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Data and Methods: Data from United Nation Population Projection, Statista and centre for disease control and prevention were used in the analyses. Life expectancy, YPLL and DALY were estimated under four scenarios; no COVID-19 deaths, actual number of COVID-19 death as of 20th July, 2020 and anticipating COVID-19 death share of 6% and 10% respectively.

Keywords: *COVID-19, mortality, life expectancy, USA, italy, germany, sweden.*

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Impact of COVID-19 Attributable Deaths on Longevity, Premature Mortality and DALY: Estimates of USA, Italy, Germany and Sweden

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Abstract- Background: In a short span of four months, the COVID-19 pandemic has added over 0.6 million deaths worldwide, which are untimely, premature and unwarranted. The USA, Italy, Germany and Sweden are four worst affected countries, accounting to over 40% of COVID-19 deaths globally. The main objective of this study is to examine the impact of COVID-19 attributable deaths on longevity, years of potential life lost (YPLL) and disability adjusted life years (DALY) in USA, Italy, Germany and Sweden.

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Results: The COVID-19 attributable deaths have lowered the life expectancy by 0.6 years in USA, 0.5 years in Italy and Sweden and 0.1 years in Germany. The loss of YPLL was 1.59, 0.13, 0.26 and 0.02 million in USA, Italy, Germany and Sweden respectively. The DALY (per 1000 population) due to COVID-19 was 5.4 in USA, 6.3 in Italy, 1.2 in Germany and 0.6 in Sweden. Compression in life expectancy and increase in YPLL and DALY may intensify further if death continues to soar.

Conclusion: COVID-19 has a marked impact on mortality. Reduction in longevity premature mortality and loss of DALY is higher among elderly.

Keywords: COVID-19, mortality, life expectancy, USA, italy, germany, sweden.

I. Introduction

COVID-19 attributable deaths are soaring each day in most of the countries with uncertainties over projected numbers, infection fatality ratio, development of a vaccine and possible end of pandemic. Globally, with over 16 million confirmed infections and additional deaths of over 650 thousand by end of July, 2020, the COVID-19 attributable deaths accounts for 1% of total all-cause mortality. If the COVID-19 mortality continues with same pace, the life expectancy would begin to shrink by end of the year though the survival threat is more among the elderly and the chronically ill. Rapid spread of the infection as well as its associated fatality may well be due to novel disease, lack of medical know how, ill-prepared health care system, crowding in urban cities, administrative inefficacy, demographic and social determinants etc.

The case fatality ratio (CFR) is a crude measure of mortality, underestimate the mortality impact of COVID-19. An alternative CFR with 14 days' delay depicts at least twice higher mortality than CFR [1]. The mortality impact of COVID-19 is higher than many other disease [2].The standardized metrics such as disability adjusted life years (DALY) and years lost due to disability (YLD) are suggested to infer infection fatality by age [3].

Considerable attempts are made on tracing future trajectories, estimation of infection and fatality rate and risk factors of COVID-19 [4-12].Demographic structure, co-morbidities and health-care burden explain COVID-19 attributable mortality to some extent [13-15]. Most common observation made as regard COVID-19 fatality is its greater risk among elderly and people with co morbidities including hypertension, diabetes, cardiovascular disease, myocardial injury [4,16-22]. The Diamond Princes cruise ship study of Japan, a standard estimate of infection, estimated the overall case fatality ratio of 2.6% as against the same being 13% among the older aged 70 and above [23].

Inadequate testing and misclassification of deaths by cause underestimate the extent of COVID-19 deaths. In USA, the excess deaths due to pneumonia and influenza raise an apprehension as regard miss-classification of COVID-19 deaths in the absence of adequate testing [24]. In Italy, 54% deaths were attributed to COVID-19 making a case for misclassification of cause of death. The COVID-19 attributable mortality has potential to reduce life expectancy in India and seasonal life expectancy in Italy [25-26]. In United States, 1 million deaths from COVID-19 would increase mortality by one–third and reduction in period life expectancy by 3.9 years in 2020 [27].

Mortality impact of COVID-19 is higher in urban counties and the social determinants are significant

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predictors of its mortality [28]. High and low fatality due to COVID-19 attributed to density and age structure in terms of elderly in UK [29]. Demographic vulnerability of COVID-19 mortality is lower in younger countries in Sub-Saharan Africa than the industrialized countries [30]. The spread of infection and mortality depends on containment measures, health system response and micro-management of epidemic which may alter reproduction number [31].

By April 2020, the case fatality rate varied from 2.2% in South Korea to 13.0% in Italy. USA, Italy, Sweden and Germany were worst hit countries by the pandemic. By end of May 2020, USA had over 1.8 million confirmed cases and over 106 thousand deaths. About 80% of deaths occurred among adults aged 65 years or more [16]. In Italy, the CFR increased from 4.2% to 13.0% within 43 days and 90% of the change was due to increasing age specific case fatality rates [32]. In Italy, USA and Germany, estimated cases of infections are 6 times, 2 times and 1.2 times higher than the number of confirmed cases, respectively [33].

Existing studies of the pandemic on fatality is limited. Given its rise in intensity it becomes pertinent to gauge impact of COVID-19 attributable mortality on longevity, premature mortality and DALY. This will answer questions like "Would additional deaths due to COVID-19 reduce longevity and increase premature mortality and DALY".

II. Data and Methods

We have analysed four worst affected countries; namely USA, Italy, Sweden and Germany that accounts over 40% of all COVID-19 attributable deaths worldwide. The selection of country is guided by the availability of age-specific infection and mortality data and severity of infection. Estimates are provided under four scenarios; no COVID-infection, COVID-infection as of 20th July, 2020 and estimates under 6% and 10% COVID-19 death share. Population and mortality data by age group for 2020 were obtained from the United Nation Population Projection [34]. The total deaths obtained from UN projection are estimated deaths in the absence of COVID-19 infection. The age specific COVID-19 attributable deaths for USA is collected from Centres for Disease Control and Prevention [35] and that for Italy, Germany and Sweden is taken from Statista [36-38]. The total number of confirmed cases and deaths for each country is collected from world meter website [39]. We have redistributed the total deaths available from world meter as per age distribution of deaths for which age data was available.

Under the assumption that the estimated deaths without COVID-19 and deaths due to COVID-19 are mutually exclusive, we have added these deaths to derive age specific death rate (number of deaths per 1000 population). The age specific case fatality ratio (ASCFR) was computed for Italy and Sweden from given data. In case of Germany, the age group of number of infections were not uniform and deaths were available for 0-9, 10-19, 20-49, 50-69 and 70-89. We have redistributed the deaths as per population distribution in 10-year age group. In case of USA, we have used the ASCFR of Diamond Cruise Study that had constant rate (0.2) till age 35 beyond which we have taken the age group close to nearest age group [23].

III. Methods

Abridged life tables, estimation of years of potential life lost (YPLL) and disability adjusted life years (DALY) are used in the analyses. Estimates are based on the assumptions that COVID-19 attributable deaths are additional deaths that would have been avoided in absence of COVID-19 infection. The probability of death has been constructed from age specific death rate (ASDR). The 10-year abridged life table is used to estimate the life expectancy and other mortality estimates. Estimates are provided under four scenarios. Scenario 1 provides the deaths as estimated from UN population prospects and labelled as deaths without COVID-19. Scenario 2 considers COVID-19 deaths accounting for 6% of total deaths while scenario 3 would increase the death share to 10% of total deaths by the end of the year. Expected deaths due to COVID-19 are distributed in accordance with the age distribution of COVID-19 as of date. A brief description of YPLL and DALY estimation is given below.

a) Years of Potential Life Lost (YPLL)

The YPLL is a summary measure of premature mortality that estimates the average years a person would have lived had he or she not died prematurely. It gives higher weight to the deaths occurring at younger ages and lower weight to the deaths at higher ages [40-41]. YPLL is estimated as:

$$YPLL = \sum_{i=0}^{\infty} d_i * L_i$$

where, L_i is the life expectancy at age i and d_i is the number of deaths at age i. The deaths are weighted by life expectancy at each age.

b) Disability Adjusted Life Years (DALY)

DALY measures the health of a population by combining data on mortality and non-fatal health outcomes into a single number. The DALY measures health gaps as opposed to health expectancies. It measures the difference between a current situation and an ideal situation where everyone lives up to the age of the standard life expectancy, and in perfect health. It combines in one measure the time lived with disability and the time lost due to premature mortality:

$$DALY = YLL + YLD$$

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where, YLL= years of life lost due to premature mortality and YLD= years lived with disability.

We have calculated YLL and YLD with discounting rate of 3% where discounting health with time reflects the social preference of a healthy year now, rather than in the future. The value of a year of life is generally decreased annually by a fixed percentage. For many years, a discount rate of 5% per annum has been standard in many economic analyses of health and in other social policy analyses, but recently environmentalists and renewable energy analysts have argued for lower discount rates for social decisions. The World Bank Disease Control Priorities study and the GBD project both used a 3% discount rate, and the US Panel on Cost-Effectiveness in Health and Medicine recently recommended that economic analyses of health also use a 3% real discount rate to adjust both costs and health outcomes [42].

The YLL is estimated as:

$$YLL = \frac{N}{r}(1 - e^{-rL})$$

where, N= number of deaths
L= Life expectancy at age of death
r= discount rate (we have also used 3% discount rate)

$$YLD = \frac{\left(I * DW * L * (1 - e^{-rL})\right)}{r}$$

where, I= number of incidence/prevalence cases. For acute diseases, incidence is considered same as prevalence
DW= disability weight (a weight factor that reflects the severity of the disease on a scale from 0 (perfect health) to 1 (dead)
L= duration of disability
r= discount rate

As COVID-19 is a novel disease, its disability weight is not available. Since COVID-19 is a severe infectious disease having acute period, we have used the disability weight of 0.133 for Infectious disease (acute episode, severe category) as proxy for COVID-19 [43]. The duration of disability of 60 days is used because the patients of COVID-19 have been hospitalized for on average 30 days and after discharge and quarantined for 14-28 days approximately.

IV. Results

Table 1 presents the key indicators of COVID-19 attributable mortality in four countries under study. With additional 1,43,504 deaths in USA, 35,058 deaths in Italy, 9168deaths in Germany and 5639 deaths in Sweden in a span of about seven months, the share of COVID-19 deaths amounts to 4.8% of total deaths in USA, 5.2% in Italy, 1.0% in Germany and 5.8% in Sweden. The COVID-19 attributable deaths can be considered as additional deaths avoidable without this infection. The case fatality ratio was very high in Italy (14.3) followed by Sweden (7.2) and Germany (4.5). The pandemic has infected at least 1.2% of the population in USA, 0.4% in Italy, 0.8% in Sweden and 0.2% in Germany. The COVID-19 attributable deaths has already lower life expectancy by 0.6 years for USA, 0.5 years each in Italy and Sweden and 0.1 years in Germany. At 10% share, the reduction in life expectancy would be 1.2 years for USA, 1 years for both Italy and Germany and 0.9 years for Sweden.

Fig 1 shows the reduction in life expectancy under varying scenarios of COVID-19 attributable deaths in USA, Italy, Germany and Sweden. Estimates suggest that the life expectancy is already lowered by 0.6 years in USA, 0.5 years each in Italy and Sweden and 0.1 years in Germany due to COVID-19 attributable deaths. In case of the COVID-19 attributable deaths would amount to 6% of total deaths in each country, the life expectancy at birth would reduce by 0.8 years in USA, 0.6 years each in Italy and Germany and 0.5 years in Sweden. The additional deaths due to COVID-19 results in a rise in CDR from 10.5 to 11.1 in Italy and this would rise to 11.6 with the COVID-19 death share rising to 10%. In case of USA, it has also increased from 8.6 to 9.5 with 10% share of COVID-19 death and the pattern is similar in Germany and Sweden as well.

Table 2 and 3 presents the estimates of life expectancy under varying scenarios of COVID-19 attributable deaths in USA, Italy, Germany and Sweden. Estimates from life table with and without COVID-19 for these four countries exhibit the changing age-specific survival patterns. The life expectancy for 2020 was 79.5 years in USA, 83.6 years in Italy, 81.5 years in Germany and 82.7 years in Sweden.

Table 4 and 5 shows the age specific assessment of Years of potential life lost (YPLL) under varying scenario of COVID-19 death share in USA, Italy, Germany and Sweden. While YPLL without COVID-19 was 55.2 million in USA, 8.9 million in Italy, 14.4 million in Germany and 1.3 million in Sweden, COVID-19 has added 1.55 million, 0.48 million, 0.12 million and 0.06 millions of YPLL in USA, Italy, Germany, and Sweden, respectively. Rate of YPLL (per 1000 population) is highest in Italy (7.9) followed by USA (7.1) and Sweden (6.4). With rising share of COVID-19 deaths to the tune of 6% and 10%, The share of YPLL on this count will rise from 7.1 to 8.8 and 14.3 per 1000 population, respectively in USA. Similar pattern has been observed for Italy, Germany and Sweden. Higher age-groups (45 years and above) are contributing more than 70% of YPLL in all the countries.

Table 6 and 7 shows the estimated DALY under varying scenarios of COVID-19 attributable deaths in USA, Italy, Germany and Sweden. The estimated DALY at current share of attributable COVID-19 deaths is 1.80 million in USA, 0.38 million in Italy, 0.10 million in Germany and 0.05 million in Sweden. At 6% share of

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attributable COVID-19 deaths, DALY for all ages would be 2.23 million in USA, 0.44 million in Italy, 0.60 million in Germany and 0.05 million in Sweden. The COVID-19 attributed loss has increased the DALYs by 6.3 per 1000 population in Italy, 5.4 in USA, 1.2 in Germany and 0.6 in Sweden. If COVID-19 attributable death accounts 6% death share, the DALYs would be 7.2 per 1000 population in Italy, 6.7 in USA, 7.1 in Germany and 0.7 in Sweden. Similarly, when COVID-19 accounts 10% death share, DALYs is 12.0 per 1000 population in Italy, 11.2 in USA, 11.9 in Germany and 1.1 in Sweden. Among all the four countries, the population 70 years and above account more than three-fourth contribution in DALY while younger ages have relatively low contribution in all the scenarios.

V. Discussion and Conclusion

The COVID-19 pandemic is one of the worst ever misery posed to mankind. While epidemics in the past have gripped limited geographical boundaries, the COVID-19 has engulfed the entire world within a brief period of four months with a reasonable degree of spread potential. Apart from threat to human life, its containment measures have led to economic loss and generated psychological scare among individuals, households, community and the nation at large. The COVID-19 pandemic has paralysed the economic activities, deepened the global recession and has assumed a crisis proportion worldwide. Given the scale and intensity of this pandemic, this is first attempt in our knowledge to assess the mortality attributed to COVID-19 in four worst affected countries. Such an assessment involves the extent of reduction in life expectancy, person year life lost and DALY that are yet to be made available so far. Selection of countries are primarily based on the extent of severity of the pandemic and availability of data but the exercise can very well be replicated elsewhere. The following are the salient findings.

First and foremost, COVID19 induced fatalities have undoubtedly contributed towards rise in the overall mortality rate in all four countries. The death rate has increased from 8.6 without COVID-19 to 9.5 with COVID-19 in USA, from 10.5 to 11.6 in Italy, 11.0 to 12.1 in Germany and 9.1 to 10.0 in Sweden. Second, the life expectancy has compressed by 0.6 years in USA, 0.5 years each in Italy and Sweden and 0.1 years in Germany. Within a few months, the COVID-19 attributable death share amounts to about 5% each in USA and Italy, 1% in Germany and 6% in Sweden. If this trend of mortality continues till end of the year, reduction in life expectancy would be substantial in these countries. Third, most of the COVID-19 deaths are unwarranted, un timely and premature. COVID-19 attributable deaths have already added 1.5 million, 0.5 million, 0.1 million and 0.06 millions of YPLL in USA, Italy, Germany, and Sweden, respectively. Fourth, with less than 1% infection, the DALY a from COVID-19 was 5.4 per thousand populations in USA, 6.3 in Italy, 1.2 in Germany and 0.6 in Sweden. If the spread of COVID-19 goes unabated, the loss of DALY would be similar to high fatality disease.

These findings are markers of tragedy experienced in countries ranked high in the level of human development, higher income level and are said to be having a better health care system. Hence the failure of preparedness to confront this pandemic by the developed world exposes our vulnerability to emerging infection of similar kind in future. In the absence of a vaccine as well as no systematic medical intervention, the only way out is the containment of its spread or developing a herd immunity in due course. At present great efforts are made by national and local government for management and control of pandemic by diverting the resources (financial and physical) for health care and lock down measures.

We acknowledge that the COVID-19 attributable deaths are to some extent underestimated due to lack of comprehensive testing, under-reporting and misclassification of COVID-19 deaths in these countries. Despite these limitations, these estimates of mortality pattern do signals about its long-term implications towards structural and compositional balance of population across world regions. Though it is very early to gauge its final impact on population structure and composition, its persistence with its virulence unless curbed by introduction of an effective vaccine and means of cure may well change the world order to a significant extent.

Conflict of interest

All authors have indicated no potential conflicts of interest to disclose.

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Table 1: Summary indicators of population and COVID-19 attributable mortality indicators in USA, Italy, Germany and Sweden, 2020

Summary Indicators	USA	Italy	Germany	Sweden
Total Population in million (2020)	331.0	60.5	83.9	10.1
Estimated number of annual deaths without COVID-19 (2020)	2830600	633800	923800	91200
Number of deaths with COVID-19 (As of 20th July)	143504	35058	9168	5639
Total Deaths including deaths due to COVID-19	2974104	668858	932968	96839
COVID-19 death as a share of total deaths as of 20th July 2020	4.8	5.24	0.98	5.82
Case-fatality ratio	3.7	14.33	4.51	7.23
Total number of COVID-19 infection as of 20th July, 2020	3925863	244624	203334	78048
Infection rate	1.2	0.40	0.24	0.77
Estimated Life expectancy without COVID-19 (years)	79.5	83.6	81.5	82.7
Reduction in life expectancy without actual number COVID-19 deaths (in Years)	0.6	0.5	0.1	0.5
Reduction in life expectancy without actual number COVID-19 deaths accounting to 6% (in Years)	0.8	0.6	0.6	0.5
Reduction in life expectancy without actual number COVID-19 deaths accounting to 10% (in Years)	1.2	1.0	1.0	0.9

Table 2: Life expectancy under varying scenarios of COVID-19 attributable mortality in United States of America (USA), 2020

Age group	Life expectancy without COVID-19	Life expectancy at current COVID-19 share of 4.8%	Life expectancy at current COVID-19 share of 6%	Life expectancy at current COVID-19 share of 10%
0-1	79.5	78.9	78.7	78.3
1-4	78.8	78.2	78.0	77.6
5-14	74.9	74.3	74.2	73.7
15-24	65.0	64.4	64.3	63.8
25-34	55.5	54.9	54.7	54.3
35-44	46.2	45.6	45.4	44.9
45-54	37.0	36.4	36.2	35.8
55-64	28.3	27.8	27.6	27.2
65-74	20.5	20.0	19.8	19.4
75-84	13.3	12.8	12.7	12.4
85+	7.6	7.2	7.2	6.9

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Table 3: Life expectancy under varying scenarios of COVID-19 attributable mortality in Italy, Germany and Sweden, 2020

		Italy				Germany				Sweden		
Age Group	Life expectancy without COVID-19	Life expectancy with actual number of COVID-19 deaths (5.2%)	Life expectancy with COVID-19 accounting 6% of total deaths	Life expectancy with COVID-19 accounting 10% of total deaths	Life expectancy without COVID-19	Life expectancy with actual number of COVID-19 deaths (1.0%)	Life expectancy with COVID-19 accounting 6% of total deaths	Life expectancy with COVID-19 accounting 10% of total deaths	Life expectancy without COVID-19	Life expectancy with actual number of COVID-19 deaths (5.8%)	Life expectancy with COVID-19 accounting 6% of total deaths	Life expectancy with COVID-19 accounting 10% of total deaths
0-9	83.6	83.0	82.9	82.6	81.5	81.4	80.9	80.5	82.7	82.2	82.2	81.8
10-19	73.8	73.3	73.2	72.8	71.8	71.7	71.2	70.8	72.8	72.3	72.3	72.0
20-29	63.9	63.4	63.3	62.9	61.9	61.8	61.3	60.9	63.0	62.4	62.4	62.1
30-39	54.1	53.5	53.5	53.1	52.1	52.0	51.5	51.1	53.2	52.7	52.7	52.4
40-49	44.3	43.8	43.7	43.3	42.4	42.3	41.8	41.4	43.5	43.0	43.0	42.7
50-59	34.8	34.3	34.2	33.8	33.1	33.0	32.5	32.1	34.0	33.5	33.5	33.2
60-69	25.7	25.2	25.1	24.7	24.4	24.3	23.8	23.5	24.9	24.4	24.4	24.1
70-79	17.3	16.8	16.8	16.5	16.4	16.3	15.9	15.5	16.7	16.3	16.2	16.0
80-89	10.0	9.7	9.7	9.5	10.3	10.2	9.8	9.6	9.4	9.0	9.0	8.7
90+	5.3	5.1	5.1	4.9	6.2	6.1	5.8	5.6	4.4	4.2	4.1	4.0

Table 4: Estimates of Years of Potential Life Lost (YPLL) under varying scenarios of COVID-19 attributable deaths in USA, 2020

Age Group	YPLL Without COVID-19	YPLL with COVID-19 deaths as of 20th July, 2020	COVID-19 deaths accounting 6% death share	COVID-19 deaths accounting 10% death share	Share of YPLL without COVID-19 deaths	Share of YPLL with COVID-19 deaths as of 20th July, 2020
0-1	1597660	839	1042	1726	2.89	0.04
1-4	528026	740	918	1521	0.96	0.03
5-14	404728	1230	1527	2529	0.73	0.05
15-24	2198402	11959	14837	24546	3.98	0.51
25-34	3408302	54773	67930	112235	6.17	2.33
35-44	3730989	116830	144819	238853	6.76	4.96
45-54	6286116	258926	320727	527736	11.38	11.00
55-64	10504149	482421	597013	979343	19.02	20.49
65-74	10931986	596419	737150	1204162	19.80	25.33
75-84	8940175	486643	600244	973948	16.19	20.67
85+	6686000	343636	422028	674976	12.11	14.60
Total	55216531	1549673	2908234	4741575	100.00	100.00
Rate of PYLL	166.8	7.1	8.8	14.3	NA	NA

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Table 5: Estimates of Years of Potential Life Lost (YPLL) under varying scenarios of COVID-19 attributable deaths in Italy, Germany and Sweden, 2020

	Italy				Germany				Sweden			
	Years of Potential Life Lost (YPLL)				Years of Potential Life Lost (YPLL)				Years of Potential Life Lost (YPLL)			
Age Group	Deaths from all cause Without COVID-19	COVID-19 deaths as of 20th July,2020	COVID-19 deaths accounting 6% death share	COVID-19 deaths accounting 10% death share	Deaths from all cause Without COVID-19	COVID-19 deaths as of 20th July,2020	COVID-19 deaths accounting 6% death share	COVID-19 deaths accounting 10% death share	Deaths from all cause Without COVID-19	COVID-19 deaths as of 20th July,2020	COVID-19 deaths accounting 6% death share	COVID-19 deaths accounting 10% death share
0-9	133698	342	391	648	260760	82	499	828	16540	82	85	141
10-19	59050	0	0	0	100518	145	878	1456	14566	0	0	0
20-29	115037	1043	1193	1976	210517	562	3404	5638	37771	564	581	963
30-39	173066	3637	4157	6879	333591	1209	7310	12093	42579	846	872	1444
40-49	487389	13514	15443	25511	831076	3248	19597	32366	69628	1942	2000	3309
50-59	967170	41852	47805	78789	2013960	10711	64407	106110	136033	5279	5437	8974
60-69	1452848	88846	101417	166583	2534936	21528	128805	211397	234225	9367	9646	15872
70-79	2099375	155492	177342	289998	3584467	33756	200413	326998	337455	19735	20318	33263
80-89	2555570	139435	158893	258690	3593104	41513	243724	394301	297444	20998	21610	35046
90+	830000	32537	37036	59943	981000	10555	61092	97761	100000	6112	6286	10055
Total	8873203	476699	543679	889018	14443930	123310	730129	1188948	1286241	64926	66834	109067
Rate of PYLL	146.8	7.9	9.0	14.7	172.4	1.5	8.7	14.2	127.4	6.4	6.6	10.8

Table 6: Estimates of DALY under varying scenarios of COVID-19 in USA, 2020

	DALY			DALY per 1000 Population		
Age Group	COVID-19 deaths as of 20th July, 2020	COVID-19 deaths accounting 6% death share	COVID-19 deaths accounting 10% death share	COVID-19 deaths as of 20th July,2020	COVID-19 deaths accounting 6% death share	COVID-19 deaths accounting 10% death share
0-1	342	425	708	0.07	0.09	0.14
1-4	303	377	628	0.02	0.03	0.04
5-14	524	652	1086	0.01	0.02	0.03
15-24	5650	7026	11710	0.13	0.16	0.27
25-34	28810	35826	59709	0.61	0.76	1.27
35-44	66453	82633	137722	1.59	1.97	3.29
45-54	161056	200272	333786	3.96	4.93	8.21
55-64	333419	414604	691007	7.90	9.82	16.37
65-74	458616	570286	950477	14.25	17.73	29.54
75-84	416425	517822	863036	25.72	31.99	53.31
85+	324939	404059	673432	48.60	60.43	100.72
Total	1796537	2233981	3723302	5.4	6.7	11.2

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Table 7: Estimate of DALY under varying scenarios of COVID-19 in Italy, Germany and Sweden, 2020

		Italy						Germany						Sweden				
	DALY			DALY per 1000 Population			DALY			DALY per 1000 Population			DALY			DALY per 1000 Population		
Age Group	COVID-19 deaths as of 20th July,2020	COVID-19 deaths accounting 6% death share	COVID-19 deaths accounting 10% death share	COVID-19 deaths as of 20th July,2020	COVID-19 deaths accounting 6% death share	COVID-19 deaths accounting 10% death share	COVID-19 deaths as of 20th July,2020	COVID-19 deaths accounting 6% death share	COVID-19 deaths accounting 10% death share	COVID-19 deaths as of 20th July,2020	COVID-19 deaths accounting 6% death share	COVID-19 deaths accounting 10% death share	COVID-19 deaths as of 20th July,2020	COVID-19 deaths accounting 6% death share	COVID-19 deaths accounting 10% death share	COVID-19 deaths as of 20th July,2020	COVID-19 deaths accounting 6% death share	COVID-19 deaths accounting 10% death share
0-9	134	153	255	0.03	0.03	0.05	31	192	319	0.00	0.02	0.04	31	32	54	0.00	0.00	0.01
10-19	0	0	0	0.00	0.00	0.00	63	382	637	0.01	0.05	0.08	0	0	0	0.00	0.00	0.00
20-29	529	605	1009	0.09	0.10	0.17	269	1644	2739	0.03	0.18	0.29	269	277	462	0.03	0.03	0.05
30-39	1901	2176	3626	0.27	0.31	0.52	642	3921	6535	0.06	0.36	0.60	447	461	768	0.04	0.04	0.07
40-49	7694	8807	14679	0.85	0.98	1.63	1878	11469	19115	0.18	1.12	1.87	1118	1152	1921	0.11	0.11	0.19
50-59	26547	30388	50647	2.77	3.18	5.29	6867	41929	69882	0.51	3.11	5.18	3387	3489	5816	0.25	0.26	0.43
60-69	63329	72494	120823	8.46	9.69	16.14	15371	93854	156424	1.44	8.82	14.70	6748	6953	11588	0.63	0.65	1.09
70-79	124638	142675	237791	20.67	23.66	39.44	26841	163885	273142	3.59	21.93	36.56	15974	16459	27432	2.14	2.20	3.67
80-89	124464	142476	237460	33.65	38.52	64.20	36029	219986	366644	7.36	44.95	74.92	19120	19701	32834	3.91	4.03	6.71
90+	31375	35915	59859	37.80	43.27	72.12	9753	59551	99252	9.94	60.70	101.17	6110	6295	10492	6.23	6.42	10.70
Total	380609		726149	6.29	7.21	12.01	97745	596814	994691	1.17	7.12	11.87	53204	435689	91367	0.64	**0.65**	**1.09**

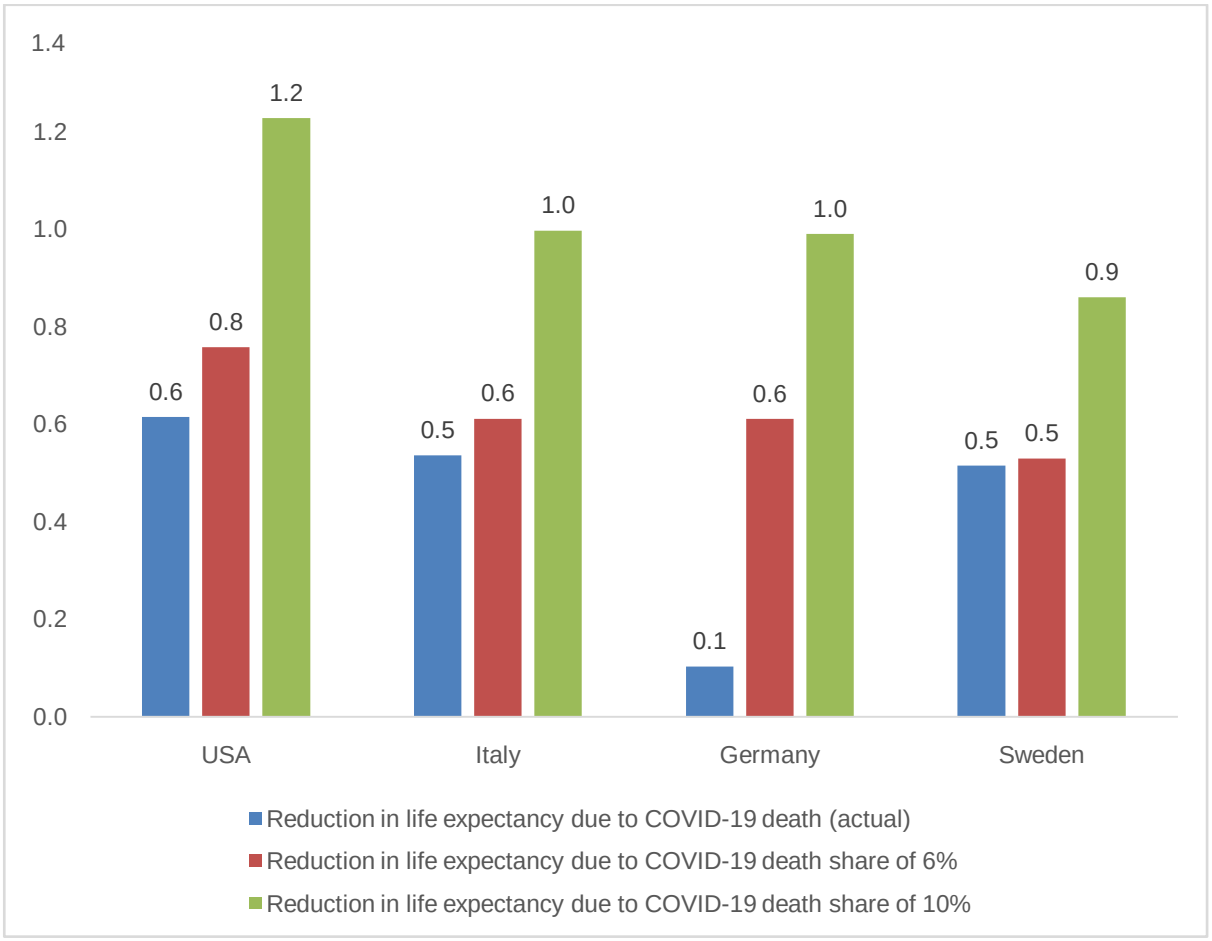


Figure 1: Reduction in Life Expectancy at Birth due to COVID-19 attributable deaths in USA, Italy, Germany and Sweden, 2020

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