

## Introduction

### The first wave of Covid-19:

- Québec : province mostly affected in Canada
- 63,713 confirmed cases, 5,770 deaths, 91.5% of deaths are aged 70+  
up to 7<sup>th</sup> September 2020

Necessary : adjust the mortality table, taking account of the deaths caused by the Covid-19

## Methodology

Calculate increase  
ment of number  
of deaths

Divide large  
age groups  
into age  
groups of 10  
years

Calculate central death rate:  
 $\bar{c}_a t_x^{d:f}$  taking account of the 1<sup>st</sup> wave of Covid-19,  $\phi_a t_x^{d:f}$  projected without influence of Covid-19

$$\bar{c}_a t_x^{d:f} = \frac{(\bar{D}_{(x,x+a)}^{d:f} + Z_{(x,x+a)}^{d:f}) / 91 \times 365}{a P_x^m - Z_{(x,x+a)}^{d:m-1}},$$
$$\phi_a t_x^{d:f} = \frac{\bar{D}_{(x,x+a)}^{d:f} / 91 \times 365}{a P_x^m}, \quad a = \begin{cases} 10 & \text{si } x < 90 \\ \infty & \text{si } x = 90 \end{cases}$$

Calculate  
probability of  
death from all  
causes in  
stage x ( ${}_a q_x$ )

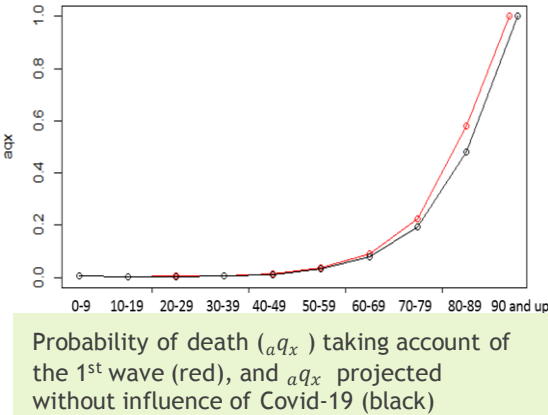
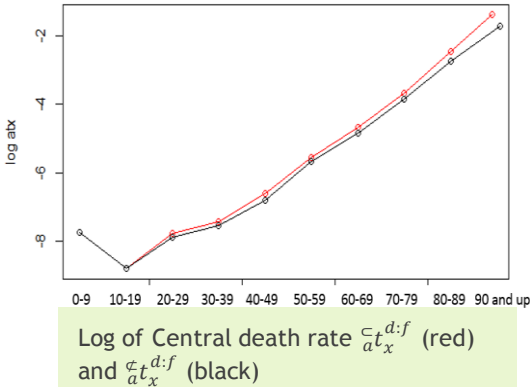
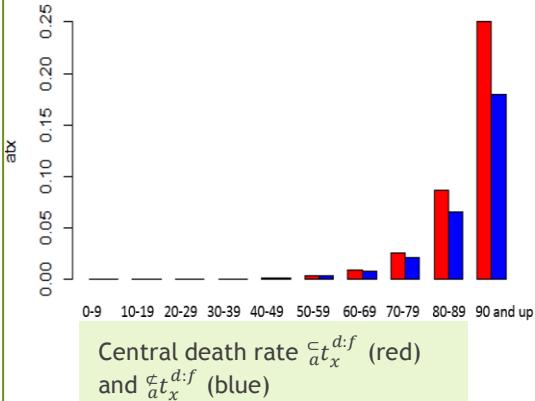
$${}_a q_x \approx 1 - e^{-a * {}_a t_x}$$

Calculate other elements  
and construct the  
adjusted mortality table

## Data Sources

- ISQ : Weekly numbers of death from all causes in Québec, 2010 to 2020, by age groups of [0,49], [50,69] et [70, ∞) , genders together
- INSPQ : Daily evolution of number of deaths due to Covid-19 in Québec, by age groups of 10 years, genders together
- ISQ : Population of Québec, 2010 to 2019 (estimation) and 2020 (projection), by age group of 5 years and gender
- ISQ : Number of deaths in Québec, by age groups of 5 years and sex, 2019

## Results and analysis

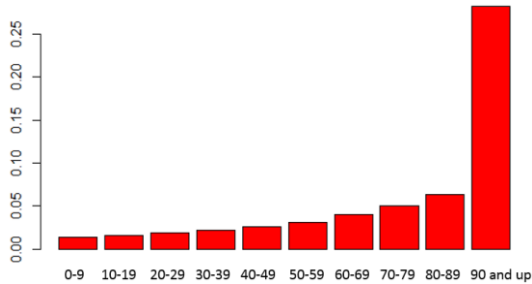


Mortality table Québec 2020 projected without influence of Covid-19

	lx	adx	aqx	aLx	Tx	ex
0	100000.00	436.1549	0.004361549	997819.2	8130434.1	81.304341
10	99563.85	152.2440	0.001529109	994877.2	7132614.9	71.638604
20	99411.60	383.2377	0.003855060	992199.8	6137737.6	61.740658
30	99028.36	523.0602	0.005281923	987668.3	5145537.8	51.960243
40	98505.30	1101.6703	0.011183868	979544.7	4157869.5	42.209600
50	97403.63	3309.3028	0.033975147	957489.8	3178324.8	32.630454
60	94094.33	7230.3837	0.076841863	904791.4	2220835.0	23.602219
70	86863.95	16860.9174	0.194107199	784334.9	1316043.6	15.150631
80	70003.03	33664.3145	0.480897969	531708.7	531708.7	7.595510
90+	36338.71	36338.7146	1.000000000	202210.3	202210.3	5.564598

Mortality table Québec 2020 taking account of the 1<sup>st</sup> wave of Covid-19

	lx	adx	aqx	aLx	Tx	ex
0	100000.00	436.1549	0.004361549	997819.2	8015762.7	80.157627
10	99563.85	152.2440	0.001529109	994877.2	7017943.5	70.486867
20	99411.60	422.0556	0.004245537	992005.7	6023066.2	60.587156
30	98989.55	595.9423	0.006020255	986915.7	5031060.5	50.824160
40	98393.60	1344.5003	0.013664509	977213.5	4044144.8	41.101704
50	97049.10	3678.1470	0.037899856	952100.3	3066931.2	31.601850
60	93370.96	8340.5568	0.089327100	892006.8	2114830.9	22.649773
70	85030.40	19153.2607	0.225251920	754537.7	1222824.2	14.381023
80	65877.14	38096.9841	0.578303565	468286.5	468286.5	7.108482
90+	27780.15	27780.1544	1.000000000	110876.9	110876.9	3.991227



Ratio of difference between life expectancy ( $e_x$ ) taking account of the 1<sup>st</sup> wave et  $e_x$  projected without influence of Covid-19

$e_{90}$  from year 1974 to 1981, source BDLC

Year	1974	1975	1976	1977	1978	1979	1980	1981
$e_{90}$	3.65	3.61	3.68	3.80	3.93	4.16	4.00	4.26

## References

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