

Bayesian Logistic Regression Analysis of the Association of Intimate Partner Violence and Modern Contraceptive Use in the Philippines

Rosabella B. Montes¹, Eduardo L. Cruz²

¹University of the Philippines Visayas Tacloban College,

²De La Salle - College of Saint Benilde,
PHILIPPINES.

¹r_baq@yahoo.com, ²elcruzus@yahoo.com

ABSTRACT

This study employs data extracted from the 2008 Philippine National Demographic and Health Survey to examine the association between intimate partner violence and modern contraceptive use among married women in the Philippines. Instead of the classical approach of data analysis commonly used in many studies, the Bayesian approach for logistic regression analysis is used to estimate the association between intimate partner violence and modern contraceptive use. Important variables that can affect the association such as the woman's age, work status, education, place of residence and religion, the husband's education and work status, the household's wealth status, family size, and decision making control were considered in this study. This study revealed a significant association between intimate partner violence and modern contraceptive use with an odds ratio of 1.345 and a corresponding 90% credible interval of 1.201 to 1.502. Thus, the odds of using modern contraceptives for married women in the Philippines who had experienced intimate partner violence is 34.5% higher than the odds for those women who did not experience intimate partner violence.

Keywords: Bayesian logistic regression, bayesian data analysis, logistic regression, intimate partner violence, modern contraceptive use

INTRODUCTION

The use of modern contraceptives is a challenging issue in the Philippines. It is continuously objected by different sectors. However, scientific evidence implies that it is important in decreasing unwanted pregnancies. Pregnancies can cause economic problems and more importantly, health risks for both mothers and infants. In the Philippines, more than half of pregnancies in 2008 were unintended and 200 Filipino women died per 100,000 live births because of pregnancy-related causes. Births and miscarriages resulted in 3,700 woman deaths in 2008, and almost half of these women did not want to get pregnant. On the other hand, infant mortality rate (IMR) estimate from the 2008 National Demographic and Health Survey (NDHS) was 25 deaths per 1000 live births. Although a steady decline of infant mortality rate (IMR) and maternal mortality rate (MMR) has been reported, levels are still high. This can be partly attributed to the low levels of contraceptive use in the Philippines (Darroch et al., 2009). In 2008, 51% of married women were reported to be using contraceptive methods, of which 37% and 17% used modern and traditional methods, respectively. However, among women of reproductive age (15-49 years old) only 32.5% used contraceptive methods, of which 21.8% and 10.7% used modern and traditional methods, respectively (National Statistics Office (NSO) [Philippines], and ICF Macro, 2009).

The Philippines' Department of Health family planning program objectives for the year 2004 included reducing IMR to less than 30 deaths per 1000 live births, reducing MMR to less than 100 deaths per 100,000 births, and increasing modern contraceptive use among women

of reproductive age to 50.5%. These objectives were not fully realized even after 4 years since the goals were intended. Specifically, MMR in 2008 was still too high compared to the stated goal for 2004. Reducing MMR entails reducing pregnancies, especially unwanted pregnancies. Unwanted pregnancies can be prevented by contraceptive use. However, non use as well as traditional contraceptive methods accounted for 9 out of 10 unwanted pregnancies in 2008. Studies associate modern contraceptive use with the household wealth status, such that women from poorer households in different countries are less likely to use modern contraceptives (Laguna et al., 2006; Rahayu, 2009; Clements and Madise, 2004). Thus, to pursue wider coverage of modern contraceptive use, the Philippine government has passed the controversial Reproductive Health (RH) Law which ensures access of the poor to reproductive health services including modern contraceptives. This law is seen to address the economic aspect that is impeding women to use modern contraceptives.

However, aside from economic-related factors, other factors such as those operating within a couple's relationship can also be determinants of a woman's decision in using contraceptives. One such factor is intimate partner violence (IPV). IPV in women are those acts of violence perpetrated by one's husband or partner and is one of the most common forms of violence experienced by women. In 2008, one-third of married Filipino women reported experiencing IPV (National Statistics Office (NSO) [Philippines], and ICF Macro, 2009). Studies investigating the association of IPV and modern contraceptive use showed different results. A study among Sub-Saharan African women (Alio et al., 2009) using DHS data reported a significant positive association (OR, 1.30; 95%CI, 1.22-1.38). However, in a study of 10 countries using DHS data, IPV was not associated with current modern contraceptive use in majority of the countries (Kishor and Ansara, 2009). Significant positive association was reported in only 3 of the 10 countries: Bolivia (OR=1.28), Bangladesh (OR=1.28), and Zimbabwe (OR= 1.25). However, when "current use" was replaced with "ever use", significant positive association was observed in 7 of the 10 countries. In the United States, a study reported that women experiencing physical or emotional abuse were more likely to report not using their preferred contraceptive method (OR, 1.39; 95%CI, 1.0-3.7) (Williams, et al., 2008). But, in the same study, a non significant association between IPV and modern contraceptive non use was reported, but the OR 95% CI (0.8-9.5) showed an inclination towards a positive association. In contrast, a recent study in rural India revealed that women who experienced physical violence from their husbands were significantly less likely to adopt contraception (Stephenson, et al., 2008). These studies reveal that a woman's decision in using contraceptives can indeed be influenced by the occurrence of IPV. Thus, it is also important to look into this relationship in the Philippine setting so that appropriate policies can be implemented such that if IPV is associated to modern contraceptive non use then programs alleviating IPV can be initiated. This study then attempted to estimate the association of IPV and modern contraceptive use among married Filipino women and also identify factors affecting the association.

DATA AND METHODOLOGY

This study uses data extracted from the 2008 National Demographic and Health Survey (NDHS) in the Philippines which was conducted from August 7 to September 27, 2008. The 2008 Philippine NDHS was collected by the National Statistics Office (NSO) with funding from the Philippine Government. The U.S. Agency for International Development (USAID) also provided financial support in the preparatory and processing phases of the survey and technical assistance was given by ICF Macro through the MEASURE Demographic Health Surveys (DHS) program. The NDHS sample was designed to represent each of the 17 administrative regions of the Philippines. A stratified three-stage sample design was used for each region with over 13,500 households selected. Three questionnaires were used for the

2008 NDHS: the Household Questionnaire, the Women's Questionnaire, and the Women's Safety Module. The Household questionnaire was primarily used to identify women ages 15-49 eligible to answer the Women's Questionnaire. From among those women who answered the Women's Questionnaire in each household, one was randomly selected as a respondent of the Women's Safety Module. There were 13,594 women interviewed for the Women's Questionnaire, and from these women, a total of 9,316 women were interviewed for the Women's Safety Module. The subjects for this study were selected from the 9,316 women who answered the Women's Safety Module of the 2008 NDHS. Pregnant women at the time of the survey were excluded since pregnancy pre-empts contraceptive non-use. All legally married women who were current modern contraceptive users at the time of the survey were identified as cases, while all legally married women who were not using any of the modern, traditional, and folk contraceptive methods were identified as controls. A total of 4,256 legally married women aged 15-49 were included in the analysis of which 2,248 were cases and 2,008 were controls. Records with missing values in the variables used in this study were excluded.

VARIABLES

In this study, the outcome variable is current modern contraceptive use. A respondent is identified as current modern contraceptive user if at the time of the survey she uses at least one of the following methods for contraception: female sterilization, male sterilization, the pill, intrauterine device (IUD), injectables, implants, patch, condom, female condom, mucus/Billings/ovulation, basal body temperature, symptothermal, standard days method, and lactational amenorrhea method (LAM). A woman is classified as non-user if she does not use any of these modern, traditional and folk contraceptive methods. The exposure variable is IPV experienced by a respondent woman (abused or non-abused). A woman is identified as abused if she has ever experienced emotional or physical or sexual violence from her current husband. Otherwise, she is identified as non-abused. Other variables that can affect the association between the outcome and exposure variables were considered including some woman characteristics (age, education, work status, religion), household characteristics (place of residence, family size, wealth status), couple characteristic (decision-making control), and husband characteristics (education, work status).

BAYESIAN LOGISTIC REGRESSION ANALYSIS

Logistic regression model is by far the most popular modelling procedure used to analyze epidemiologic data (Bagley, et.al, 2001). Most studies using logistic regression analysis use the classical approach where maximum likelihood estimation (MLE) is used to estimate parameters. Classical methods in data analysis are founded on the ideas of randomization and random sampling such that its usage in observational studies is questioned. Thus, Bayesian methods are advocated and argued to be most appropriate for studies wherein the procedures used in generating the samples and data do not follow the ideas of randomization (Greenland, 2006). In this study, the Bayesian approach in logistic regression analysis was used to estimate the association between IPV and modern contraceptive use. The Bayesian framework basically includes expressing the data as a likelihood function, providing a suitable prior distribution to represent prior information on the variables considered in the study, and then coming up with a posterior distribution that is used in making inferences about the parameters. The WinBUGS software was used for this approach in the data analysis. This program makes use of the Gibbs sampling algorithm to come up with estimates of the association. The prior distribution and its parameters such as precision (stated as reciprocal of the variance) need to be specified when doing Bayesian logistic regression modelling in WinBUGS (Spiegelhalter, et al., 2003). In this study, vaguely informative priors

were used. Using “vaguely informative” priors give notable improvements compared to MLEs without distorting the true posterior distribution (Greenland, 2007). All models were initially run with 1000 burn-in iterations and 2000 more iterations after burn-in. Assessment of convergence was done using history plots, BGR statistic plots, density plots and autocorrelation plots. Accuracy of posterior estimates were assessed based on the Markov Chain (MC) error. An estimate was considered accurate if the MC error is within 5% of the standard deviations. If convergence was not established in this first run, then more iterations were performed. For variables where autocorrelation was evident, “thinning” (i.e. only every k^{th} iteration is stored and used for the samples) was applied. The algorithm used in estimating the association of IPV and modern contraceptive use included four steps: 1) screening for probable confounders, 2) screening for probable effect measure modifier (EMM), 3) assessment of significant EMM, and 4) assessment of significant confounders. Probable confounders were screened based on the significance of the crude OR estimate. The crude association between the screened variable and modern contraceptive use from the result of Bayesian simple logistic regression analysis was considered significant if the 80% credible interval did not contain the null value (OR=1). Probable confounders were identified using the 80% credible interval to avoid exclusion of important variables. For variables with more than two categories, a variable was considered a probable confounder if it was significant in at least one category. In this study, age, education, work status, religion, husband’s education, husband’s work status, wealth status, residence, family size, and decision-making control were screened as probable confounders. Screening for probable EMM was done by looking at the significance of the interaction term in the model containing the exposure, the probable EMM candidate, and the interaction term between the exposure and the probable EMM candidate. Significance was determined based on the 90% credible interval of the beta coefficient of the interaction term (null value $\beta=0$ not contained in the interval). The variable residence was screened as a probable EMM. A probable EMM is considered significant if the coefficient of the interaction term in the model containing the exposure, probable confounders, probable EMM, and the interaction term between the exposure and the probable EMM has a 95% credible interval not containing the null value ($\beta=0$). Confounding effect of probable confounders from step 1 was assessed through the change in the odds ratio (OR) estimate criterion. A variable was considered a significant confounder if there was at least 10% change in the OR estimate. The final model used in making inferences will then contain the exposure variable, significant confounders, and significant EMM.

RESULTS

There were 4,256 legally married Filipino women included in this study: 2,008 were current modern contraceptive users (cases) and 2,248 non users (controls). Table 1 shows the distribution of cases and controls according to IPV experience, woman, household, couple, and husband characteristics. Comparing the modern contraceptive users and the non-users, the study showed that a higher proportion of women who experienced IPV, older (aged 40-49), from urban areas, with at least secondary education, and with husbands with at least secondary education, were modern contraceptive users, while a higher proportion of women who were from the lowest wealth status, with 0-2 children were non users. Most women were Roman Catholics and have husbands who were working, and most household decision-making were made by the wife only or wife and husband jointly.

To screen probable confounders, simple logistic regression analysis using the Bayesian approach was performed. Table 2 shows the unadjusted odds ratios and the corresponding 80% credible intervals for variables screened. Results showed that the crude associations between each of the variables under Woman, Household, Couple and Husband characteristics and modern contraceptive use were all significant. All variables were then considered as

probable confounders. The place of residence (urban or rural) was screened as a possible EMM as it is suspected that the direction of the association between IPV and modern contraceptive use may differ based on the place of residence of the woman. However, results showed that whether a woman is from an urban or rural area did not change the direction of the association. The beta coefficient for the interaction term between the exposure and the probable EMM was -0.1471 with 90% credible interval (-0.3717, 0.0770). Thus, place of residence was not considered a probable EMM.

Table 1. Distribution of cases and controls according to IPV experience, woman, household, couple, and husband characteristics

Characteristics	Current Modern Contraceptive Use				Total		
	Controls		Cases		No.	%	
	No.	%	No.	%			
IPV Experience							
Non Abused	1,697	75.41	1,397	69.57	3,094	72.70	
Abused	551	24.51	611	30.43	1,162	27.30	
Woman Characteristics							
Age (years)							
15-29	860	38.26	450	22.41	1,310	30.78	
30-39	565	25.13	582	28.98	1,147	26.95	
40-49	823	36.61	976	48.61	1,799	42.27	
Education							
No Education	94	4.18	7	0.35	101	2.37	
Primary	647	28.78	443	22.06	1,090	25.61	
Secondary	862	38.35	914	45.52	1,776	41.73	
Higher	645	28.69	644	32.07	1,289	30.29	
Work Status							
Not Working	1,122	49.91	821	40.89	1,943	45.65	
Working	1,126	50.09	1,187	59.11	2,313	54.35	
Religion							
Non Roman Catholic	662	29.45	452	22.51	1,114	26.17	
Catholic	1,586	70.55	1,556	77.49	3,142	73.83	
Household Characteristics							
Residence							
Rural	1,390	61.83	1,103	54.93	2,493	58.58	
Urban	858	38.17	905	45.07	1,763	41.42	
Wealth Status							
Lowest	681	30.29	373	18.58	1,054	24.77	
Second	448	19.93	458	22.81	906	21.29	
Middle	378	16.81	455	22.66	833	19.57	
Fourth	378	16.81	433	21.56	811	19.06	
Highest	363	16.15	289	14.39	652	15.32	
Family Size							
0-2 children	1,124	50.0	817	40.69	1,941	45.60	
3-4 children	617	27.45	838	41.73	1,455	34.19	
5 or more children	507	22.55	353	17.58	860	20.21	
Couple's Characteristic							
Decision-making Control							
Husband only	181	8.05	123	6.13	304	7.14	
Wife/Couple	2,067	91.95	1,885	93.87	3,952	92.86	
Husband's Characteristic							
Education							
No Education	91	4.05	10	0.49	101	2.37	
Primary	790	35.14	576	28.69	1,366	32.10	
Secondary	748	33.27	813	40.49	1,561	36.68	
Higher	619	27.54	609	30.33	1,228	28.85	
Work Status							
Not Working	57	2.54	36	1.79	93	2.19	

Table 2. Unadjusted OR and 80% credible intervals of the association between current modern contraceptive use and selected variables

Variable	OR	80% CrI
Woman Characteristics		
Age (years)		
15-29	1.95	1.75- 2.16
30-39	2.24	2.03- 2.45
40-49	Ref.	
Education		
No Education	Ref.	
Primary	5.44	3.77- 7.32
Secondary	8.46	5.86-11.39
Higher	7.96	5.55-10.7
Work Status		
Not Working	Ref.	
Working	1.45	1.34- 1.56
Religion		
Non Roman Catholic	Ref.	
Catholic	1.44	1.31- 1.57
Household Characteristics		
Residence		
Rural	Ref.	
Urban	1.34	1.24- 1.45
Wealth Status		
Lowest	Ref.	
Second	1.84	1.63- 2.06
Middle	2.16	1.91- 2.42
Fourth	2.05	1.82- 2.31
Highest	1.44	1.27- 1.63
Family Size		
0-2 children	Ref.	
3-4 children	1.87	1.71- 2.05
5 or more children	0.96	0.86-1.06
Couple's Characteristic		
Decision-making Control		
Husband Only	Ref.	
Wife/Couple	1.34	1.14- 1.55
Husband's Characteristic		
Education		
No Education	Ref.	
Primary	3.53	2.58-4.64
Secondary	5.25	3.81-6.9
Higher	4.77	3.46-6.29
Work Status		
Not Working	Ref.	
Working	1.39	1.05-1.81

Stratum specific ORs shown in Table 3 revealed that the odds of using modern contraceptives was higher for women who experienced IPV than those who did not for both urban and rural categories. The significance of the confounding effect to the association of IPV and modern contraceptive use of variables considered as probable confounders was also examined. Results shown in Table 4 revealed that based on the 10% change in the OR criterion, none

of the variables: family size, decision-making control, husband's work status, residence, religion, woman's work status, woman's age, husband's education, woman's education, wealth status delivered significant confounding effect. That is, there was no significant change in the association of IPV and modern contraceptive use when these variables were included in the analysis. Although, it is noteworthy that the findings showed that the woman's education and work status, together with the husband's education gave the highest percent change in the OR. With this result, the final model showed a significant positive association between current modern contraceptive use and IPV with an estimated OR = 1.345 and a corresponding 90% credible interval 1.201-1.502.

Table 3. Residence stratum-specific OR of the association of modern contraceptive use and IPV

	<i>OR</i>	<i>90% CrI</i>
Rural Residence	1.45	1.24-1.67
Urban Residence	1.25	1.05-1.49

Table 4. Assessment of significant confounders in the association of modern contraceptive and intimate partner violence

	<i>OR</i>	<i>%Change</i>
Full Model	1.296	-
Variables deleted in order:		
Family size	1.336	3.09
Decision-making control	1.323	2.08
Husband's Work Status	1.321	1.93
Residence	1.323	2.08
Religion	1.327	2.39
Woman's work status	1.363	5.17
Woman's age	1.357	4.71
Husband's Education	1.362	5.09
Woman's Education	1.382	6.64
Wealth Status	1.345	3.78

DISCUSSION

The findings of this study showed that there was a significant positive association between IPV and modern contraceptive use among married women in the Philippines, and that a woman's age, education, work status, religion, wealth status, family size, place of residence, couple decision-making control, and the husband's education and work status did not affect significantly the said association. This result implies that women who had experienced IPV

are more likely to use modern contraceptives than those women who had not experienced IPV. This result is consistent with other studies (Alio et al., 2009; Kishor and Ansara, 2009). Explanations for a positive association include the possibility that modern contraceptive use, for some women, could be a cause for IPV; likewise, the increased contraceptive use in abused women can also be a defensive mechanism. Women experiencing IPV may opt to use modern contraception to protect themselves and avoid further violence which can happen during pregnancy since pregnancy is considered as a stimulus for domestic violence such that pregnant women are twice more likely to be beaten than women who are not pregnant (Burch,2004).

Similar to past studies showing evidence of positive association, this study also used information from the NDHS, and studies showing evidence of negative association (Stephenson, et. al, 2008; Williams, et.al, 2008) used data sets other than the NDHS with a case-control and cohort study designs. This can be a possible manifestation of the limitation of the cross-sectional nature of NDHS where the subjects of this study were selected from. Though in this study, the use of current modern contraceptive use and IPV experience shows a clearer temporal connection since both variables used are embedded on the woman's current relationship, still IPV experience can precede or is concurrent with modern contraceptive use.

CONCLUSION AND RECOMMENDATIONS

This study aimed to estimate the association of modern contraceptive and determine factors affecting the said association. The findings of the study was that the odds of current modern contraceptive use among married Filipino women who have experienced IPV is 34.5% higher than in those who have not experienced IPV from their current husbands, regardless of the woman's characteristics: age, education, work status, religion; household characteristics: residence, family size, wealth status; couple characteristic: decision making-control; and husband's characteristics: work status, education. This is contrary to the negative association that was expected; so that family planning program implications such as incorporation of interventions that alleviate IPV in order to increase modern contraceptive use among married Filipino women were not supported by the findings of this study. For future studies, it will be worthwhile to meticulously ascertain the temporal order of the variables so that situations wherein modern contraceptive use is the possible cause of IPV can be eliminated, and this can entail conduct of a cohort or follow-up study. Also, this study looked into the three components of IPV: emotional, sexual, and physical violence, but was merged into a single variable, so that association of modern contraceptive use to each component of IPV can also be investigated.

REFERENCES

- [1] Alio, AP et.al.(2009). Intimate Partner Violence and Contraceptive use among women in Sub-Saharan Africa. *International Journal of Gynaecology and Obstetrics*, 107(1), 35-38.
- [2] Bagley, S., White, H.& Golomb, B.(2001). Logistic regression in the medical literature: Standards for use and reporting, with particular attention to one medical domain. *Journal of Clinical Epidemiology*, 54, 979-985.
- [3] Burch, R.L. (2004). Pregnancy as an stimulus for domestic violence. *Journal of Family Violence*, 19(4).
- [4] Clements, S.& Madise, N.(2004). Who is being Served Least by Family Planning Providers? A Study of Modern Contraceptive Use in Ghana, Tanzania, and Zimbabwe. *African Reproductive Health*, 8[2], 124-1136.
- [5] Darroch, J. E. et.al.(2009). *Meeting women's contraceptive needs in the Philippines*. In Brief, New York: Guttmacher Institute, (1).
- [6] Greenland, S.(2006). Bayesian perspectives for epidemiological research: I. Foundations and basic methods. *International Journal of Epidemiology*, 35, 765-775.
- [7] Greenland, S. (2007). Bayesian perspectives for epidemiological research. II. Regression Analysis. *International Journal of Epidemiology*, 36, 195-202.
- [8] Kishor, S. & Ansara, D.(2009) *The Relationship between experiencing intimate partner violence and modern contraceptive use in 10 Countries*.
- [9] Laguna, E., Po, EL., & Perez, A. (2000). *Contraceptive use dynamics in the Philippines: Determinants of Contraceptive Method Choice and Discontinuation*. Calverton, Maryland: ORC Macro.
- [10] National Statistics Office (NSO) [Philippines], and ICF Macro.(2009). National Demographic and Health Survey 2008. Calverton, Maryland: National Statistics Office and ICF Macro.
- [11] Spiegelhalter, D., et al. (2003). *WinBUGS User Manual*. Imperial College School of Medicine and MRC Biostatistics Unit.
- [12] Stephenson, R., et al. (2008). Domestic Violence, Contraceptive Use, and Unwanted Pregnancy in Rural India. *Studies in Family Planning*, 39(3), 177-186.
- [13] Williams, C. et al. (2008). Intimate Partner Violence and Women's Contraceptive Use. *Violence Against Women*, 14(12), 1382-1396.