## Contents

	Page
Abstract	5
Acknowledgments	7
Contents	8
List of Tables	10
List of Figures	11
Chapter	
1. Introduction	
1. Introduction  1.1 Background  1.2 Objectives	12
1.2 Objectives	15
1.3 Rationale  1.4 Expected advantages	15
1.4 Expected advantages	16
1.5 Literature reviews	16
2. Methodology	
2.1 The National Vital Registration Data	20
2.2 The 2005 Verbal Autopsy Study	22
2.3 Statistical analysis	23
2.4 Model of death rates	28
3. Preliminary Data Analysis	
3.1 Association between VA and VR cause groups	31
3.2 Associations between outcome and determinants	32

	Page
4. Statistical Modeling	
4.1 Logistic regression model	35
4.2 P-values of estimated coefficients	37
4.3 The ROC curve	37
4.4 Regional variation	39
4.5 Extending to the target population	46
4.6 Modeling death rates ("populating from the sample")	47
5. Discussion and Conclusion	
5.1 Summary of findings 5.2 Discussion	49
5.2 Discussion	50
5.3 Limitations, strength and further study	51
References	52
5.3 Limitations, strength and further study References Appendix Vitae	56
Vitae	63

## **List of Tables**

Tables	Page
Table 2.1: The ICD-10 for liver cancer deaths	21
Table 2.2: Major cause groups	22
Table 3.1: Number of liver cancer deaths in nine provinces	32
Table 3.2: Number of total deaths and liver cancer deaths by gender and	33
age-groups	
Table 3.3: Number of total deaths and liver cancer deaths by VR cause	33
location groups	
Table 4.1: Coefficients, standard errors and p-value of logistic regression model	35
Table 4.2: P-values of estimated coefficients	37
Table 4.3: Cross classification of model results and VA assessed	38
liver cancer deaths	

## List of figures

Figures	Page
Figure 1.1: Life Cycles of O. viverrini and C. sinensis	13
Figure 2.1: Thai vital registration data processing	20
Figure 2.2: Nine sample provinces with sample size frome the 2005 VA study	23
Figure 2.3: Path diagram	24
Figure 2.4: Analysis process	25
Figure 3.1: Association between VA and VR cause groups	31
Figure 3.2: Association between outcome and determinants	34
Figure 4.1: Roc curve for liver cancer from the VA study	38
Figure 4.2: Coefficients of province from logistic regression model	39
Figure 4.3: The thematic map of province coefficients	40
Figure 4.4: Percent of the liver cancer deaths in 2000-2001	41
Figure 4.5: Percent of the liver cancer deaths in 2002-2003	42
Figure 4.6: Percent of the liver cancer deaths in 2004-2005	43
Figure 4.7: Percent of the liver cancer deaths in 2006-2007	44
Figure 4.8: Percent of the liver cancer deaths in 2008-2009	45
Figure 4.9: Cumulative graphs from liver cancer deaths in 2000-2009	46
Figure 4.10: Liver cancer deaths per 100,000 population by age group and year	47
Figure 4.11 Liver cancer deaths by province	48