Health Conditions of Particular Concern to Maternal Child Health Populations in Post-Invasion Iraq: A Comparison Between Data Sources

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Abstract

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Reproductive age women and children face injuries, higher rates of infectious diseases, and limited health seeking behavior in times of armed conflict – all of which can contribute to adverse health outcomes. This cross-sectional study evaluated the burden (prevalence) of 16 diseases of particular concern to maternal and child health populations from the early days of the occupation in 2004 to post-occupation in 2016 using Iraq Surveillance data, collected by the Iraq Ministry of Health, as well as Global Burden of Disease (GBD) data collected by the Institute of Health Metrics and Evaluation (IHME). We used Joinpoint to determine early-post analyses of prevalence ratios for each data source and to conduct trend analyses. For each health condition, we examined the relative difference between the average of yearly prevalence rates from 2004 and 2016 between the two data sources by subtracting the Iraq Surveillance data measurements from the GBd data (Table 1). The GBD data generally reported more cases in the conditions of interest than the surveillance data, although the overall trends were similar in both datasets. For example, based on the Iraq Surveillance data, the average of the yearly prevalence rates of Hepatitis B was 7.98 cases per 100,000 people. The relative difference between GBD and Iraq Surveillance Data was 126.25 cases per 100,000 people, while based on the GBD data, the average of the yearly prevalence was 134.23 per 100,000 people. Furthermore, Iraq Surveillance data identified outbreaks of several conditions (e.g. measles and sexual assault) that were not reported in GBD data. GBD and Iraq Surveillance data were in closest agreement for the prevalence of common childhood conditions (chickenpox, diphtheria, pertussis). Both datasets indicated there was either a decrease or a marginal increase (<10% increase) in all diseases from 2004 to 2016. In sum, both datasets, the Iraq Surveillance data and the GBD data, are useful in understanding the burden from these health conditions and had limitations. Further research to address these limitations will improve understanding of health conditions of reproductive age

women and under five children in Iraq, which in turn will facilitate the effort to improve maternal and child health in Iraq.

INTRODUCTION

War often results in adverse maternal and child health outcomes. Populations living in war zones have higher rates of death, illness, and disability (1), often from direct and obvious injuries from weapons and explosions. Rates of infectious diseases (including sexually transmitted infections) spike during wartime due to declines in public health infrastructure and municipal operations (water, sewer, garbage, transportation, and communications), interpersonal and sexual violence, and a generalized rise in stress levels with declines in social cohesion (1). Further, access to reproductive health services for women are often impeded, and as a result this population is uniquely affected by healthcare instability (2,3).

The Middle East region has been a hotbed for armed conflict for decades. According to the Eastern Mediterranean section of the Global Maternal Sepsis Study and Awareness Campaign (GLOSS), a facility-based cohort study revealed deaths from maternal and neonatal sepsis in war torn regions, such as Iraq, expose broader determinants and consequences of health and other issues related to substandard quality of care (3,4). For instance, family planning services in Iraq were solely provided by doctors from 2004-2016 (general practitioners and gynecologists), when the World Health Organization (WHO) deems participation by nurses and midwives to be essential (5,6). This is because the Eastern Mediterranean was amidst a critical shortage of nurses and midwives due to brain drain and armed conflict in the region (6). This shortage subsequently continued to diminish the quality of maternal-child care (6).

Iraqi and Middle Eastern resident women and refugees experienced an increase in stigma surrounding sex and menstruation following the Iraq War (7,8). Stigma often affects female reproductive health outcomes as it limits proactive health-seeking behavior, leading to adverse sexual and reproductive health outcomes (8). This effect can be observed in the increased percentage of women who reported not feeling comfortable discussing pap smears and sexually transmitted infections (including human papillomavirus) with their healthcare providers in 2004 (8). African and Eastern Mediterranean countries consistently report the highest prevalence rates

of Hepatitis B and C (HBV/HCV) infection in the world, due to several long standing wars in these regions (5).

Beyond infectious diseases, nutrient deficiencies and other chronic disorders such as childhood asthma and epilepsy, are prevalent with rates among Middle Eastern mothers and newborns as high as 79% and 60%, respectively (9,10). In the broader Eastern Mediterranean region, lack of funding, inadequate personnel, and low morale among the remaining providers are major barriers in implementing possible solutions (e.g. the Integrated Management for Childhood Illness, IMCI) to lessen nutrient deficiency (11,12,13,14). The destabilization of the Iraqi education system has resulted in an increase in outside child labor in dangerous war-torn areas, increasing risk of torture and sexual abuse by adults (15), as reflected by a decrease in disability-adjusted life years (DALYs) of the average Iraqi child (16).

Despite past scholarly efforts, there is still a need for a comprehensive and systematic understanding of how the Iraq war has affected health and undermined disease control among reproductive age women and children under five years of age. Available literature is sparse and not specific to post-invasion Iraq (17). Available data on chronic diseases or health effects, such as violence, neoplasms, hepatitis, epilepsy, and diabetes are not recent (17). Furthermore, existing studies did not examine comparability of data generated from multiple sources.

To obtain a better picture of health conditions that are of particular concern to reproductive age women and under-5 children in Iraq during the 2004-2016 time period (20). We compared the first full year of the U.S.-led occupation to the period later in the conflict after U.S. troops were formally withdrawn. We also conducted trend analyses to advance the understanding of how the Iraq war has affected health and disease control in health conditions that commonly affect reproductive age women and children under five years of age, or cause disproportionate harm in these age groups.

METHODS

Study Design. Using a cross-sectional study design, we investigated the prevalence of health conditions (see below and appendix) that are of particular concern to reproductive age women and under-five children. We compared prevalence at two time points: one year after the invasion of Iraq (2004) through the occupation period (2016).

Study Setting. The study analyzed data collected from 18 governorates in Iraq – all governorates except for Kurdistan (Iraq surveillance data from the region is unavailable). Geography of these regions ranges from mountainous to desert, with an uneven distribution of the effects of invasion and occupation in different areas.

Study Population. The study covered a population of about 26.32 million in 2004 and 317.2 million in 2016. De-identified aggregate routine health surveillance data on the study population was used and did not require IRB approval, as deemed by the Human Subjects Division of the University of Washington.

Data Sources. Data from two main sources were utilized in this study. Cases from hospitals, primary health centers, and tertiary hospitals were collected by the Preventive Health Department of the Directorate General of Health in each Iraqi province. These national routine health surveillance data were then reported to the Center for Disease Control/Communicable Disease Control Unit of the Ministry of Health in Iraq, referred to as Iraqi Surveillance data. Aggregate data from the years 2004-2016 permitted prevalence calculations for 16 diseases relevant to reproductive age women and <5 year old children, but we were unable to disaggregate the data by sex and age to allow for prevalence analysis of the actual rates among reproductive age women and under 5 children(18, 19).

The second dataset comprised the Global Burden of Disease (GBD) data from the University of Washington's Institute for Health Metrics and Evaluation. GBD data are compiled from a variety

of sources, including household surveys, registries, and tracking systems in many international settings. The prevalence of conditions described below (and in the appendix) was used to compare concordance of the two data sources. The GBD data were desegregated which allowed prevalence assessment of prevalence of the 16 conditions of interest in reproductive age women and under-5 children. Therefore, we used aggregated rates from the GBD data to provide an apples-to-apples comparison with the GBD data.

Measures. We examined 16 health conditions of interest to maternal-child health in four categories (see appendix). The first category included sexually transmitted infections, including cervical cancer as a proxy for human papilloma virus (HPV) rates. The second category included injury-related health issues such as sexual assault, and assault with sharps and firearms. The third category comprised vaccine-preventable common childhood illnesses (e.g. chickenpox/varicella, whooping cough, and diphtheria) and the fourth category comprised non-communicable health issues, such as asthma, diabetes, epilepsy, and cancer.

Data Analysis. We started by cleaning data and running logic checks on data we obtained from the Iraq Surveillance as well as GBD. We constructed tables and figures to summarize prevalence and trends of the 16 health conditions using data from the two datasets. We determined the relative difference between the GBD data and the Iraq Surveillance data by calculating an average of the yearly prevalence from 2004-2016, then subtracting the surveillance data from similar averages of the GBD data. We used Joinpoint regression calculations to conduct trend analyses of these health indicators from 2004-2016 data. We then compared direction and magnitude of the slopes in both datasets. We also utilized data from each data set to conduct an early-post comparison, comparing the prevalence rates of each health condition in 2004 with the corresponding prevalence rates in 2016 (18). We used the slope of the line created from points in 2004 and 2016 to determine if any change detected was statistically significant (18).

All data analyses were conducted using Excel and the National Cancer Institute Joinpoint Regression Trend Analysis Software (19).

RESULTS

The GBD dataset contained more thorough information than the Iraq Surveillance dataset. For instance, the latter had at least three missing points for cervical cancer (2014, 2015, 2016), pediatric cancer (2014, 2015, 2016), and epilepsy (2012, 2013, 2014).

Prevalence Analysis. While cleaning the data, we noticed significant disparities between the prevalence rates in the GBD data and the Iraq Surveillance data, from relative difference of 2.60 individuals per 100,000 for a relatively rare disease (Hepatitis C) to a relative difference of 6046 per 100,000 for a more common condition (diabetes) (Table 1). The GBD data frequently, but not always, portrayed higher average prevalence estimates of disease than the Iraq Surveillance Data. For common childhood vaccine preventable diseases (diphtheria, measles, tetanus, and varicella), prevalence rates from the Iraq Surveillance data estimates were higher than the GBD estimates, with relative differences ranging from 0.01 per 100,000 points for diphtheria to -70.7 per 100,000 for varicella.

Trend Analysis: We found good agreement between the Iraq Surveillance data and GBD in trend analyses using Joinpoint, especially during the years 2004-2010 and in the health conditions common to children. Pattern, shape, and magnitude of all Joinpoint graphs comparing trends of the Iraq Surveillance data to the GBD were similar, even though the surveillance data lacked enough cases for some of the conditions for the corresponding slopes to be statistically significant (Table 2, Figure 1). There is particularly good agreement in the children's health conditions. However, the GBD data missed several key outbreaks, such a measles outbreak in 2009 and a significant peak of sexual assaults in 2004 (Figure 2).

Early-post Analysis. The majority of prevalence ratios (e.g. some infectious diseases, pediatric cancer, and assault with firearms) in the Iraq Surveillance data and about half of the prevalence

ratios in the GBD were less than one, indicating the prevalence of health conditions decreased between 2004 to 2016 (Table 2). Graphs in the time trends of the conditions (Figure 2) generally indicate that the majority of the decrease is after 2011, when most of the American troops had left the region. There is good agreement between the two datasets with some exceptions. The prevalence ratio for sexual assault was 0.15 in the Iraq Surveillance data, indicating that the number of incidents dropped significantly from 2004 to 2016 while similar prevalence ratio for sexual assault was 1.03 in the GBD. The GBD data indicated that prevalence of conditions such as hepatitis B and "assault with sharps" remained steady, while the Iraq Surveillance data showed that their prevalence decreased significantly.

DISCUSSION

To our knowledge, this study is novel in comparing domestic public health surveillance data results to data from a well-established, international data institute (21). Ideally, Iraq Surveillance Data would corroborate trends, early-post comparisons, and prevalence rates in conditions of particular concern to the maternal and child health population with the data provided from the IHME. Instead, we found fragmented and unreliable agreement between the GBD dataset and the Iraq Surveillance data, as the former left out outbreaks of sexual assault in 2004 and measles in 2009.

We found prevalence rates from the GBD data were higher than those of the Iraq Surveillance data; however, the trends were mostly in agreement. We would expect this, since GBD data draws from household surveys, hospital records, the private sector, mixed-methods interviewing, while the Iraq Surveillance draws only from hospitals and doctors offices. There is also more missingness in the Iraq Surveillance data than the GBD data.

The Iraq Surveillance data also showed a large peak in sexual assaults in 2004, immediately post-invasion. These findings are in line with studies among Iraqi women and children survivors of sexual violence, which have found substantial burdens of sexual assault but

low rates of care-seeking behavior post-assault due to feelings of guilt, shame, and fear of retribution (5, 6, 7).

In the early-post analyses, the prevalence ratios themselves were mostly less than one in both datasets (Table 6), indicating a decrease or a stabilization in most conditions from 2004 to 2016. This appears to be in line with expectations, as the earlier days of the occupation were more hazardous than after 2011, when American troops officially left Iraq (11, 12, 16). The prevalence could also have declined due to increased migration into refugee camps, deaths from the conditions, or a decline in data collection (11, 12, 16). Some of the disagreement between the GBD and Iraq Surveillance data may be due to the fact that the GBD data failed to include several significant changes in trends of various health conditions. The measles and infectious disease epidemics, mentioned above, are good examples. The cases where the GBD and Iraq Surveillance data did not agree (hepatitis B, tetanus, varicella, asthma, and epilepsy), the GBD data was at or close to a prevalence rate ratio of one, indicating that the prevalence of disease had not changed much from 2004 to 2016 (Table 3). However, the same prevalence ratio for these conditions in the Iraq Surveillance dataset mostly showed a sharp decrease from the early days of the war to after the US troops left.

Although the Ministry of Health Iraq Surveillance data is very useful for many reasons, it had its limitations. The dataset did not include disease reporting from the private sector, as well as information from Kurdistan, an almost separate governorate in the North. Because the surveillance data were aggregated, there was no way to analyze by age or sex for most of the conditions in the Iraq surveillance dataset. Secondly, due to security and stability concerns, there was likely underreporting of disease cases and sexual assaults in both datasets. The GBD data used information compiled from UNICEF, the Red Cross, household surveys, mixed-methods studies, immunization records, and surveillance systems in addition to medical records data that the Iraq Surveillance data collected. It is highly probable the war also directly affected case reporting, collecting and various aspect of the health information system processes in the collection of both data sets.

This study summarized and compared the most recent and best-available evidence for prevalence of health conditions of particular concern to maternal and child populations in Iraq between 2004-2016. Prior to the invasion, Iraq had one of the most robust health care systems in the Eastern Mediterranean (5) However, over the course of the occupation as the levels of violence increased, the "brain drain" of Iraqi medical professionals created staffing shortages of hospitals and public health departments that led to deficiencies in the Iraq surveillance system (8,9,11,12). The GBD data, despite being compiled from many different sources seemed to leave out significant epidemics such as measles and sexual assault. Further research to address these issues will improve understanding of health conditions of reproductive age women and under five children in Iraq which in turn will facilitate the effort to improve maternal and child health in Iraq.

Table 1. Prevalence of health conditions of particular concern to maternal and child health populations in post-invasion Iraq (2004-2016)

Condition	Average Prevalence Global Burden of Disease data	Average Prevalence Iraq Surveillance (per 100,000)	Relative Difference (per 100,000)
Hepatitis B	134.23	7.98	126.25
Hepatitis C	5.51	2.91	2.60
Cervical Cancer	7.86	1.05	6.81
Assault with sharps	106.75	7.08	99.67
Assault with Firearms	21.05	8.23	12.82
Sexual Assault	1300.97	0.04	1300.93
Diphtheria	0.01	0.02	-0.01
Pertussis	34.01	9.17	24.84
Measles	4.05	14.58	-10.53
Neonatal Tetanus	0.17	0.03	0.14
Tetanus	0.06	0.08	-0.02
Chickenpox/ Varicella	74.51	144.58	-70.07
Asthma	5052.05	23.51	5028.54
Epilepsy	311.24	1.96	309.28
Pediatric Cancer	115.85	9.82	106.03
Diabetes	6076.67	30.62	6046.05

Data Sources: Cases from hospitals, primary health centers, and tertiary hospitals were collected by the Preventive Health Department of the Directorate General of Health in each Iraqi province. These national routine health surveillance data were then reported to the Center for Disease Control/Communicable Disease Control Unit of the Ministry of Health in Iraq, referred to as Iraqi Surveillance data.

The second dataset comprised the Global Burden of Disease (GBD) data from the University of Washington's Institute for Health Metrics and Evaluation. GBD data are compiled from a variety of sources, including household surveys, registries, and tracking systems in many international settings.

Interpretation: The relative difference column represents the subtraction calculation: GBD-Surveillance prevalence numbers. In most cases, GBD reported more cases per 100,000 than did Surveillance data. In the case of asthma and diabetes, two relatively common diseases, GBD reported more than 6000 cases per thousand more than Surveillance data did

Table 2. Trend Analysis of health conditions of particular concern to maternal and child health populations in Iraq

Condition	Values of the Slopes of the Regression Line 2016:2004, GBD Data^	Values of the Slope of the Regression Line, 2016:2004, Iraq Surveillance Data^
Hepatitis B	-0.38*, 0.08*, -0.12	0.67*, -1.78
Hepatitis C	-0.19*, -0.15*, -0.18*	0.08, -0.41
Cervical Cancer	-0.51*, -0.21	-12.12*, 8.07*
Diabetes	197.01*, -13.98	-3.34, 4.19*, -5.13
Diphtheria	<-0.01*	<-0.01*
Pertussis	-0.67	-1.32*
Measles	-0.27	-1.89
Neonatal Tetanus	0.03*, <-0.01*	-0.02*, -0.01, -0.01*
Tetanus	<0.01*	0.00
Chickenpox/ Varicella	0.02*	6.13
Asthma	22.17*	6.13
Epilepsy	1.40*	-21.42, 11.72*
Pediatric Cancer	-1.47*	-10.2, 7.14
Assault with Sharps	0.08*, -0.06, -0.17*	-1.26*, 0.10
Assault with Firearms	-0.01*, -0.03*, -0.06*	2.09, -6.46*, 0.42
Sexual Assault	0.15*, -0.03*, 0.08*	-0.05*, 0.00

*Indicates a significant difference from 0 at the 95% level. Segments where the slope of disease trends agree is highlighted in yellow.

Data Sources: Cases from hospitals, primary health centers, and tertiary hospitals were collected by the PreventiveHealth Department of the Directorate General of Health in each Iraqi province. These national routine health surveillance data were then reported to the Center for Disease Control/Communicable Disease Control Unit of the Ministry of Health in Iraq, referred to as Iraqi Surveillance data.

The second dataset comprised the Global Burden of Disease (GBD) data from the University of Washington's Institute for Health Metrics and Evaluation. GBD data are compiled from a variety of sources, including household surveys, registries, and tracking systems in many international settings.

Interpretation: The three different values in each column represent the slopes of various intervals on the trend analysis graphs of the GBD data and the surveillance data (Figure 1): For example, in the Epilepsy row in the GBD column, we see that the prevalence increased by 1.40 cases per 100,000 year. In the Iraq Surveillance column, we see that the prevalence of epilepsy decreased by 21.42 cases per 100,000 per year, then increased by 11.72 cases per 100,000 per year.

Table 3. Early-Post Comparison of health conditions of particular concern to maternal and child health populations in Iraq^. 2004 (early occupation) compared to 2016 (after all the troops were formally withdrawn from Iraq)

Condition	Prevalence (per100,000), 2016 (GBD data)	Prevalence (per 100,000) 2004, GBD Data	Prevalence Ratio, 2016:2004, GBD Data	Prevalence ratio (per100,000) 2016, Iraq Surveillance data	Prevalence Ratio (per 100,000), 2004, Iraq Surveillance Data	Prevalence Ratio, 2016:2004, Iraq Surveillance Data
Hepatitis B	133.86	134.60	0.99*	5.19	6.23	0.84
Hepatitis C	3.72	5.78	0.64*	1.83	2.71	0.67*
Cervical Cancer	3.90	6.10	0.64*	1.14	1.29	0.88*
Diabetes	6458.22	5695.13	1.13*	27.07	22.88	1.18*
Diphtheria	0.0050	0.011	0.44*	0.003	0.06	0.04*
Pertussis	59.71	65.34	0.91	2.68	32.83	0.08*
Measles	0.066	37.67	1.13	2.66	5.42	1.18
Neonatal Tetanus	0.16	0.13	1.20*	0.01	0.06	0.20*
Tetanus	0.06	0.05	1.03*	0.06	0.11	0.60
Chickenpox/ Varicella	74.67	74.36	1.01*	140.54	143.50	0.98
Asthma	25.29	24.24	1.06*	5196.15	4907.94	1.04
Epilepsy	319.87	302.61	1.06*	2.94	2.12	1.39
Pediatric Cancer	109.43	122.26	0.90*	10.29	12.74	0.81*
Assault with Sharps	109.48	104.02	0.98	4.66	13.52	0.34*
Assault with Firearms	1.50	1.80	0.84*	3.85	16.34	0.24*
Sexual Assault	46.76	46.35	1.03*	0.02	0.13	0.15*

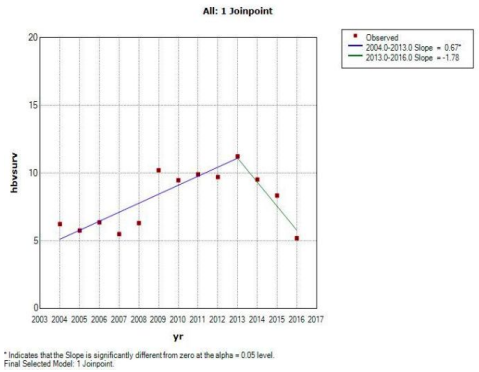
*Indicates a significant difference from 1.0 at the 95% level.

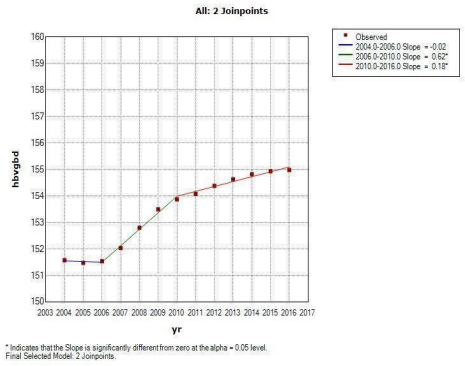
Data Sources: Cases from hospitals, primary health centers, and tertiary hospitals were collected by the PreventiveHealth Department of the Directorate General of Health in each Iraqi province. These national routine health surveillance data were then reported to the Center for Disease Control/Communicable Disease Control Unit of the Ministry of Health in Iraq, referred to as Iraqi Surveillance data.

The second dataset comprised the Global Burden of Disease (GBD) data from the University of Washington's Institute for Health Metrics and Evaluation. GBD data are compiled from a variety of sources, including household surveys, registries, and tracking systems in many international settings.

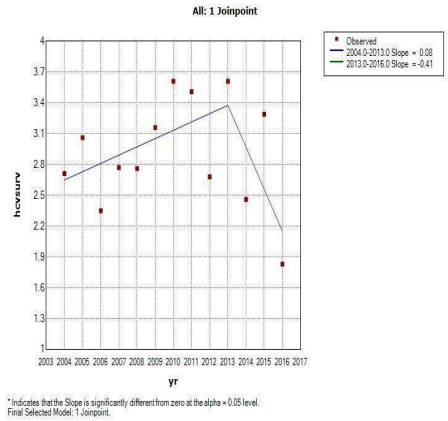
Interpretation: Prevalence values of each disease in 2016 and 2004 were used to determine the prevalence ratios for each dataset, or the ratio of the proportion of those with a certain disease in 2016 over the proportion of those with the same disease in 2004. A prevalence ratio less than 1 (for example, assault with firearms in both the GBD and Iraq Surveillance datasets) indicates that there was a greater number of individuals with a specified health condition in 2004 than 2016. Agreement in direction (greater or less than 1) of the prevalence ratios are highlighted in yellow.

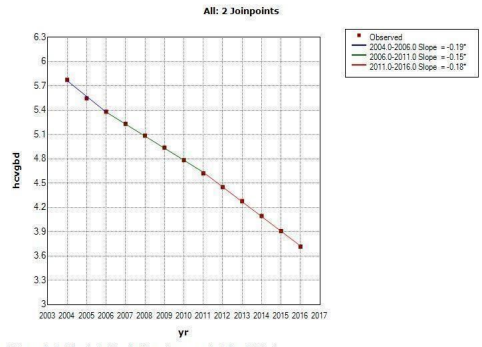
Figure 1: Comparison of trends of health conditions of particular concern to maternal and child health populations in Iraq, 2004-2016 (Iraq Surveillance data on the left and GBD data on the right)



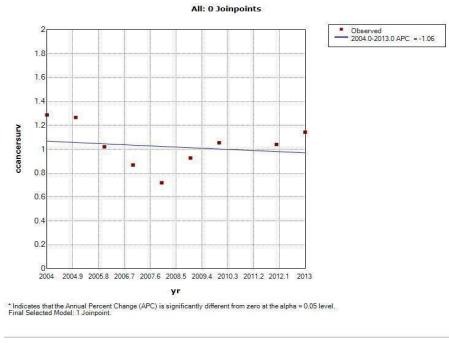


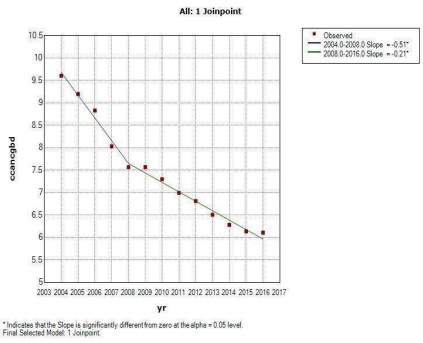
HEPATITIS B



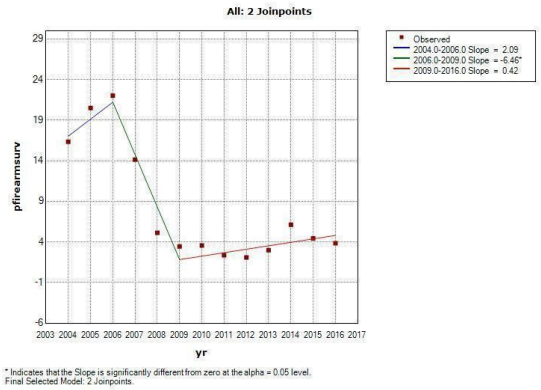


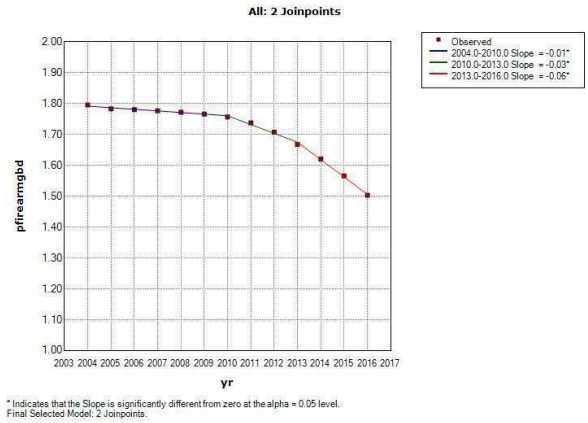
HEPATITIS C



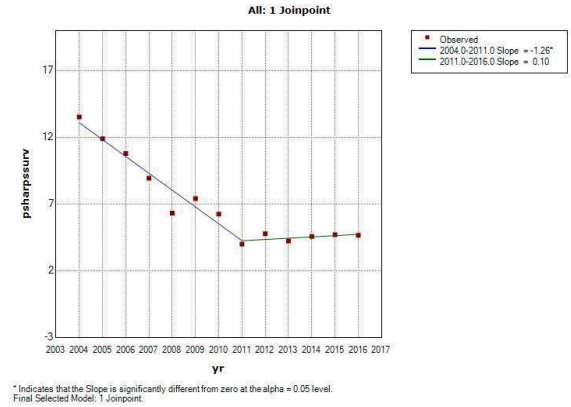


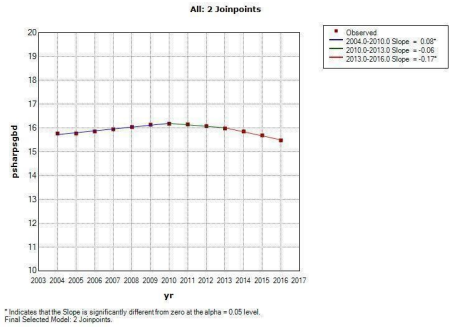
CERVICAL CANCER



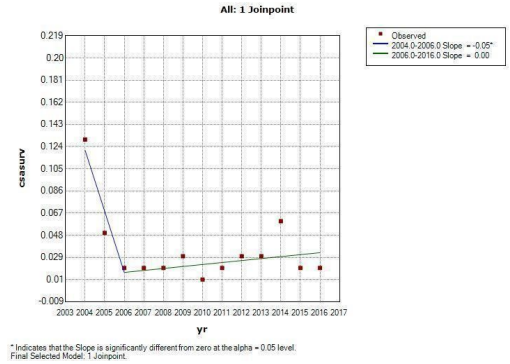


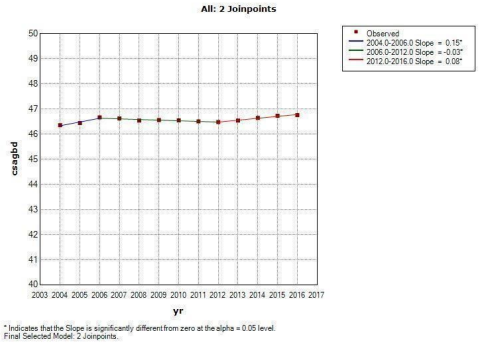
ASSAULT WITH FIREARMS



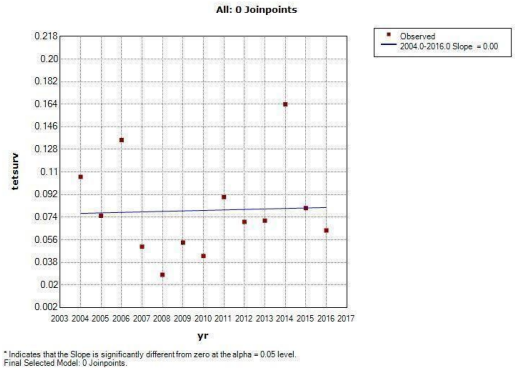


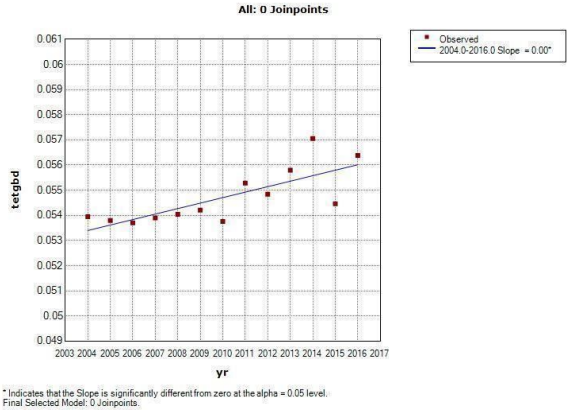
ASSAULT WITH SHARPS



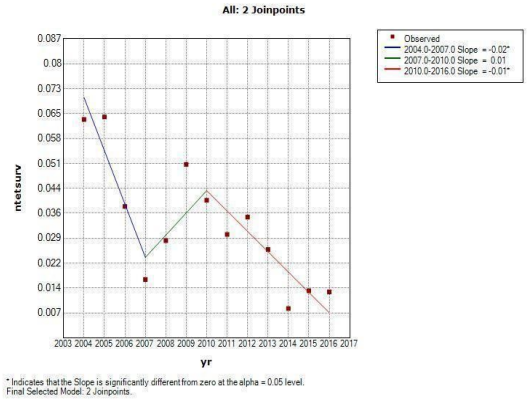


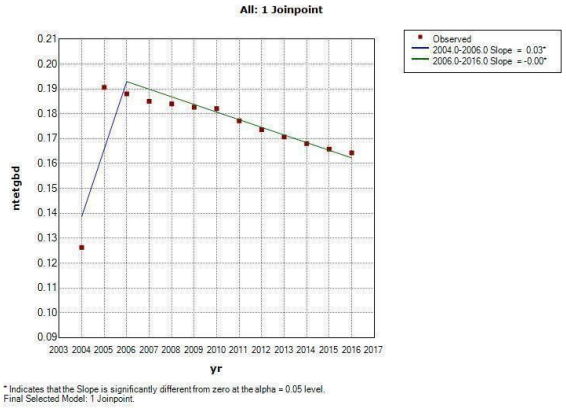
SEXUAL ASSAULT



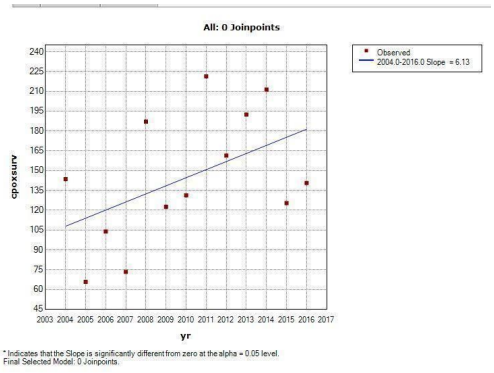


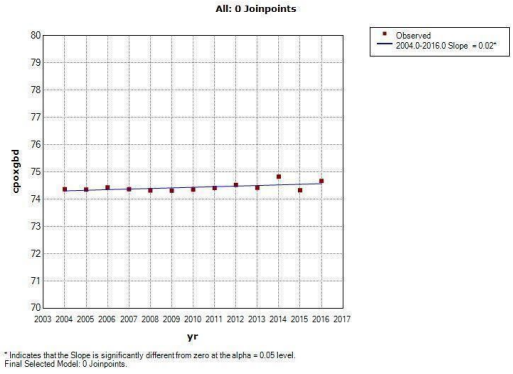
TETANUS



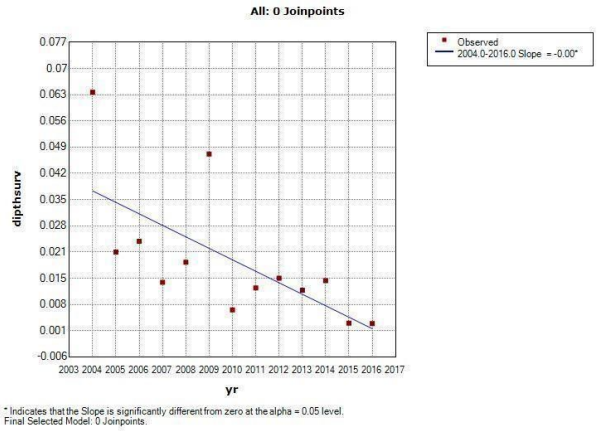


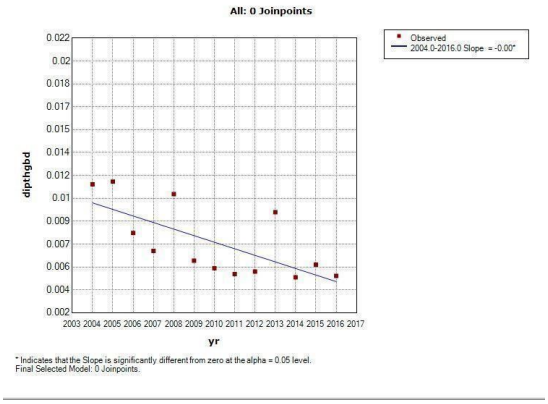
NEONATAL TETANUS



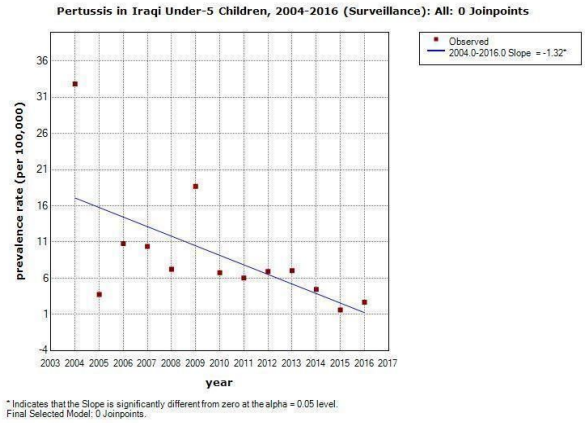


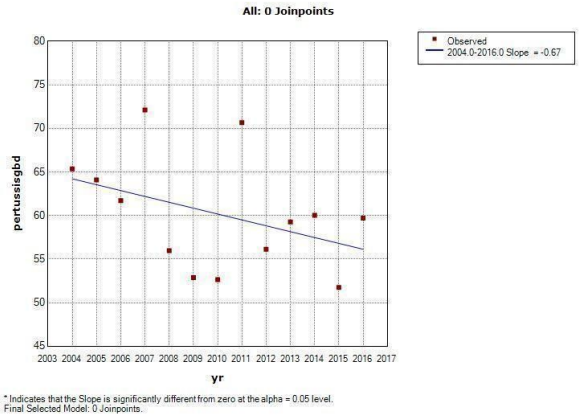
CHICKENPOX/VARICELLA



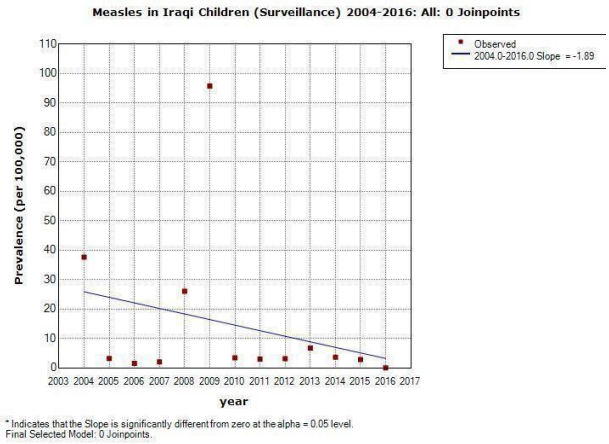


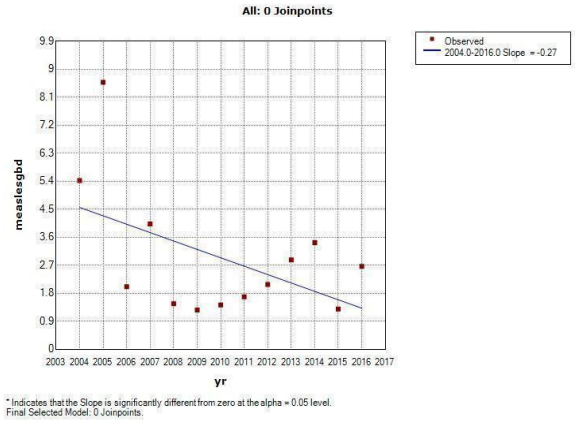
DIPHTHERIA



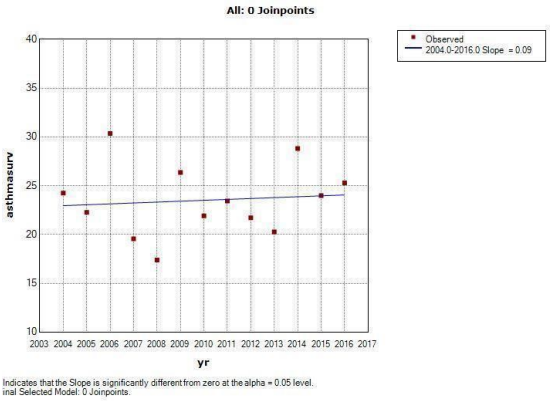


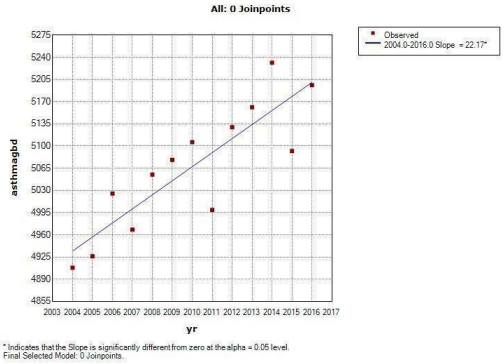
PERTUSSIS



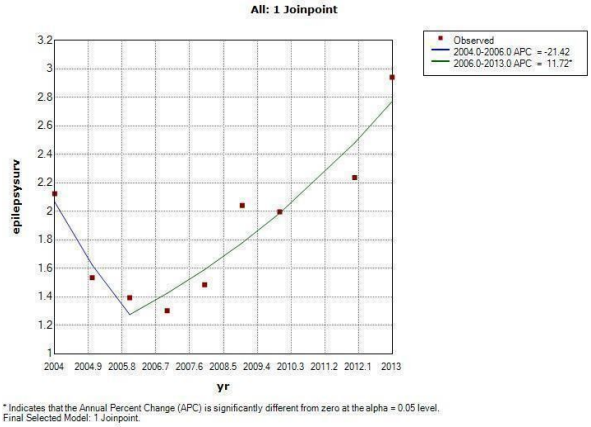


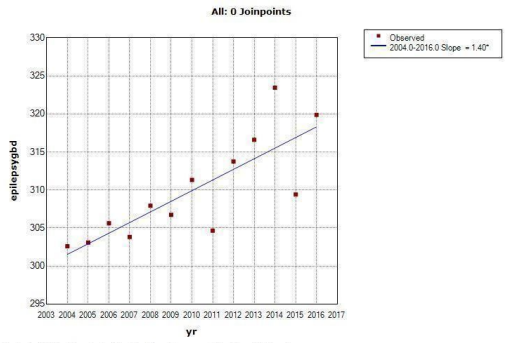
MEASLES



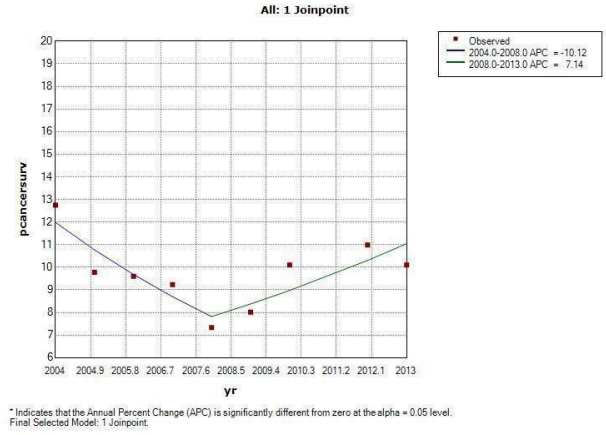


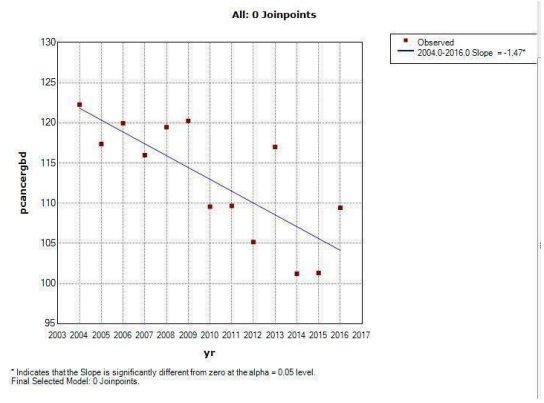
ASTHMA



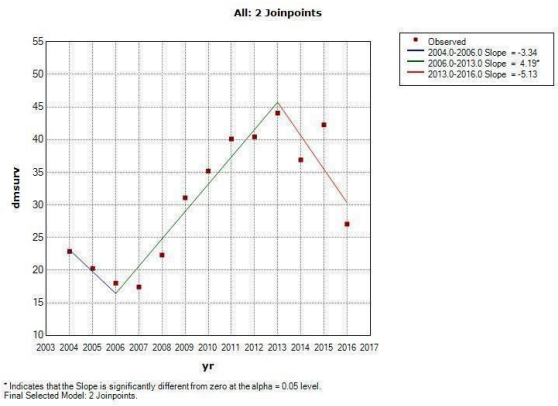


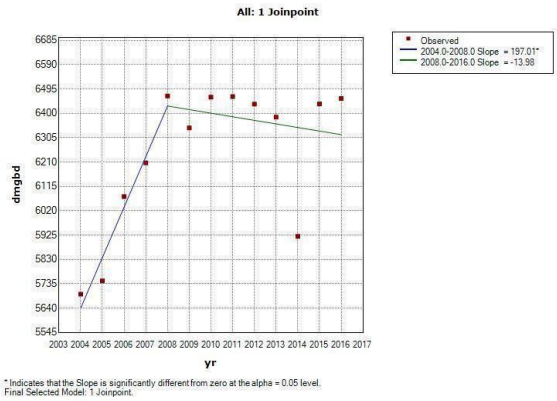
EPILEPSY





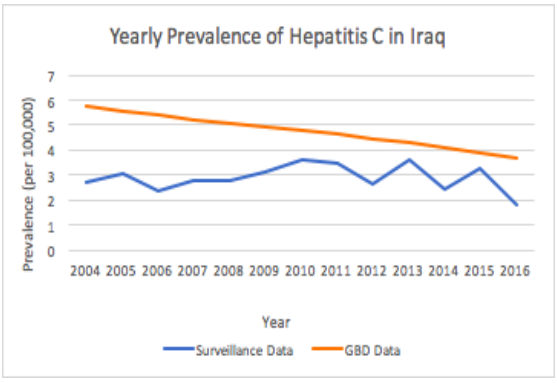
PEDIATRIC CANCER

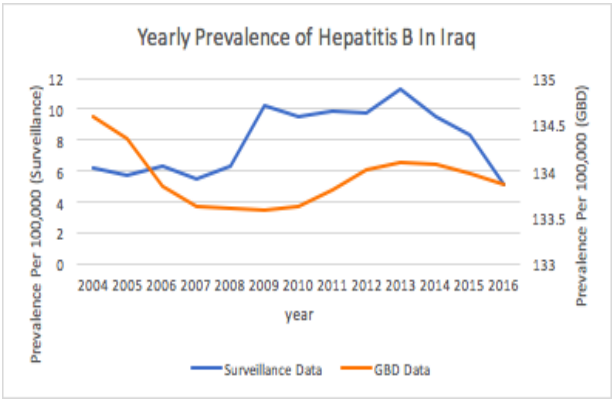

All: 2 Joinpoints
dmsurv
yr
Observed
2004.0-2006.0 Slope = -3.34
2006.0-2013.0 Slope = 4.19*
2013.0-2016.0 Slope = -5.13
* Indicates that the Slope is significantly different from zero at the alpha = 0.05 level.
Final Selected Model: 2 Joinpoints.

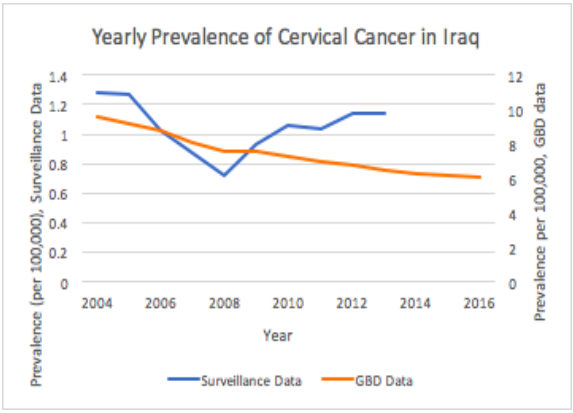

All: 1 Joinpoint
dmgbd
yr
Observed
2004.0-2008.0 Slope = 197.01*
2008.0-2016.0 Slope = -13.98
* Indicates that the Slope is significantly different from zero at the alpha = 0.05 level.
Final Selected Model: 1 Joinpoint.

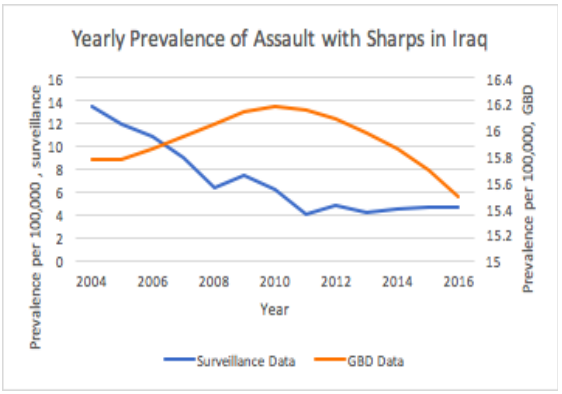
DIABETES

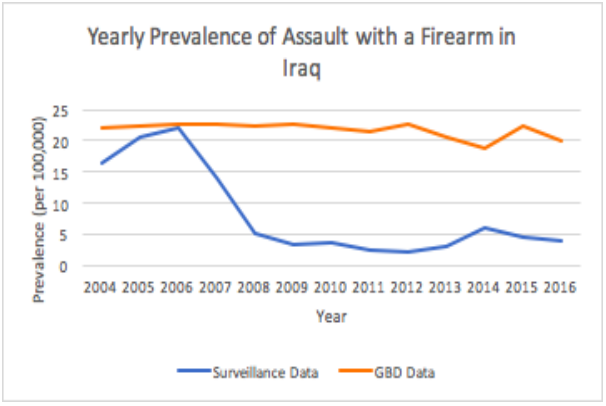
Figure 2: Graphs of prevalence trends of particular concern to Maternal-Child health, 2004-2016

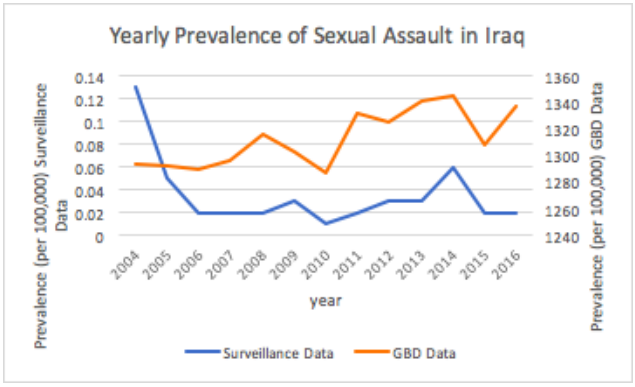


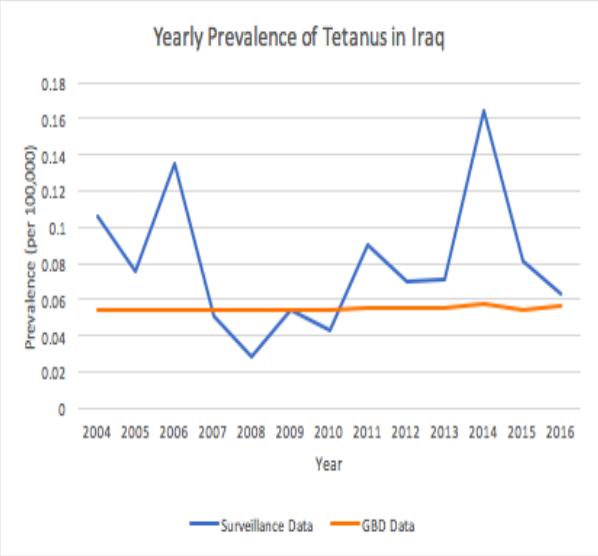


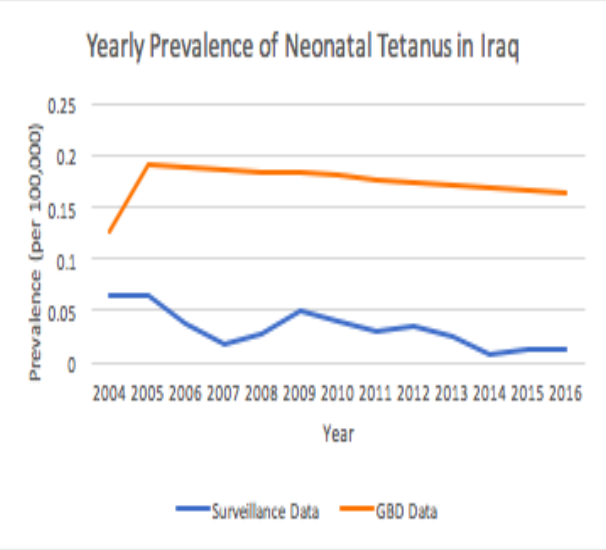


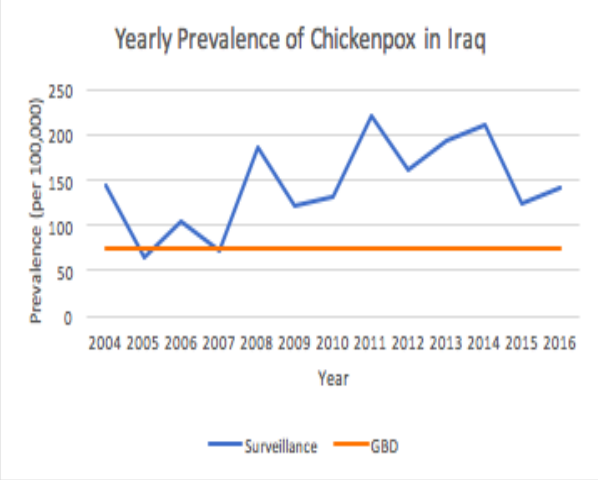


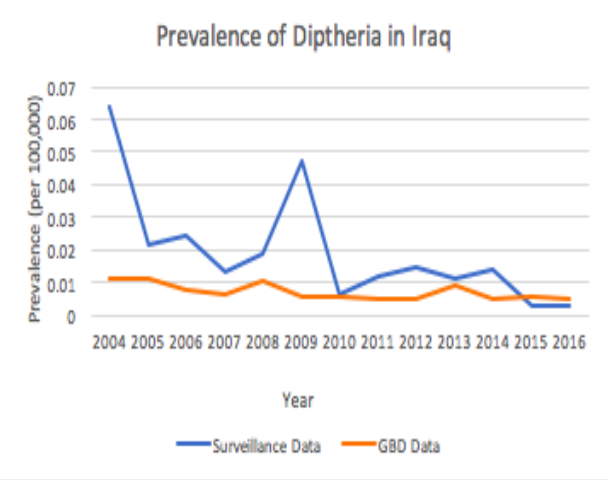


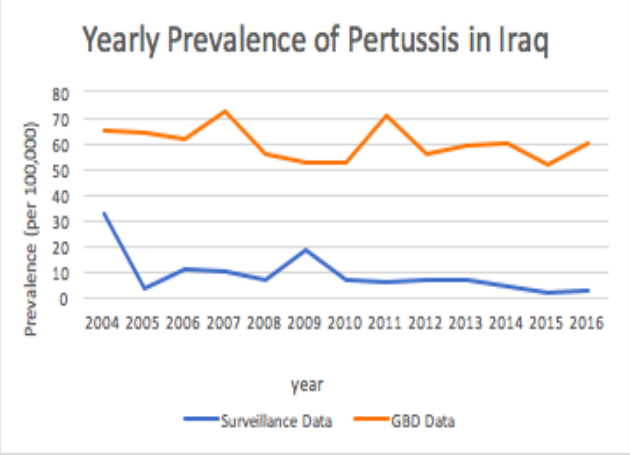


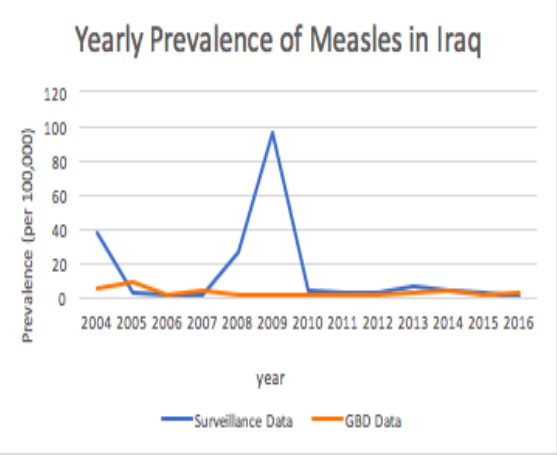

Yearly Prevalence of Tetanus in Iraq
Prevalence (per 100,000)
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016
Year
Surveillance Data
GBD Data

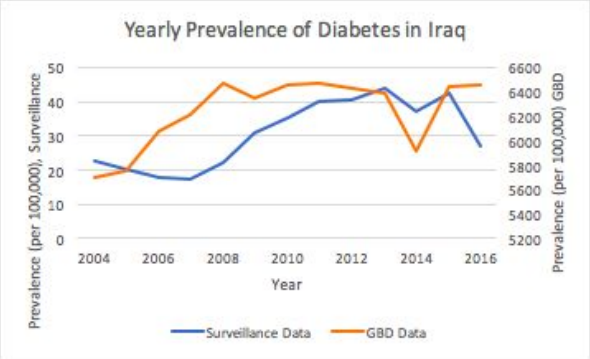

Yearly Prevalence of Neonatal Tetanus in Iraq
Prevalence (per 100,000)
0.25
0.2
0.15
0.1
0.05
0
2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016
Year
Surveillance Data
GBD Data

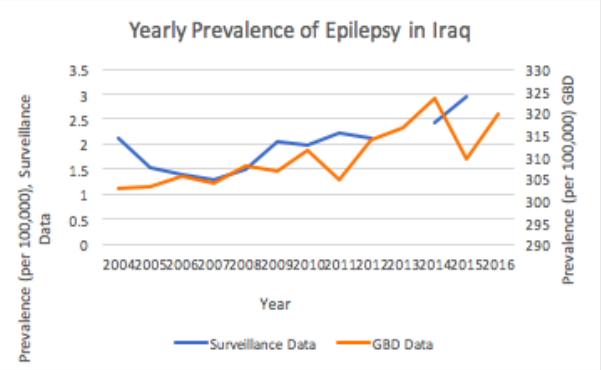

Yearly Prevalence of Chickenpox in Iraq
Prevalence (per 100,000)
250
200
150
100
50
0
2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016
Year
Surveillance
GBD

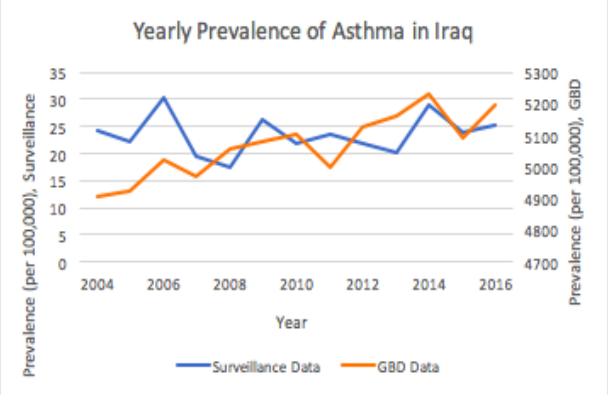

Prevalence of Diptheria in Iraq
Prevalence (per 100,000)
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016
Year
Surveillance Data
GBD Data

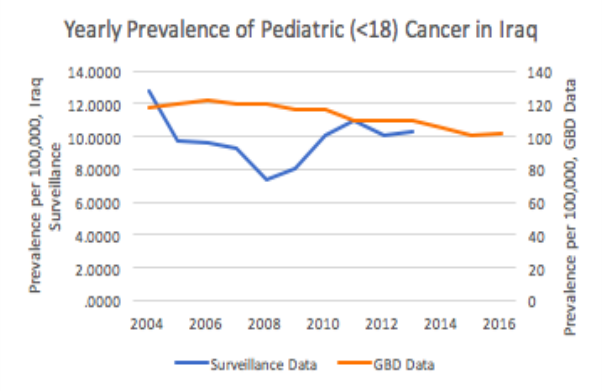

Yearly Prevalence of Pertussis in Iraq
Prevalence (per 100,000)
80
70
60
50
40
30
20
10
0
2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016
year
Surveillance Data
GBD Data


Yearly Prevalence of Measles in Iraq
Prevalence (per 100,000)
120
100
80
60
40
20
0
2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016
year
Surveillance Data
GBD Data


Yearly Prevalence of Diabetes in Iraq
Prevalence (per 100,000), Surveillance
Prevalence (per 100,000) GBD
Year
Surveillance Data
GBD Data


Yearly Prevalence of Epilepsy in Iraq
Prevalence (per 100,000), Surveillance Data
Prevalence (per 100,000) GBD
Year
Surveillance Data
GBD Data


Yearly Prevalence of Asthma in Iraq
Prevalence (per 100,000), Surveillance
Prevalence (per 100,000), GBD
Year
Surveillance Data
GBD Data


Yearly Prevalence of Pediatric (<18) Cancer in Iraq
Prevalence per 100,000, Iraq Surveillance
Prevalence per 100,000, GBD Data
Surveillance Data
GBD Data

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APPENDIX A

DISEASE CATEGORY LIST

Women of reproductive age (15-49 years): STDs

- 01 Hepatitis B (hbvsurv, hbvgbd)
- 02 Hepatitis C (hcvsurv, hcvgbd)
- 03 Cervical Cancer (ccancsurv, ccancgbd)

Violence of Concern to both Reproductive Age Women and Under-5 Children

- 01 Assault with sharps (sharpsurv, sharpsgbd)
- 02 Assault with firearms (gunsurv, gunsgbdwoman)
- 03 Sexual assault (sasurv, sagbd)

Under 5 Children's vaccine preventable health problems

- 01 Diphtheria (diptheriasurv, diptheriagbd)
- 02 Pertussis (pertussisurv, pertussisgbd)
- 03 Measles (measlesurv, measlesgbd)
- 04 Neonatal tetanus (ntetsurv, ntetgbd)
- 05 Tetanus (tetsurv, tetgbd)
- 06 Chickenpox/Varicella (cpoxsurv, cpoxgbd)

Chronic Conditions of concern to Reproductive Age Women and Under 5 Children

- 01 Asthma (asthmasurv, asthmagbd)
- 02 Epilepsy (epilepsysurv, epilepsygbd)
- 03 Cancer/Malignant neoplasms (pcancersurv, pcancergbd)
- 04 Diabetes (dmsurv, dmgbd)