Ministry of Health (2005-2015) on admissions to a national mental health public hospital in Jamaica, which is the Bellevue Hospital (referred to as Bellevue). The period for this work is from 2005 through to 2015. Homicide has an effect on admissions to the maternity institution, Victoria Jubilee hospital, using the positive elasticities, especially those greater than one. Pregnancy has an effect on hospitalization to a psychiatric hospital, which means that there are psychiatric induced births in Jamaica.

Keywords: Induced birth; Postpartum psychosis

Introduction

Jamaica is the largest English-Speaking Caribbean nation and the third largest Caribbean island with an estimated population of 2,793,335 people (for 2015, Statistical Institute of Jamaica, 2016; United Nations). It is 4,411 square miles and 146 miles long, 51 miles wide and achieved independence on 6th August 1962. The island is divided into 14 parishes, with the capital of each parish indicated by a red circle or square shown on (Figure 1). The population is served by at least one government hospital in each parish, with certain hospitals being affiliated with the national institution and some extend to the wider English-Speaking Caribbean.



Source: <https://www.google.com/jm/search?q=map+in+jamaica&biw>

Key: Capital of each parish is marked by a red circle or red square

Figure 1: Map of Jamaica by Parishes.

Some of the island's national hospitals include: Bellevue (i.e., mental health), Victoria Jubilee (i.e. maternity), National Chest

(Tuberculosis), Sir John Golding Rehabilitation (i.e., physical medicine and rehabilitation); Kingston Public (i.e., trauma) & Bustamante Hospital for Children (i.e., general medicine). Both the Victoria Jubilee and the Bellevue hospitals are located in the parish of Kingston. Victoria Jubilee is on North Street, Western Kingston, and Bellevue is sited on Windward Road, Eastern Kingston, Jamaica. Victoria Jubilee Hospital was established in 1872 and it is the only maternity hospital on the island SERHA [1]; Hall & Wynter [2]. Bellevue hospital was built and commissioned in 1861. It was initially called the Jamaica Lunatic Asylum, renamed in 1938 as Jamaica Mental Hospital and as the Bellevue hospital in 1946 bellevuehospital.org nd [3].

A search of health literature revealed the following studies that have previously examined postpartum psychosis Bydlowski [4]; Baldur-Felskov et al. [5]; Xu et al. [6]; Crawford et al. [7]; Gold [8]; Thornton, Guendelman & Hosang [9] among others. Burke et al. [10] found that women tend to be at their peak of prevalence as it relates to psychiatric disorders during their childbearing years. The National Institute for Health [11] outlined that women who have had severe mental health problems are more likely to experience mental health illness during pregnancy. A group of researchers, examining some 1.3 Swedish born between 1973 to 1985, found that people who were born prematurely were more likely to have mental health problems Gallagher [12], which were similar to that revealed in study Nosarti et al. [13].

The researchers did not uncover any practically systematic empirical enquiry aim at untangling the effects of homicide and deaths on admissions to maternity hospital and the relationship between the hospitalization of pregnant women and psychiatric hospitalization. An extensive search of Pub Med, Google scholar and other search engines did unearth any research on the aforementioned issues. Another rationale for this study is based on the comments of Valenca & de Moraes [14] "There is a scarcity of studies in the literature that deal with the relationship between mental disorders and homicide in developing countries" (S67). Such reality suggests the health literature is lacking on the matter of postpartum psychosis, especially in Jamaica with a homicide rate that is highest in the Caribbean. For this paper, the researchers attempted to bridge the gap in the health literature by addressing the following.

Objectives: Evaluate the role of homicide on admissions to a maternity hospital (or on pregnancy); Assess whether or not deaths can induce pregnancy or birth; Determine the responsivity of hospitalization at a mental health facility among pregnant women & Calculated the responsivity of hospitalization to a maternity institution based on changes in homicide or deaths.

Theoretical Framework

Koppensteiner & Manacorda [15] 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 Y_{iat} is the individual outcome variable (birthweight, gestational length, etc.) in area (municipality or neighborhood) a , at time t , HOM_{at} is the local homicide rate and d_a and d_t are respectively mother's area of residence and month of conception-fixed effects, while u is an error term" Koppensteiner & Manacorda [15]. This paper employs a similar model to explain how 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 admissions to Bellevue a national mental health public hospital in Jamaica from 2005 through 2015. The timeline for this research work is 2005 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 between homicide and pregnancy, death and pregnancy, and admissions to a psychiatric and maternity hospital, using R2.

In order to assure the OLS application was appropriate for this study; all the assumptions were tested before usage. In cases

where variables are highly inter-correlated ($r > 0.7$), tolerance were checked and if multi-collinearity was discovered, one of the variables was dropped and using separately in a model without the highly correlated variable.

Two of the assumptions of OLS were not met, linearity and normality, and so with this violation, OLS was not used Cohen & Cohen [16]; Hu [17]; Hill et al. [2]; Lewis-Beck [18]; Maddala [19]. Given that the two of the assumptions of OLS were violated, curvilinear analyses were done on the data Cohen & Cohen [16]; Hu [17]; Hill et al. [2]; Maddala [18]. Whether it is medical research or otherwise, interpreting the correlation coefficients is important Divaris et al. [20]; Hinkle et al. [21]; Mukaka [22] and Evans [23] provided a platform for correlation coefficient interpretations. Evans [23] outlined that for r , 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 r^2 : 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 [24,25]; and Howitt & Cramer [26].

Having tried to use 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.

Cross-elasticities of hospitalization

(% Δ in admissions at national psychiatric hospital (i.e.,Bellevue))/(% Δ in admissions at national maternity hospital (i.e.,Victoria Jubilee))

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

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

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

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

Or

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

Interpretations of elasticities results:

$\eta > 1$: 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;

$\eta < 1$: 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

$\eta < -1$: This is a substitution effect that is highly responsive

$\eta < -1$: This is a substitution effect this is lowly responsive

Complementary effect

$\eta > -1$: This is a complementary effect that is lowly responsive

$\eta < +1$: this is a complementary effect that is highly responsive

Birth rate

Birth rate = $(\sum [\text{Birth at time } t]) / (\sum [\text{Mid-year population at time } t]) \times 1,000$

Death rate

Death rate = $(\sum [\text{Death at time } t]) / (\sum [\text{Mid-year population at time } t]) \times 1,000$

Psychiatric hospitalization rate

Psychiatric hospitalization rate = $(\sum [\text{Admissions at psychiatric hospital at time } t]) / (\sum [\text{Mid-year population at time } t]) \times 100,000$

Homicide rate

Homicide rate = $(\sum [\text{Homicide at time } t]) / (\sum [\text{Mid-year population at time } t]) \times 100,000$

Note: The rates are displayed in Annex (Table 1).

Table 1: (Annex): Birth rate, death rate, homicide rate and psychiatric hospitalization rate 2006-2015.

Year	Birth rate/1000	Death rate/1000	Homicide rate/100,000	Psychiatric hospitalization rate/100,000
2006	16.24	7.12	50.32	41.68
2007	16.21	7.68	58.82	36.06
2008	16.04	7.43	59.58	36.17
2009	15.87	6.99	62.32	40.32
2010	15.03	7.98	52.98	38.77
2011	14.69	6.27	41.67	35.45
2012	14.61	6.28	40.44	36.75
2013	13.54	5.68	44.20	36.50
2014	18.41	6.67	36.94	36.94
2015	18.16	6.50	42.67	35.58

Findings

Table 2: Admissions at Victoria Jubilee hospital, deaths and homicides, 2006-2015.

Year	Victoria Jubilee Hospitalizations	Deaths	Homicides
2006	14,101	18,960	1,340
2007	15,846	20,550	1,574
2008	14,928	19,966	1,601
2009	16,635	18,855	1,680
2010	15,885	21,503	1,428
2011	15,888	16,926	1,125
2012	16,452	16,998	1,095
2013	16,895	15,427	1,200
2014	15,209	18,146	1,005
2015	16,688	18,157	1,192

Table 2 presents data on annual admissions at Victoria Jubilee hospital (i.e., Nation's maternity hospital), deaths and homicide for Jamaica from 2005-to-2015. Over the 10-year period, the average number of admissions to the Victoria Jubilee hospital was 15855 pregnant women \pm 886 pregnant women (95%CI: 15221-15489 pregnant women) compared to 1324 \pm 1155-1493 people murdered (95%CI: 1155-1493) and 18549 deaths \pm 1829 deaths (95%CI: 17241-19857deaths). In the first 5-year period (2006-2010), the average number of pregnant women hospitalized Victoria Jubilee hospital was 15479 \pm 980 pregnant women (95%CI: 14262-16695 pregnant women) compared to 1525 \pm 138 people murdered (95%CI:

1354-1696) and 19967 \pm 1112 deaths (95%CI: 18586-21348 deaths). Comparatively, for the latter 5-year period, the average number of admissions at the Victoria Jubilee hospital was 16230 pregnant women \pm 675 pregnant women (95%CI: 15391 - 17068 pregnant women) compared to 1123 \pm 80 people murdered (95%CI: 1024-1224) and 17131deaths \pm 1123 deaths (95%CI: 15736-18525 deaths). It should be noted here that the number of pregnant women admitted to the Victoria Jubilee hospital rose by 4.85% in the latter 5-year period over the former 5-year period compared to a 26.36% decline in murders for the same period.

Table 3: Cross-elasticities of homicide, 2006-2015.

Year	Diff in Hospitalization	Diff in Homicide	% Δ in admissions atVictoria Jubilee	% Δ in Homicide	η
2006	-	-	-	-	-
2007	1,745	234	12.38	17.46	0.7087
2008	-918	27	-5.79	1.72	-3.3773
2009	1,707	79	11.43	4.93	2.3174
2010	-750	-252	-4.51	-15.00	0.3006
2011	3	-303	0.02	-21.22	-0.0009
2012	564	-30	3.55	-2.67	-1.3312
2013	443	105	2.69	9.59	0.2808
2014	-1,686	-195	-9.98	-16.25	0.6141
2015	1,479	187	9.72	18.61	0.5226

Table 3 presents a summary of cross-elasticities of homicide for Jamaica, using hospitalization at the Victoria Jubilee hospital and homicide) for Jamaica from 2006-2015. Cross-elasticities of homicide have changed from being lowly to highly responsive as well as from complementary to substitution. The positive elasticities indicate a complementary effect between hospitalization at Victoria Jubilee hospital and homicide (i.e., increases in homicide results in a rise in hospitalization at

the maternity hospital and vice versa). The two variables act in the same manner, which means that changes in homicide is associated with the shift in admissions at Victoria Jubilee hospital. The magnitude of the change is value of the elasticity ($\eta < 1$ or $\eta > 1$). When elasticity is less than one ($\eta < 1$) it indicates that the relation between hospitalization and homicide is lowly responsive and vice versa for elasticities larger than one ($\eta > 1$). It follows, therefore, that homicide has an effect on admissions

to Victoria Jubilee hospital, using the positive elasticities, especially those greater than one.

Table 4: Cross-elasticities of hospitalization to deaths in Jamaica 2006-2015.

Year	Hospitalization Victoria Jubilee	Hospitalization at Bellevue	% Δ in admissions at Victoria Jubilee	% Δ in admissions at Bellevue	η
2006	14,101	18,960	-	-	-
2007	15,846	20,550	12.38	8.39	1.4757
2008	14,928	19,966	-5.79	-2.84	2.0386
2009	16,635	18,855	11.43	-5.56	-2.0550
2010	15,885	21,503	-4.51	14.04	-0.3210
2011	15,888	16,926	0.02	-21.29	-0.0009
2012	16,452	16,998	3.55	0.43	8.3451
2013	16,895	15,427	2.69	-9.24	-0.2913
2014	15,209	18,146	-9.98	17.62	-0.5662
2015	16,688	18,157	9.72	0.06	160.4190

Table 4 presents a summary of cross-elasticities of hospitalization to deaths. Over the studied period, deaths have substantially influenced hospitalization at Victoria Jubilee hospital in 2015 compare to 2014 ($\eta=160.4 > 1$). Furthermore, over the 10-year period, there were four times those hospitalizations at Victoria Jubilee hospital highly associated with the changes in deaths 2007, 2008, 2012 and 2015. However, there are years in which admissions at Victoria Jubilee hospital lowly respond to changes in death, suggesting that deaths had little to no influence on admissions of pregnant women to the maternity hospital. In 2011 over 2010, deaths overall had no effect on admissions at Victoria Jubilee.

Figure 1 depicts scatter plots of hospitalization at Victoria Jubilee hospital and homicide along a super-imposed function. On examination of (Figure 1), there is a cycle of hospitalization and homicide representing the peaks and troughs. The peaks and troughs suggest that there is a delayed effect of homicide on births. Using OLS, no linear correlation existed between admissions to the Victoria Jubilee hospital and homicide,

$F [1, 8] = 0.081, P = 0.783 > 0.05$. The relationship between admissions at the national maternity hospital and homicide is best fitted by polynomial function, Equations (2) and (3):

$$V = f(H) \quad (2)$$

$$V = \beta_0 + \beta_1 H + \beta_2 H^2 + \beta_3 H^3 + \beta_4 H^4 + \beta_5 H^5 + \beta_6 H^6 + \beta_7 H^7 \quad (3)$$

Where V is admissions (or hospitalization) to the national maternity hospital (i.e. Victoria Jubilee Hospital; H is homicide; β_0 is constant and β_1-7 are constants for each homicide component. Equation (3) accounts for 100% of the data points.

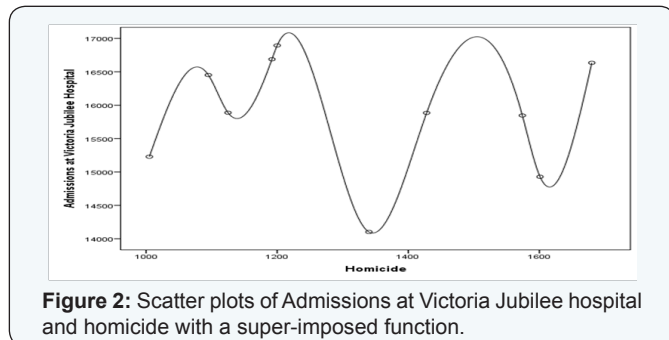


Figure 2: Scatter plots of Admissions at Victoria Jubilee hospital and homicide with a super-imposed function.

Figure 2 shows scatter plots of hospitalization at Victoria Jubilee hospital and deaths. Generally, deaths do not have a positive effect on the admissions of pregnant women being hospitalization at Victoria Jubilee hospital in Jamaica. Using OLS, no linear correlation existed between the two aforementioned variables, $F [1, 8] = 1.646, P = 0.235 > 0.05$. Thus, correlation is a curvilinear one which is best fitted by a 3-degree polynomial function (Equations 4,5)

$$V = f(D) \quad (4)$$

$$V = \beta_0 + \beta_1 D + \beta_2 D^2 + \beta_3 D^3 \quad (5)$$

Where V is admissions (or hospitalization) to the national maternity hospital (i.e. Victoria Jubilee Hospital; D is death; β_0 is constant and β_1-3 are constants for each death component. (Equation 5) accounts for 29.9% of the data points, which is a strong model.

Table 5: OLS of deaths on homicide 2005-2015.

	B	Std. Error	Beta	t	P value.
Constant	11816.1	2764.9		4.274	0.003
Homicide	5.085	2.059	0.658	2.470	0.039

By way of OLS, a linear correlation existed between deaths and homicide in Jamaica, $F [1, 8] = 6.100, P = 0.038 < 0.05$, with the relationship between a positive one (Table 5). The squared R for the OLS was 0.433 and this indicates a strong model. It means that 43.3% of the data are explained by linear model (Equation 6). Although the linear function is a strong one, it is best explained by a curvilinear function, $R^2 = 0.806$ or 80.6%. (Figure 3) depicts a cubic function or a 3-degree polynomial function between deaths and homicide for Jamaica, (Equation 7).

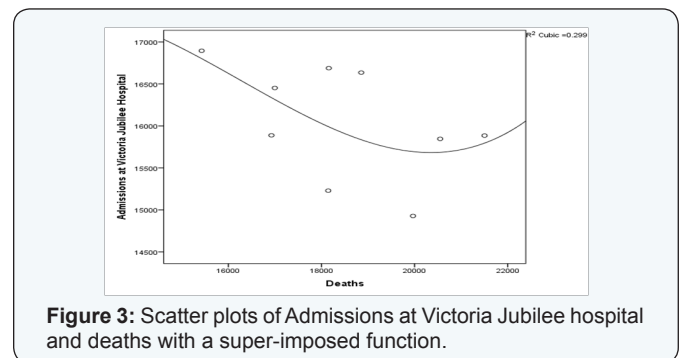


Figure 3: Scatter plots of Admissions at Victoria Jubilee hospital and deaths with a super-imposed function.

$$D_t = f(H_t) \quad (6.1)$$

$$D_t = \alpha + \beta_1 H_t \quad (6.2)$$

$$D_t = 11,816 + 5H_t \quad (6.3)$$

Where D_t is deaths in time period t ; H_t is homicide in time period t ; α is a constant and β_1 is the coefficient of H_t or the slope

$$D = f(H) \quad (7)$$

$$D = \beta_0 + \beta_1 H + \beta_2 H^2 + \beta_3 H^3 \quad (8)$$

Table 6 presents cross-elasticities between admissions at Victoria Jubilee hospital influencing hospitalization to the national psychiatric hospital in Jamaica (Bellevue Hospital) over a 10-year period. During that timeframe, there have been occasions when pregnant women who were hospitalized at the Victoria Jubilee hospital later became patients at the national psychiatric hospital. Those findings highlight the psychology of birth for women and the psychiatric effects on some women following childbirth is reflected by data for 2009 over 2008, 2010 over 2009, and 2012 over 2011. This means that birth is inducing psychiatric behavior among some pregnant women, but that psychiatric disorders are infrequently highly responsive to changes in the hospitalization of pregnant women.

Table 6: Cross-elasticities of hospitalization in Jamaica 2006-2015.

Year	Hospitalization Victoria Jubilee	Hospitalization at Bellevue	% Δ in admissions at Victoria Jubilee	% Δ in admissions at Bellevue	η
2006	14,101	1,110	-	-	-
2007	15,846	965	12.38	-13.06	-1.06
2008	14,928	972	-5.79	0.73	-0.13
2009	16,635	1,087	11.43	11.83	1.03
2010	15,885	1,045	-4.51	-3.86	0.86
2011	15,888	957	0.02	-8.42	-445.89
2012	16,452	995	3.55	3.97	1.12
2013	16,895	991	2.69	-0.40	-0.15
2014	15,209	1,005	-9.98	1.41	-0.14
2015	16,688	994	9.72	-1.09	-0.11

Using OLS regression, no linear correlation existed between hospitalization to the psychiatric hospital in Jamaica (Bellevue) and the national maternity hospital (Victoria Jubilee), $F[1,8]=0.724$, $P = 0.419$. With the linearity assumption violated, curvilinear models were examined and it was found that 3-degree polynomial is a strong fit for the data, $R^2 = 0.509$, (Equation 10) and (Figures 4-7).

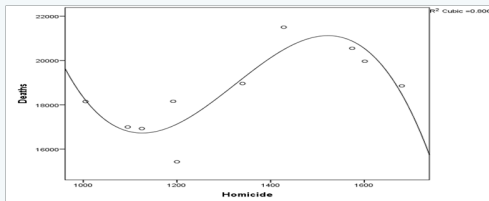


Figure 4: Scatter diagram of death and homicide on a super-imposed function

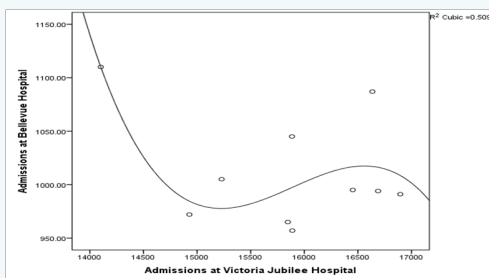


Figure 5: Scatter plots of admissions at Psychiatric and Maternity Hospitals on a super-imposed function

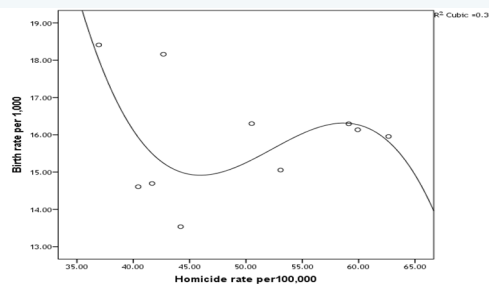


Figure 6: Scatter plots of Birth rate and homicide rate, superimposed on a curvilinear function

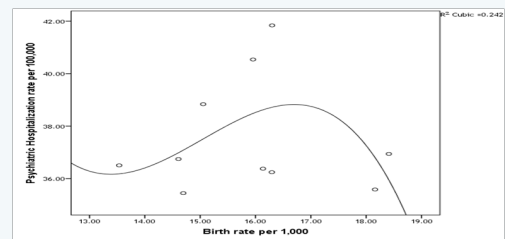


Figure 7: Scatter plots of psychiatric hospitalization rate and birth rate, superimposed

$$B = f(H) \quad (9)$$

$$B = \beta_0 + \beta_1 V + \beta_2 V^2 + \beta_3 V^3 \quad (10)$$

Where B is admissions at the national psychiatric hospital in Jamaica (Bellevue); V is admissions at the national maternity hospital (Victoria Jubilee); β_0 is a constant and β_{1-3} are coefficients.

Birth and Homicide rates

Using OLS regression, no linear statistical correlation existed between birth rate per 1,000 and homicide rate per 100,000 – $F[1, 8] = 0.039$, $P = 0.848 > 0.05$. However, the relationship is a curvilinear one, which account for 30.8% of the data points and this is a relatively strong model. This is expressed in (Equation 12):

$$R = f(H) \quad (11)$$

$$R = \beta_0 + \beta_1 H + \beta_2 H^2 + \beta_3 H^3 \quad (12)$$

Where R is birth rate per 1,000 of mid-year population in Jamaica; H is homicide rate per 100,000 mid-year populations; β_0 is a constant and β_{1-3} are coefficients.

Birth and Psychiatric Hospitalization rates

Using OLS regression, no linear statistical correlation existed between birth rate per 1,000 and psychiatric hospitalization rate per 100,000 – $F[1, 8] = 0.000$, $P = 0.994 > 0.05$, $R^2 = 0.000$. However, the relationship is a curvilinear one, which account for 24.2% of the data points and this is a moderate associative model. The model means that birth is influenced by psychiatric

hospitalization; this is expressed in (Equation. 14):

$$B = f(R) \quad (13)$$

$$B = \beta_0 + \beta_1 R + \beta_2 R^2 + \beta_3 R^3 \quad (14)$$

Where R is birth rate per 1,000 of mid-year population in Jamaica; B is psychiatric hospitalization rate per 100,000 mid-year populations; β_0 is a constant and β_{1-3} are coefficients.

Discussion

The issue of the induced birth is widely studied, especially in health literature. While the issue of natural birth is highly preferred over induced labor, induction is a reality for many pregnant women because of medical problems, psychiatric orders or other issues that are considered as part of the decision-making for induction. It is not easy for a pregnant woman to agree to induction; however, a life threatening issue may influence the decision Lothian [27]; Wang et al. [28]. The issue of induction of birth has been clinically examined because of the vulnerability of women during pregnancy, treatment approaches and the rationale of childbirths to be a natural thing for women. There is a psychopathology of pregnancy that has never been explained by homicide and other deaths, which is examined in this paper. This study found that homicide as well as other deaths has an effect on induction of birth, suggesting that pregnant women in Jamaica are affected by the psychology of murders more than other types of deaths.

Not only is there is psychology of homicide or homicide psychology that includes evolutionary, biological, environmental and theoretical perspectives Richard-Devantoy et al. [29]; Martin & Wilson [30]; Bancroft [31]; Buss & Duntley [32]; Daly & Wilson [33,34]; Nisbeth [35]; Smith & Zahn [36]; but it is accounting for induced birth among pregnant women in Jamaica. Jamaica is among developing nations with the most murders and Bourne and colleagues refer it as the health pandemic Bourne et al. [37]; yet no study has been done on it effect on births.

This paper has empirically shown that homicide accounts for a significant number of hospitalization at the national maternity hospital, Victoria Jubilee hospital. The findings also revealed that 1) pregnancy is affecting psychosis; 2) homicide is influencing admissions at a maternity institution; 3) the relationship between homicide and maternity hospitalization of pregnant women is a cyclical one & 4) admissions at the psychiatric hospital in Jamaica is sometimes highly responsive to pregnant women hospitalized at the maternity institution. Such revelations, from this empirical study, mean that pregnancy is not only about birth at full-term, it is also associated with increased psychiatric conditions (i.e. postpartum psychological disorders), induced births, and that homicide has a psychiatric delayed effect on pregnancy.

This means that pregnant women who reside in violent crime communities, especially exposed to murder or having a family murdered, are must be given pharmacologic treatment during pregnancy because of the psychiatric disorder associated with

homicide on pregnancy. The Massachusetts General Hospital [38] forwarded that it has been found some women who become depressed or anxious, experienced bipolar disorder and other psychiatric disorders during pregnancy, which explains the hospitalization of pregnant women to psychiatric hospitals in this study. While pregnancy is associated with myriad of psychiatric disorders Carter [39]; Zuckerman et al. [40]; Santvana et al. [41], homicide is one of the explanations of the negative psychological state of pregnant women.

The present research revealed a curvilinear relationship between birth rate and homicide rate, which is contrary to established literature Pickett et al. [42]; Koppensteiner & Manacorda [15]. It is established in the literature there is a strong positive linear correlation ($r=0.95$, $P<0.001$ in the United States; $r=0.74$, $P < 0.001$; internationally) between homicide rate and adolescent birth rates Pickett et al. [42]. The current work has established a cyclical pattern between admissions of pregnant women to the maternity hospital in Jamaica and homicide, suggesting that time effect of homicide on pregnancy, which was not recognized by the literature. The cyclical function provides an explanation that murders does not immediately affect psychological state of pregnant women and so does the pregnancy on their mental health. The change in the mental health status of pregnant women is also documented in a study which found lower birth weight of infants when their mothers' were exposed to violence Torche & Villarreal [43] assisting in the explanation of effect of homicide on birth. Hutto opined that the closer a woman and her fetus were to a homicide did not linearly affect the birth outcomes of the fetus. There was also little difference between birth outcomes of mothers residing in low crime and high crime areas Hutto [44].

The non-linearity between homicide and outcome of pregnancy is also supported by this study; but Hutto stops short of explaining what emerged from the data. Therefore, the researchers claimed that homicide is inducing some births in Jamaica and that the delayed effect future birth outcomes. Furthermore, because the society is unable to remove the exposure of violence from the landscape, especially experienced by pregnant women, care must be taken by health care practitioners to identify these women who may expose to these traumatic situations for the purpose of future treatment even when there is no sign of mental health disorders. The psychology of homicide or homicide psychology has more than a psychological effect on pregnant woman as study showed physiology of homicide on the human immune system Segerstrom & Miller [45].

It is Segerstrom & Miller [45] perspective that provide the evidence that there is a lower birthweight of infants when their mothers were exposed to violence & Bourne [46] empirically established a significant relationship between decline births and homicide. Thus, pregnant women are at increased risks of postpartum psychological disorders Bydlowski [4], physical changes in their bodies as well as to their unborn child as well

as delayed effect of exposure to homicide. This research concurs with the literature that birth is inducing psychiatric disorder Xu et al. [6]; Bydlowski [4]; Doucet et al. [47]; Jones & Smith [48]; Sit et al. [49]; but this paper goes further to show that association is a curvilinear one.

This study also demonstrated that there is a completely different reaction of pregnant women towards homicide than to other type of deaths. The psychology of homicide is, therefore, different from the psychology of other deaths and this is captured in the functions of this study. Clearly, pregnant women have a different susceptible to homicide than to other deaths as there is greater delay effect of former than the latter and this adds to the health literature on postpartum psychological disorders. The time effect of homicide is longer than that for other deaths and so this new reality requires more work as the data hereby cannot examine this phenomenon.

The time effect of homicide on pregnant women would add more to the health care literature as medical practitioner in treating their patients will be able to identify this issue and correctly diagnose the vulnerability of pregnant women to violence, particularly homicide. Time effect is nothing new in health literature as Sorenson, Wiebe & Berk [50] showed that legalized abortions (or homicide of infants) were statistically associated with a significant decline in homicide in subsequent years, suggesting that psychology to human's behavior is more than a temporal one and extend into years afterwards, which is what is occurring among Jamaican pregnant women who are exposed to homicide [51-55].

Conclusion

Homicide has a different effect on the mental health status of pregnant women than other type of deaths. There is empirical evidence herein that homicide is inducing births and that this effect was not identified before this study. The delayed effect of homicide on pregnancy must be taken into health care treatment and clinical work, particularly because it is difficult to eliminate all violent exposure from pregnant women. Outside of the psychiatric effect of homicide on pregnancy, there is a psychiatric disorder associated with pregnancy and that its effect is a delayed one.

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