



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

Paul Andrew Bourne<sup>1\*</sup> and Angela Hudson-Davis<sup>2</sup>

<sup>1</sup>Director, Socio-Medical Research Institute, Kingston, Jamaica  
<sup>2</sup>Angela Hudson-Davis, Capella University, USA

## Abstract

For this paper, the researchers have narrowed the gap in the health literature by addressing the following objectives: 1) evaluate the role of homicide on admissions to a maternity hospital (or on pregnancy); 2) assess whether or not deaths can induce pregnancy or birth; 3) determine the responsivity of hospitalization at a mental health facility among pregnant women; and 4) 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. The period for this work is from 2005 through to 2015. Homicide has an effect on admissions to Victoria Jubilee hospital, using the positive elasticities, especially those greater than one.

**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 2105, Statistical Institute of Jamaica, 2016; United Nations, nd). It is 4,411 square miles and 146 miles long, 51 miles wide and got independence on 6<sup>th</sup> August 1962. The island is classified into 14 parishes, with the capital of each parish highlighted in red on Figure 1. The population is served by at least one government hospital in each parish, with certain hospitals being the national institution and some extend to the wider English-Speaking Caribbean.

Some of the island's national hospitals include 1) Bellevue (i.e., mental health); 2) Victoria Jubilee (i.e. maternity institution); 3) National Chest (Tuberculosis); 4) Sir John Golding Rehabilitation (physical medicine and rehabilitation); 5) Kingston Public (trauma) and Bustamante Children. Both the Victoria Jubilee and the Bellevue hospitals are located in the parish of Kingston. Victoria Jubilee is situated on North Street, Western Kingston, and Bellevue is sited on Windward Road, Eastern Kingston, Jamaica. The former was established in 1872 and it is the only maternity hospital in the island [1-3]. The Bellevue hospital was built and commissioned in 1861. It was initially called the Jamaica Lunatic Asylum, renamed in 1938 as Jamaica Mental Hospital and after as the Bellevue hospital in 1946 [1].

A search of health literature turn up the following studies that have examined postpartum psychosis [4-10] found that women tend to be at their peak of prevalence as it relates to psychiatric disorders during their childbirth years. The National Institute for Health outlined that women who have had severe mental health problems are more likely to experience mental health illness during pregnancy [11]. A group of researchers, examining some 1.3 Swedish born between 1973 to 1985, found that people who were born premature were more likely to have mental health problems (Gallagher, 2012), which were similar like what obtains in Nosarti, et al.'s study [12].

The researchers have come across practically no systematic empirical enquiry aim to disentangle the effects of homicide and deaths on admissions to maternity hospital and relationship between the hospitalization of pregnant women and psychiatric hospitalization. An extensive search of PubMed, google scholar and other search

engines did not turn up a single research on the aforementioned issues. Another rationale for this study is based on the comments of Valenca and de Moraes "There is a scarcity of studies in the literature that deal with the relationship between mental disorders and homicide in developing countries" (S67) [13]. Such reality means that there is a gap in health literature on the matter of postpartum psychosis, especially in Jamaica with a homicide rate that is highest in the Caribbean. For this paper, the researchers have narrowed the gap in the health literature by addressing the following objectives:

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

## Methods and Materials

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 [1]. The period for this work is from 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

\*Corresponding author: Paul Andrew Bourne, Director, Socio-Medical Research Institute, Kingston, Jamaica, Tel: (1 876) 566 3088; E-mail: [paulbourne1@gmail.com](mailto:paulbourne1@gmail.com)

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to determine whether rape and carnal abuse rate is a factor of homicide as well as the strength of the relationship, using  $R^2$ .

In order to meet the use of the OLS's application, for this study, all the assumptions were met before usage. 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.

### Cross-Elasticities of Hospitalization

Where  $\eta$  is the elasticity of hospitalization

$\% \Delta$  denotes the percentage change in hospitalization for  $t + 1$  and  $t$ .

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.

### Findings

Table 1 presents data on annual admissions at Victoria Jubilee hospital (i.e. Nation's maternity hospital), deaths and homicide for Jamaica from 2006-to-2015. Over the 10-year period, the average number of admissions at 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: 18586-21348deaths). 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 2 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). Simply put, the two variables act in the same manner, which means that changes in homicide is associated with the same direction movement 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 3 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 over 2014 ( $\eta=160.4>1$ ). Furthermore, over the 10-year period, there were four times that hospitalization at Victoria Jubilee hospital highly respond to 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 technically had no effect on admissions at the national maternity hospital in Jamaica, Victoria Jubilee.

Figure 2 depicts scatter plots of hospitalization at Victoria Jubilee hospital and homicide along a super-imposed function. On examination of Figure 2, there is a cycle of hospitalization and homicide indicating

that peaks and troughs. The peaks and troughs suggest that there is a delayed effect of homicide on births.

Figure 3 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.

Figure 4 shows the scatter plots of deaths at Victoria Jubilee hospital and homicide with a super-imposed function.

Table 4 presents cross-elasticities between admissions at Victoria Jubilee hospital influencing hospitalization to the national psychiatric hospital in Jamaica [1] over a 10-year period. For the 10-year period, 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 speak of the psychology of birth for women and how some women who give birth become psychiatric afterwards as is reflected by data for 2009 over 2008, 2010 over 2009, and 2012 over 2011. This means that birth is inducing psychiatric behaviour among some pregnant women, but that psychiatric disorders are infrequently highly responsive to changes in the hospitalization of pregnant women.

## 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 brought into the making of the decision for induction. It is not easy for a pregnant woman to say yes to induction; but no may a life threatening issue that may rule out such saying otherwise [14,15]. The issue of induction of birth has been clinically examined because of the vulnerability of women during pregnancy, treatment approaches and the rationale of wanting births 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 murders.

Not only is there is psychology of homicide or homicide psychology that includes include evolutionary, biological, environmental and theoretical perspectives but it is accounting for induced birth among pregnant women in Jamaica [16-22]. Jamaica is among nations with the most murders and Bourne and colleagues refer it as the health pandemic yet no study has been done on it effect on births [23]. This paper has empirically shown that homicide is accounting for hospitalization at the national maternity hospital in Jamaica. The findings also revealed

Year	Hospitalization Victoria Jubilee	Deaths	Homicide
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 1: Admissions at Victoria Jubilee hospital, deaths and homicide, 2006-2015.

Year	Diff in Hospitalization	Diff in Homicide	% Δ in admissions at Victoria Jubilee	% Δ in Homicide	$\eta$
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	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 2: Cross-elasticities of homicide, 2006-2015.

Year	Hospitalization at Victoria Jubilee hospital	Deaths	% Δ in Admissions at Victoria Jubilee hospital	% Δ in Deaths	$\eta$
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	-2.055
2010	15,885	21,503	-4.51	14.04	-0.321
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	160.419

Table 3: Cross-elasticities of hospitalization to deaths in Jamaica, 2006-2015.

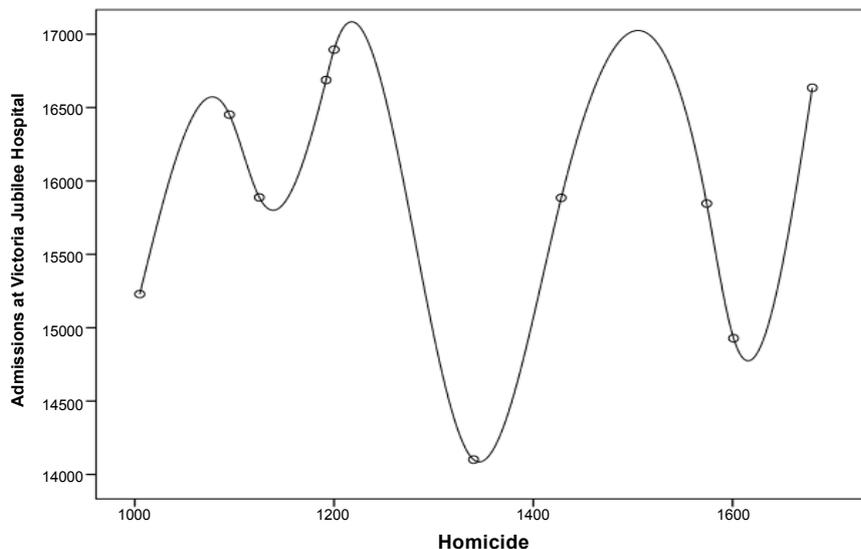


Figure 2: Scatter plots of Admissions at Victoria Jubilee hospital and homicide with a super-imposed function.

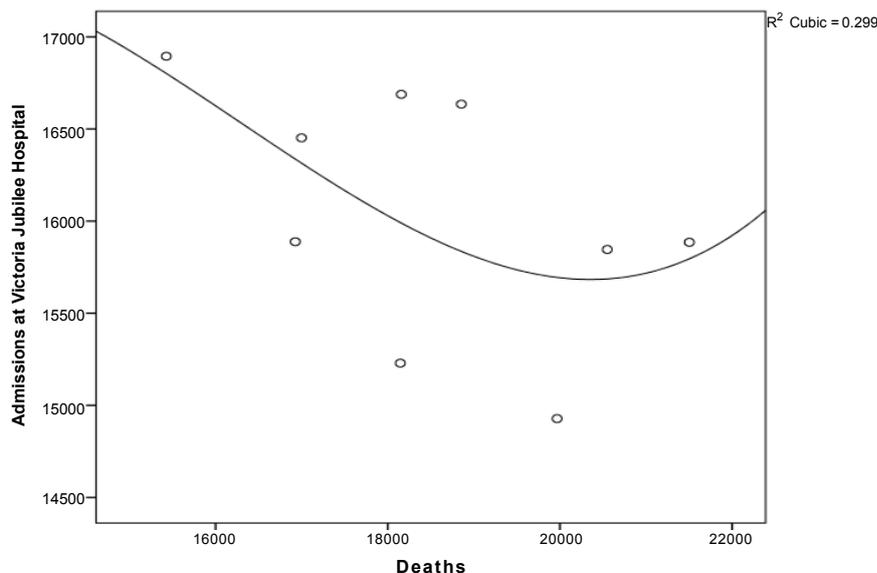


Figure 3: Scatter plots of Admissions at Victoria Jubilee hospital and deaths with a super-imposed function.

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, and 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, it is also associated with increased psychiatric conditions (i.e. postpartum psychological disorders) and that homicide has a delayed effect on pregnancy.

The current work has established a cyclical pattern between admissions of pregnant women at the maternity hospital in Jamaica and homicide, suggesting that time effect of homicide on pregnancy. 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 assisting in the explanation of effect of homicide on birth [24]. 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 [25].

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. So, we are forwarding here 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 landscape, especially experienced by pregnant women, care must be taken by health care practitioners to identify these women for the purpose of future treatment even when

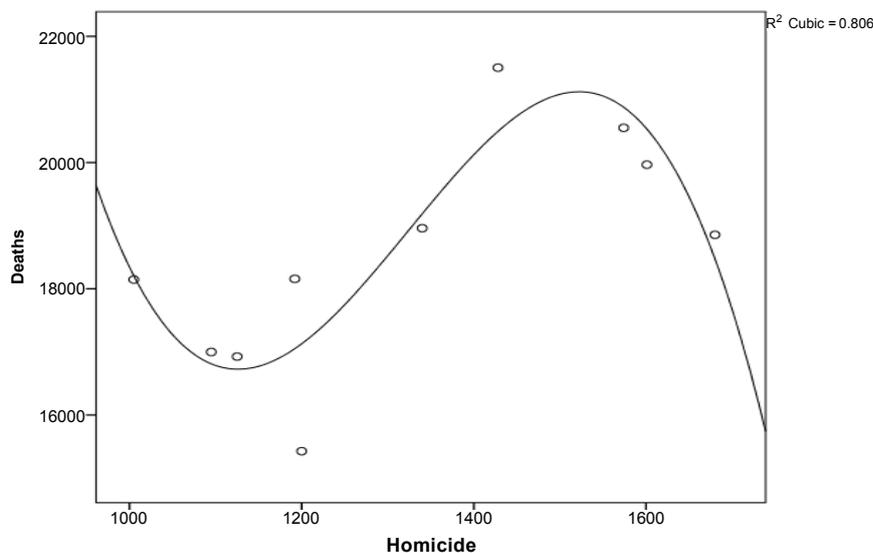


Figure 4: Scatter plots of deaths at Victoria Jubilee hospital and homicide with a super-imposed function.

Year	Hospitalization Victoria Jubilee	Hospitalization at Bellevue	% Δ in admissions at Victoria Jubilee	% Δ in admissions	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	-0.4	-0.15
2014	15,209	1,005	-9.98	1.41	-0.14
2015	16,688	994	9.72	-1.09	-0.11

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

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 [26]. It is Segerstrom and Miller's perspective that is explaining the lower birth weight of infants when their mothers were exposed to violence and Bourne empirically established a significant relationship between decline births and homicide [27]. Thus, pregnant women are at increased risks of postpartum psychological disorders, physical changes in their bodies as well as to their unborn child as well as delayed effect of exposure to homicide [28].

This paper showed 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,

and Berk 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 behaviour 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 [29-34].

## Conclusion

Homicide has completely 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.

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