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Direct impact of COVID-19 by estimating disability adjusted life years (DALYs) at national level in France 2020

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[Under revision in PLOS ONE]

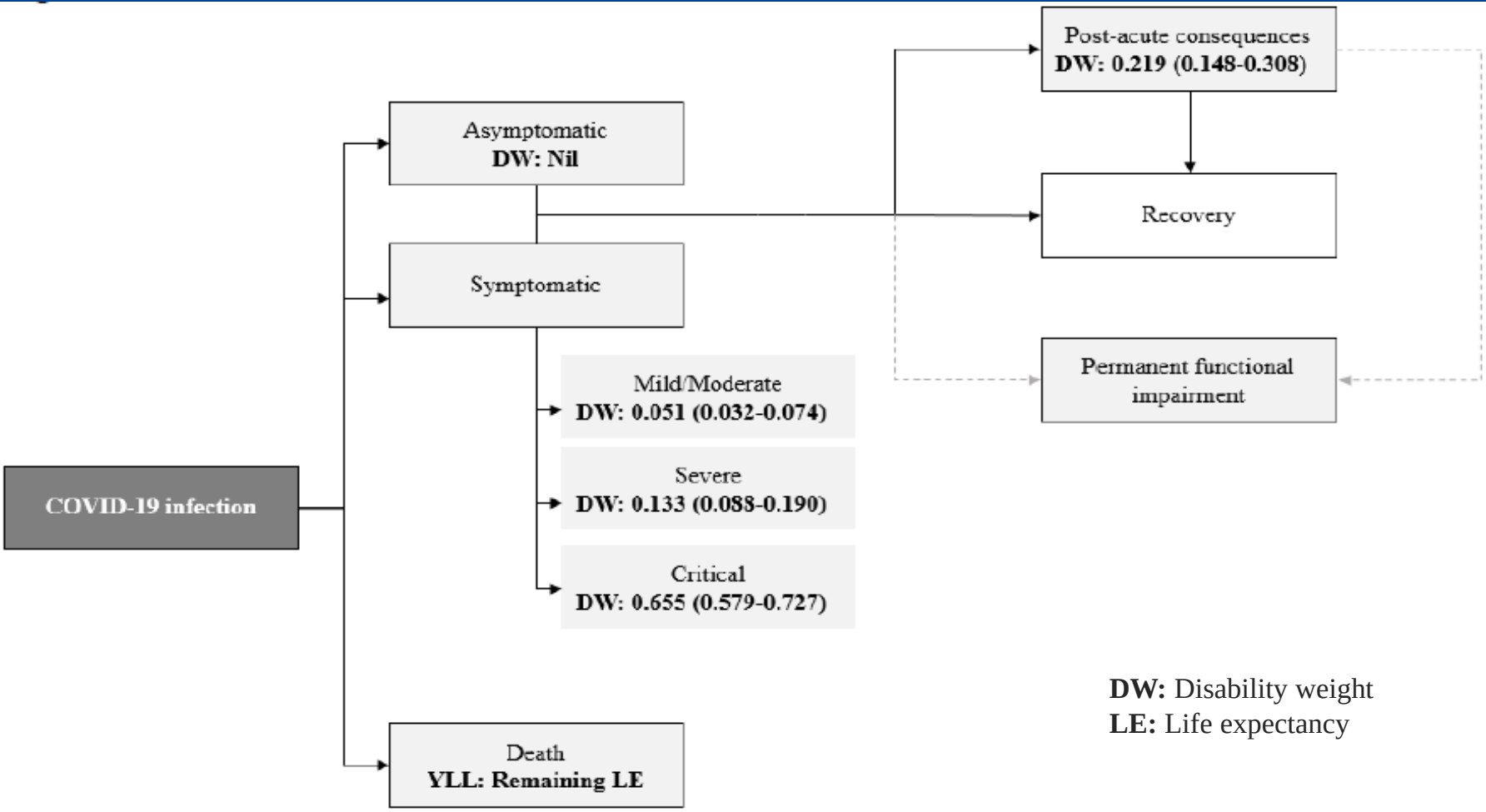
OBJECTIVE

« To calculate the direct impact of COVID-19 including acute symptomatic infections and post-acute consequences using DALYs at national level in France in 2020 »

DATA SOURCES USED

- SI-DEP (Système d'Information de DEpistage Populationnel)
- SI-VIC (Système d'Information pour le suivi des VICtimes d'attentats et de situation sanitaires exceptionnelles)
- CépiDc (Centre d'épidémiologie sur les causes médicales de décès)

CONSENSUS MODEL FOR COVID-19 [1]



DW: Disability weight
LE: Life expectancy

[1] *Wyper GM et al, Burden of disease methods : a guide to calculate COVID-19 disability-adjusted life years (méthodes de détermination de la charge de morbidité : guide pour le calcul des années de vie corrigées de l'incapacité).*

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Main Results

YEARS OF LIFE LOST (YLL) DUE TO COVID-19

- **72 735 deaths** correspondant to a total **982 531 YLL**
  - 43% (women)
  - 57% (men)
- YLL highest: 80-89 years
  - 330 083 (34%)
- % YLL:
  - < 70 years: 26%
  - ≥ 70 years: 74%

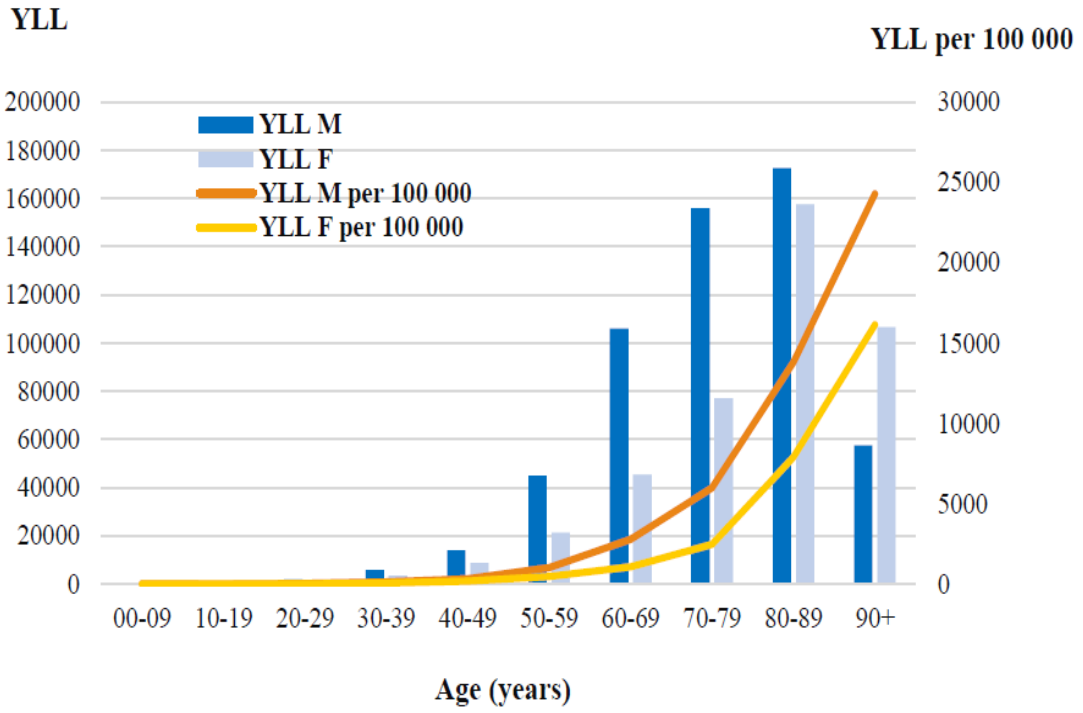

Figure 1: Years of life lost due COVID-19 by age and sex in France in 2020

YEARS LIVED WITH DISABILITY (YLD) DUE TO ACUTE SYMPTOMATIC COVID-19 INFECTIONS

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- 1 585 032 **acute symptomatic infections*** correspond to a total **4208 YLD**:
  - 47% (women)
  - 53% (men)
- YLD highest among men (70 -79 years)
  - 464
- % YLD:
  - < 70 years: 67%
  - ≥ 70 years: 33%

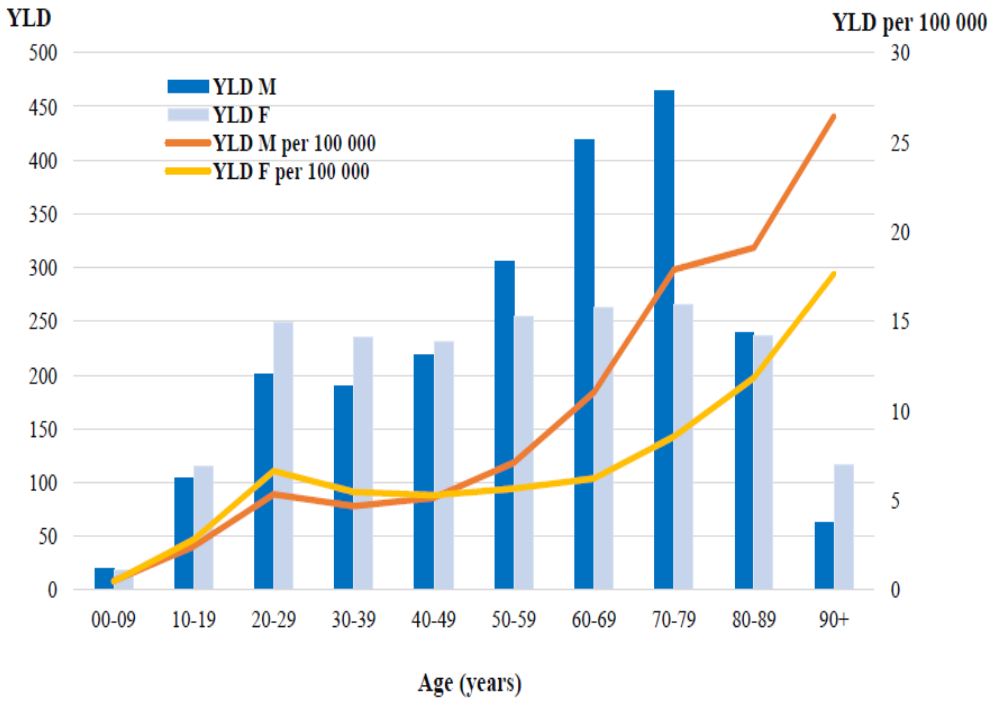

Figure 2: Years lived with disability due to acute symptomatic infections by age and sex in France in 2020

**mild/moderate, severe and critical*

YEARS LIVED WITH DISABILITY (YLD)

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Number of total COVID-19 infections and total YLD calculated

	Number of infections	YLD
Acute symptomatic infections	**1 585 032**	**4208 (reference point)**
Mild/moderate	1 420 879	2174
Severe	138 303	835
Critical	25 850	1199
Long COVID*	**226 660**	**3971**
Morbidity (Total YLD)	**1 811 692**	**8179**

***1/7 case (14,3%) based on total number of acute symptomatic infections (*mild/moderate, severe and critical*)**

Sudre Carole H et al, Nature medicine, 2021

SCENARIO ANALYSES: IMPACT ON YLD

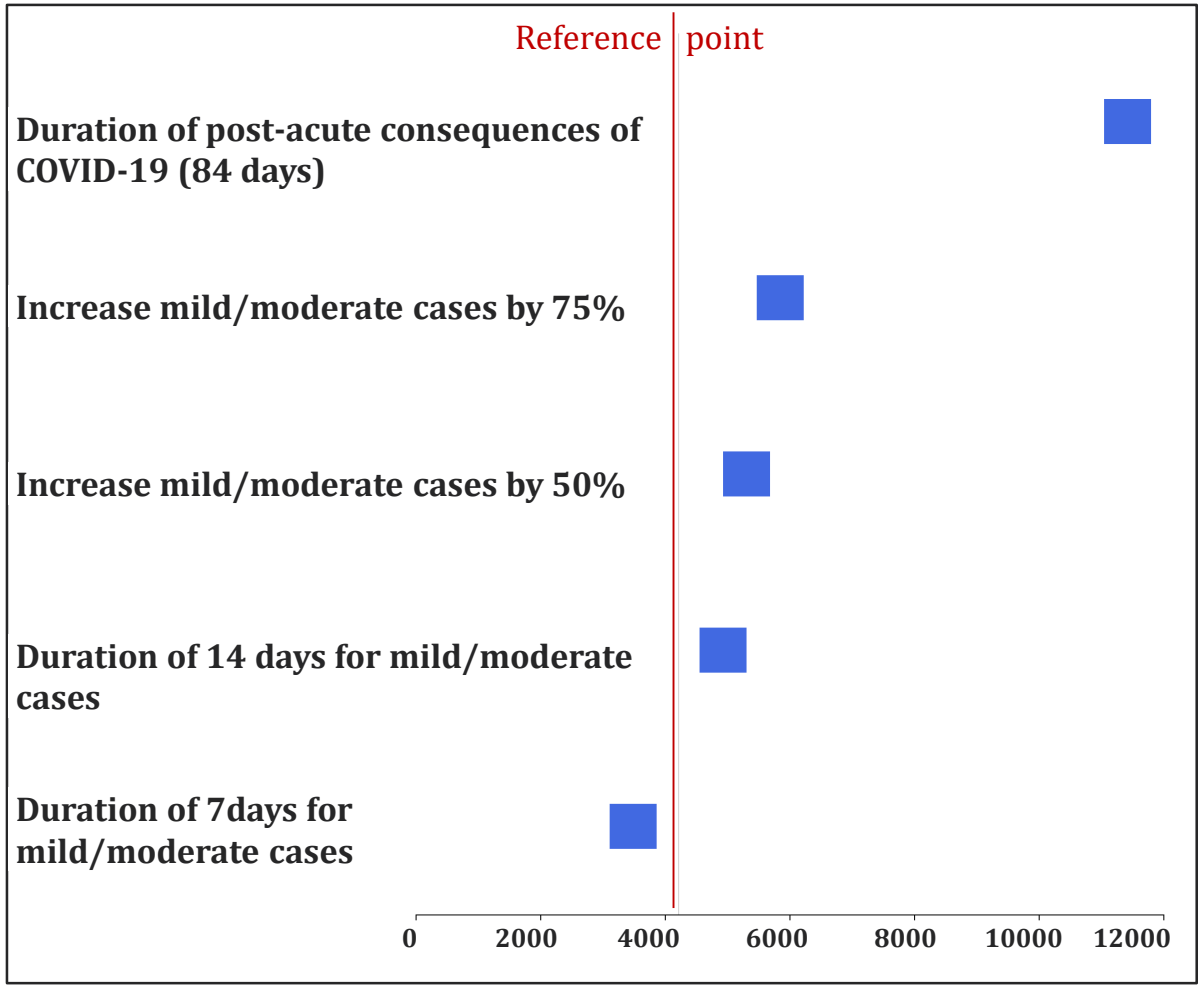

Figure 4: Scenario analyses and YLD estimates

DISABILITY ADJUSTED LIFE YEARS (DALY) DUE TO ACUTE SYMPTOMATIC COVID-19 INFECTIONS

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- 986 740 total DALYs:
  - 43% (women)
  - 57% (men)
- DALYs highest among 80 -89 years:
  - 34% of total DALYs
- % DALYs:
  - < 70 years: 26%
  - ≥ 70 years: 74%

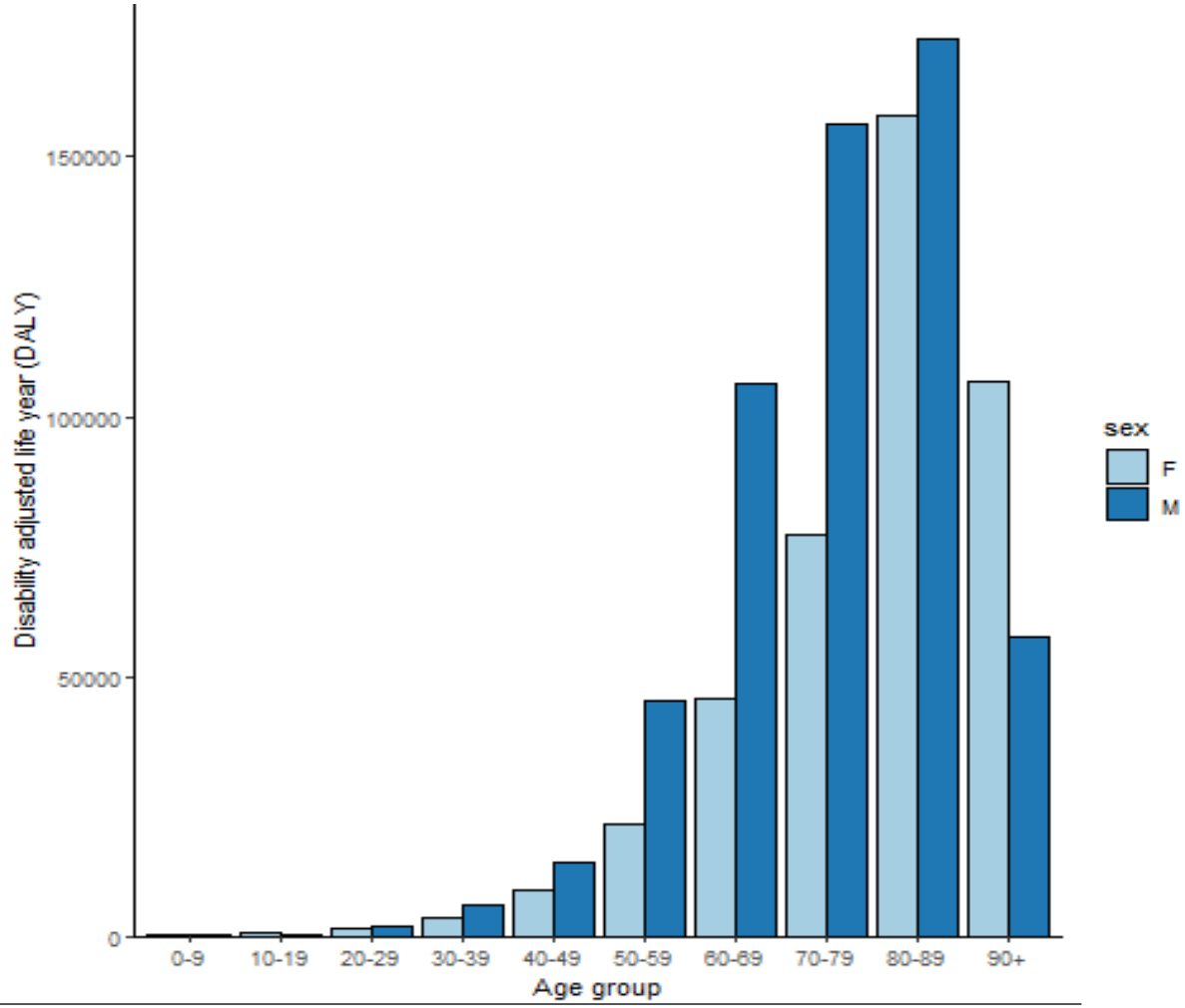
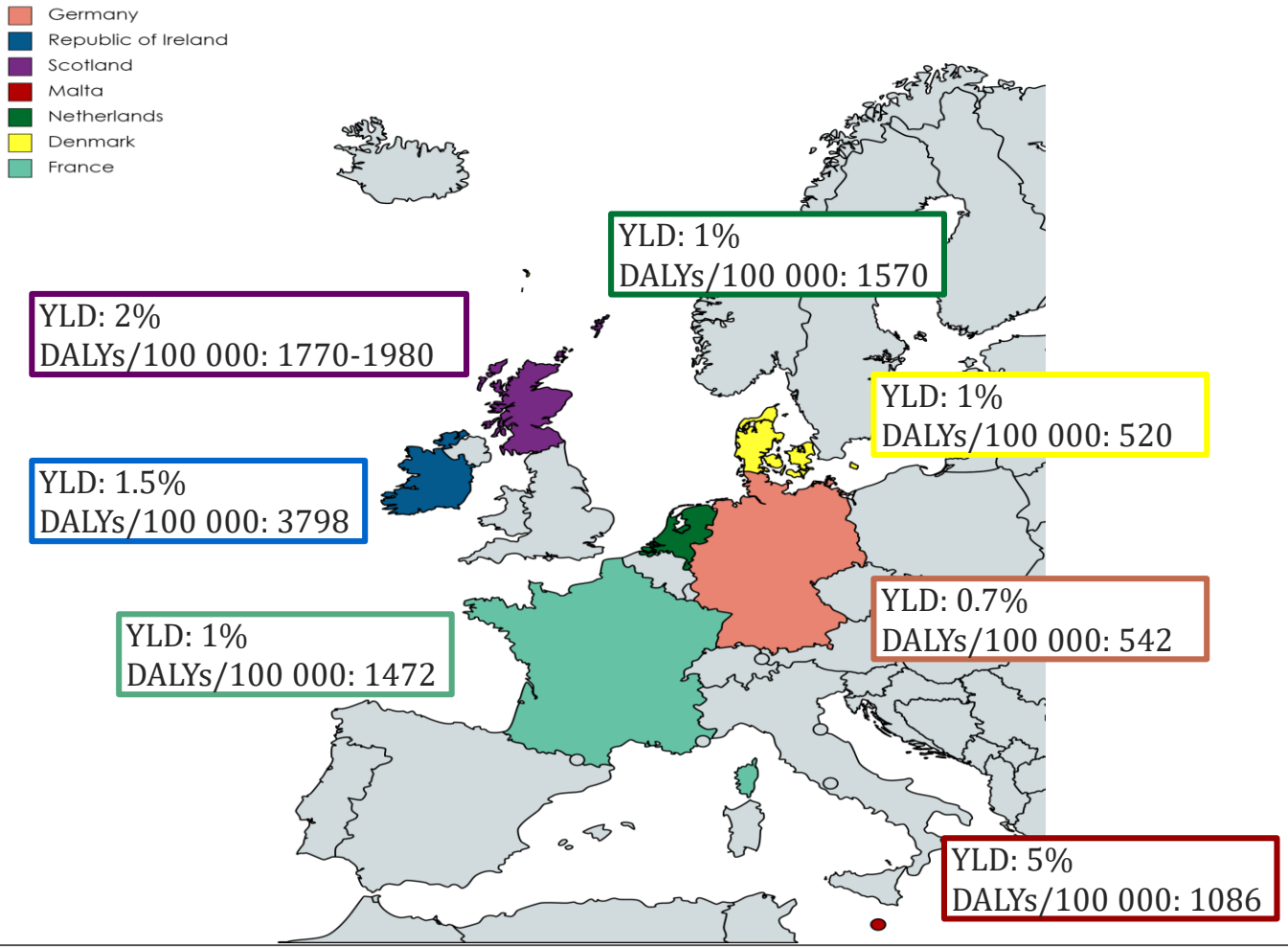


Figure 5: Disability adjusted life years due to acute symptomatic COVID-19 infections by age and by sex in France in 2020

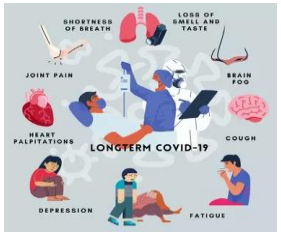
COMPARISON WITH OTHER STUDIES IN EUROPE



CONCLUSIONS

COVID-19 has a substantial impact on population health in France in 2020

1. 1. The majority of health loss was due to mortality (99%)



2. Large contribution of long COVID to YLD component of the disease burden

Prospective study: To assess the impact of health inequalities within these estimates

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Acknowledgements

COVID-19 Task force

european burden-eu of disease network

YLD BY AGE, SEX AND SEVERITY LEVELS (MILD/MODERATE, SEVERE AND CRITICAL)

- **YLD-Mild/moderate**:
  - higher among women than men (60% vs 44%)
- **YLD-Severe**:
  - Almost similar in both sexes (20% in women vs 19% in men)
- **YLD-Critical**:
  - higher among men than women (37% vs 20%)

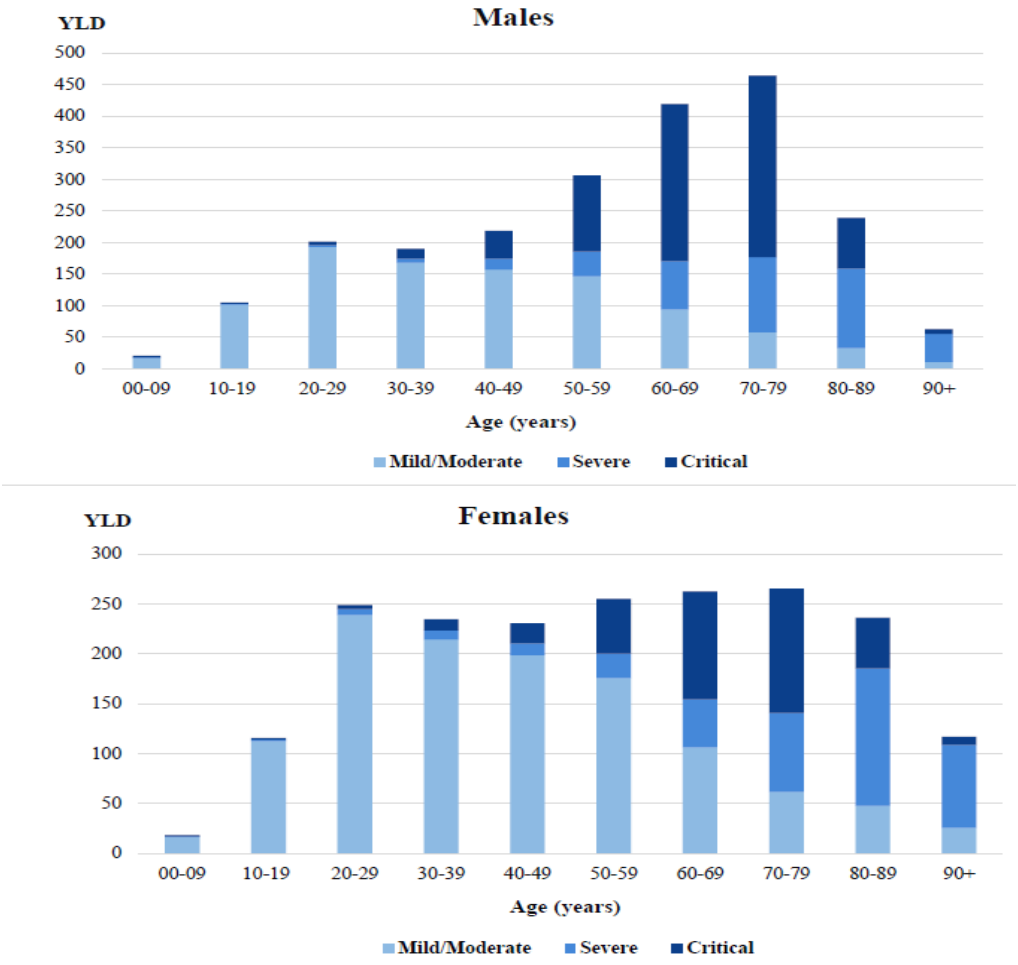

Figure 3: YLD estimates by age, sex and severity levels

IMPLICATIONS IN PUBLIC HEALTH

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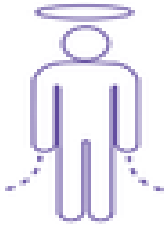
Younger than 70 years:



Higher YLL among men than women (31% vs 19%)

- **Need to improve health care and prevention**

Higher YLD among people aged younger than 70 years than aged 70 years and above (67% vs 33%)

- **A strong adverse economic and social impacts**

ESTIMATION OF YLD: YREARS LIVED WITH DISABILITY DUE TO COVID-19

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$$YLD = \Sigma^{l}_{h=1} \text{number of cases}_{h} \times \text{duration}_{h} \times \textit{disability weight}_{h}$$

h=health state, l=number of cases for each health state

Health state	Description	Duration (days)	Disability weight (95% UI)
Asymptomatic	Has infection but no symptoms	7	0
Mild/Moderate	No smell No taste, diarrhea, sore throat, sneezing, coughing, fever, and, pneumonia,	10	0.051 (0.032 – 0.074)[1]
Severe	Hospitalised, non-intensive care	12	0.133 (0.088-0.190) [1]
Critical	Hospitalised with intensive care	20	0.655 (0.579-0.727) [2]
Covid long*	Person still feels symptoms such as fatigue, insomnia, depression	28	0.219(0.148-0.308) [1]

*** 1/7 case (14,3%) of total acute symptomatic infections (mild/moderate, severe and critical)[3]**

[1] *Salomon et al. 2015*
[2] *Haagsma et al. 2015*
[3] *Sudre CH et al, Nature medicine, 2021*

ESTIMATION OF YLL: YEARS OF LIFE LOST DUE TO MORTALITY DUE TO COVID-19

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$$YLL = \sum_{a=1}^{a=1} YLL_a = \sum number\ of\ deaths_a \times life\ expectancy_a$$

a = age group (0-9, 10-19, 20-29, 30-39, 40-49, 50-59, 60-69, 70-79, 80-89, 90+)

- Deaths with COVID-19 as the main underlying cause of death
- GBD reference life table of « Global burden of disease » (GBD) 2019

COMPARAISON DES RÉSULTATS DES DALYS COVID-19 AVEC LES RÉSULTATS DU GBD 2019 EN FRANCE (LEVEL 3)

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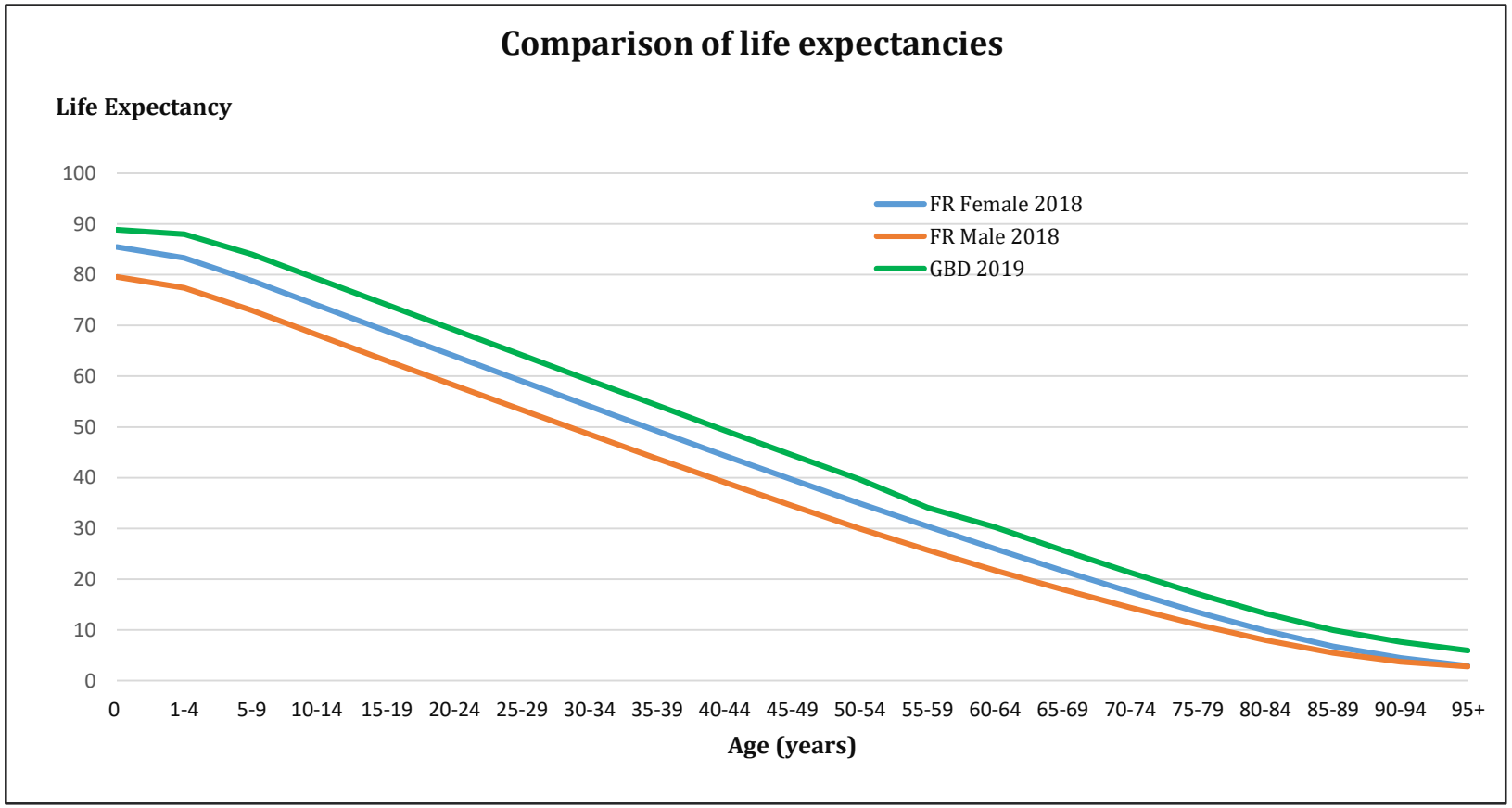
Ranking	Health conditions	DALYs
1	**COVID -19**	**990 710**
2	Low back pain	927 416
3	Ischemic heart disease	897 074
4	Lung cancer	880 498
5	Falls	785 307
6	Stroke	630 048
7	Alzheimer's disease	582 922
8	Depressive disorders	511 467
9	Headache disorders	491 168
10	Colorectal cancer	422 215

COMPARISON OF LIFE EXPECTANCIES



COMPARAISON DES ÉTUDES DE DALYS EN LIEN AVEC LA COVID-19 DANS LES PAYS EUROPÉENS

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S/No	Countries-period of analysis	Life table	Mortality	Morbidity	YLL	YLD	DALYs/100 000	%YLD
1	Germany [2020]	National life tables-2016/2018	31 638	1 717 006	303 608	2033	542	0.7%
2	Scotland [2020]	GBD-2019	6167-6845	641 789	94 633-106 357	1886	1770-1980	2%
3	Malta [7 Mar. 2020- 31 Mar.2021]	GBD-2019	331	70 421	5229	250	1086	5%
4	The Netherlands [2020]	GBD-2019	19 980	928 476	271 900	1600	1570	1%
5	Republic of Ireland	GBD-2019	4500	220 273	50 823	800	3798	1.5%
6	**France [2020]**	**GBD-2019**	**72 735**	**1 585 032**	**982 531**	**8179**	**1472**	**1%**

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Merci