

# Contents

<b>1</b>	<b>Introduction</b>	<b>1</b>
1.1	Bronchiolitis and the Respiratory Syncytial Virus . . . . .	1
1.1.1	Respiratory syncytial virus structure . . . . .	2
1.1.2	Spread . . . . .	3
1.1.3	Reinfections . . . . .	5
1.1.4	Treatment . . . . .	6
1.1.5	Seasonality . . . . .	7
1.1.6	Risk factors for RSV infection . . . . .	9
1.1.7	Disease sequelae . . . . .	9
1.2	Impact on health system . . . . .	10
1.3	Vaccines . . . . .	11
1.4	Mathematical Models . . . . .	13
1.4.1	Continuous models . . . . .	13
1.4.2	Network models . . . . .	14
1.5	A brief Outline of this Dissertation . . . . .	16

<b>2 Mathematical modeling of respiratory syncytial virus (RSV): Vaccination strategies and budget applications</b>	<b>19</b>
2.1 Introduction . . . . .	20
2.2 Methods . . . . .	21
2.2.1 Estimating parameters . . . . .	24
2.2.2 Source RSV data . . . . .	26
2.3 Results . . . . .	27
2.3.1 Model fitting . . . . .	27
2.3.2 A Vaccination Strategy . . . . .	29
2.4 Discussion . . . . .	34
<b>3 Cost analysis of a vaccination strategy for respiratory syncytial virus (RSV) in a network model</b>	<b>37</b>
3.1 Introduction . . . . .	38
3.2 The Social Network model for RSV . . . . .	40
3.3 Simulation and model fitting . . . . .	42
3.4 Vaccination strategy and cost . . . . .	44
3.5 Conclusions . . . . .	47
<b>4 Seasonal RSV epidemic in a Random Social Network</b>	<b>51</b>
4.1 Introduction . . . . .	52
4.2 Methods . . . . .	53
4.2.1 Hospitalization Data . . . . .	53

4.2.2	Population Model . . . . .	54
4.2.3	Random Network SIRS Model . . . . .	55
4.3	Results . . . . .	58
4.3.1	Phase diagram and epidemic behaviours . . . . .	58
4.3.2	Fitting with Hospitalization Data . . . . .	59
4.4	Discussion . . . . .	63
<b>5</b>	<b>Conclusions</b>	<b>65</b>
	<b>Bibliography</b>	<b>67</b>