Clinical Epidemiology and Global Health 26 (2024) 101488

Contents lists available at ScienceDirect

Clinical Epidemiology and Global Health

journal homepage: www.elsevier.com/locate/cegh

Development of a Web-based calculator to estimate DALY and Productivity Losses due to COVID-19

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ARTICLE INFO

Keywords:
Disability-adjusted life years
Cost of productivity lost
Years of potential productive life lost
Value of statistical life

ABSTRACT

Objectives: Ever since the emergence of COVID-19, health and the economy worldwide have witnessed a severe disruption, with infection spreading rapidly, covering 231 countries as of May 07, 2023. Policymakers and Governments have been working to offer tailored interventions to the most vulnerable cohorts. Given this background, the paper involves description towards developing a Web-based Calculator to compute various estimates that quantify health economic impacts as these are much helpful than just mortality and simpler measures.
Methods: The computations required to determine the estimates and the variables involved have been picked based on the observations and literature. The manuscript presents the significance of the estimates, a description of the Calculator developed, followed by validation. The values estimated using Calculator were validated against those computed using formulas for the state of West Bengal, India.
Results: The results indicated that the Calculator is able to produce near accurate results with the highest error percentage witnessed for Cost of Productivity Lost due to Absenteeism as 0.946%. Error percentages for Disability-Adjusted Life Years was 0.175, and less than 0.1 for all other estimates.
Conclusions: This could prove to be an effective tool for the policymakers and practitioners to identify the long-term impacts and the most vulnerable cohorts and devise targeted interventions. Additionally, these tools will allow the policymakers and governments to save time in compute these estimates in the future.

1. Introduction

COVID-19 has tormented the population health, healthcare systems and economies around the globe since its onset in December 2019. The pandemic has spread across 231 countries as of May 07, 2023, claiming 6,870,879 lives with 687,724,379 incidences and 660,201,450 recoveries.[1] Such huge high-impact events need to be quantified to understand the magnitude of economic losses incurred.[2] Measures such as Burden of Disease (BoD) measures, productivity loss, and Value of Statistical Life (VSL) help to quantify the impact of such events or diseases and to identify the most vulnerable cohorts for targeted interventions and policymaking.[3,4] This is essential to cut down the losses incurred in health and economy for future pandemics.

Disability-Adjusted Life Years (DALY) is one of the most widely adopted public health measures that was developed for the Global Burden of Disease and Injury (GBD)[5] study jointly by the World Health Organization (WHO), Harvard School of Public Health, and the World Bank.[2,3,6] The associated productivity losses could be computed using Years of Potential Productive Life Lost (YPLL) and Cost of Productivity Lost (CPL). The former measure computes the productive years lost, while the latter has sub-components to quantify permanent and temporary losses in terms of cost. The aforementioned alongside Years of Potential Life Lost (YPLL), Premature Years of Potential Life Lost (PYPLL), Working Years of Potential Life Lost (WYPLL), and Value of

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https://doi.org/10.1016/j.cegh.2023.101488
Received 14 June 2023; Received in revised form 23 November 2023; Accepted 14 December 2023
Available online 6 January 2024

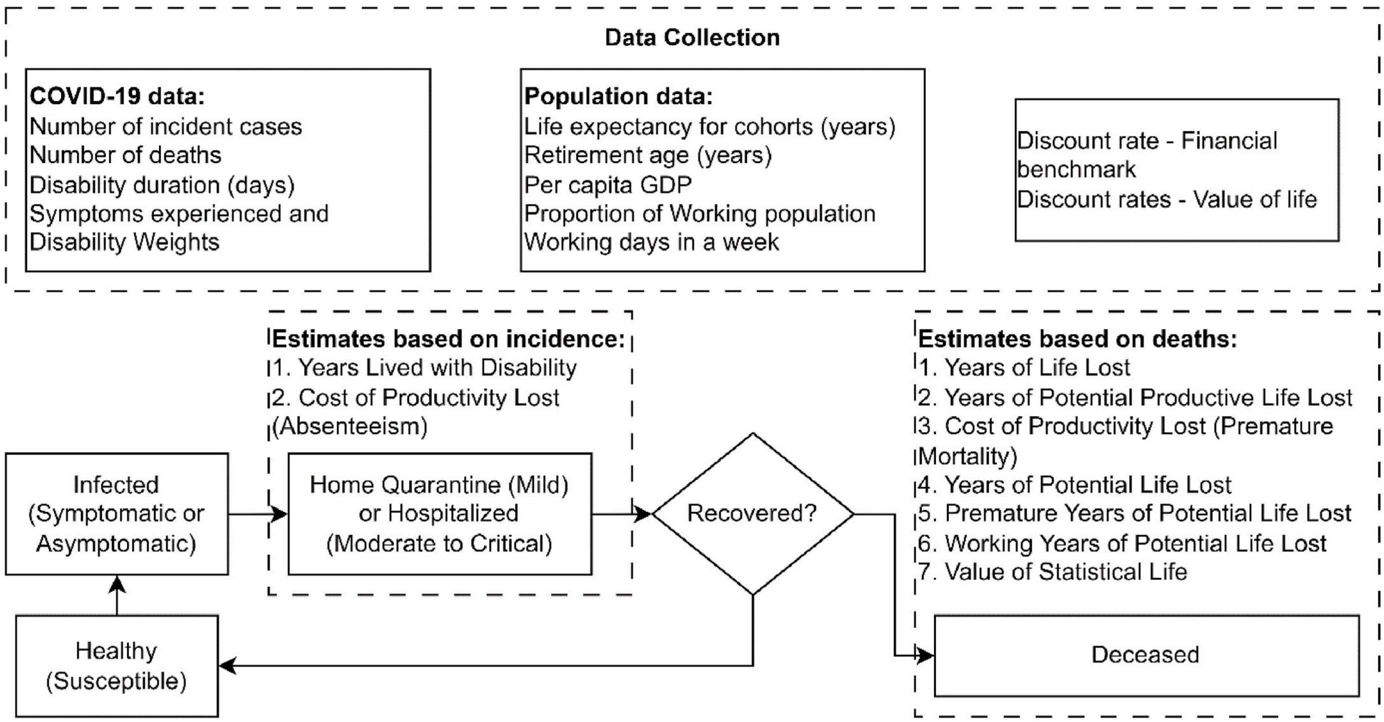

Fig. 1. Estimates and the trajectory of infection.

Statistical Life (VSL) help to quantify the losses and identify the potential cohorts contributing more to the losses. This is important as the disease has unequally impacted certain groups, including healthcare workers, comorbid people, etc. YPLL measures the life lived without the occurrence of the event compared with the life expectancy. Deaths at younger age groups are assigned higher weights and vice versa. PYPLL assesses

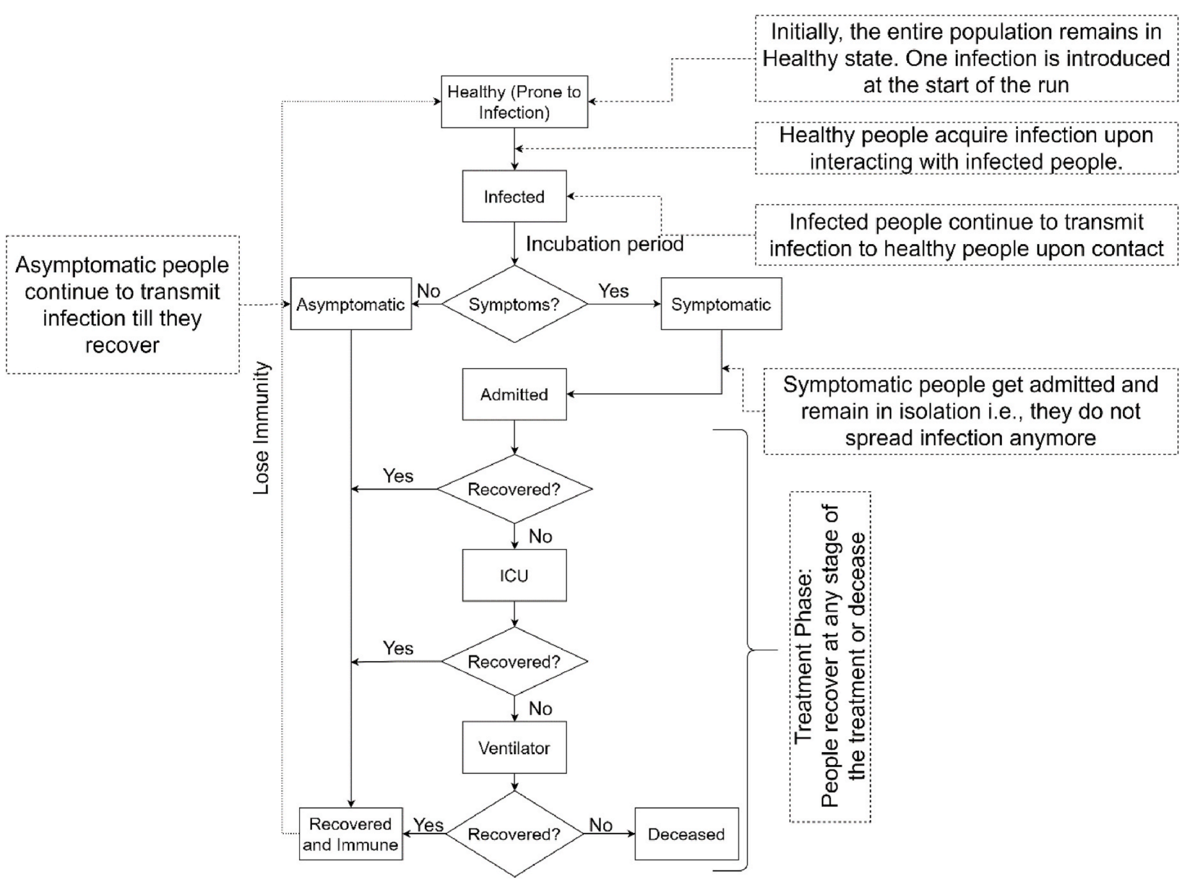

Fig. 2. State chart of SHIVIR model.

premature death's social and economic impacts, considering the upper slab based on the study objective(s). WYPLL represents the working years lost by assigning a fixed weight for people before 15 years and varied weight for others, based on the difference between the upper age slab and mid-point of the cohort.[3,7] As policymaking needs to balance multiple dimensions like health, economy, and society considering these estimates, VSL was computed as the trade-off between survival and earning.[3,4,8] These estimates would interest policymakers, healthcare researchers, and practitioners to work alongside to devise tailored interventions. Additionally, it helps to understand the long-term impacts and most vulnerable cohorts. Also, the presence of a methodical guideline to compute these estimates might be helpful for the stakeholders.

With this background, the present study aims to present a step-by-step methodology to compute the above-mentioned estimates. DALY, YPPLL, CPL, YPLL, PYPLL, WYPLL, and VSL for COVID across the countries globally and various states of India. A web-based calculator has been developed to assist policymakers and researchers in instantaneously determining the estimates and measuring the population-level impact and impact on various cohorts. The Calculator has the flexibility to compute estimates of age-gender cohorts, i.e., for males and females of each age group defined by the user, which enhances its practical usefulness. The inputs that would be required and the trajectory of infection with respect to the estimates are presented in Fig. 1.

2. Research methodology

The methodology adopted could be majorly deconstructed into demographical and epidemiological parameters. The former changes with the population characteristics and location being studied, while the disease dynamics govern the latter. Some of the important aspects are discussed successively:

2.1. Study area

Defining the geographical scope of the study and target population is primarily essential. This forms the basis for the definition of several demographic as well as epidemiological parameters pertaining to the population.

2.2. Longitudinality

Defining the tenure of the study is needed to capture time series data, including incidence, deaths, and hospitalized cases. Also, the time step to be chosen depends on the data availability. Largely, the epidemiological data of COVID-19 are captured on a daily basis.

2.3. Disease model

A disease model explains the progress of the disease across various states. A state chart is used to represent the disease model with all possible states of the existence of an infected person. Any infected individual could be mapped to one and only one of these states at any point in time. The transition between the states and duration of existence is purely based on the disease's influence on several population cohorts. Outcome-based disease models distinguish the levels of severity of COVID-19.[9] The State Chart indicating various states of the SHIVIR model is presented in Fig. 2.[9] Several other models developed include the Susceptible (S), Exposed (E), Symptomatic (I), Purely Asymptomatic (P), Hospitalized or Quarantined (H), Recovered (R) and Deceased (D) (SIPHERD) by Mahajan et al. (2020),[10] Susceptible (S), Exposed (E), Infective (I), and Recovered (R) (SEIR) model by Zhang & Jain, (2020),[11] other Susceptible (S), Infective (I), and Recovered (R) based, Agent-based,[9] and mathematical models.[11]

Table 1
Data collected and definitions.

Parameter	Definition
Number of cases	Total number of incidence/infections due to the disease i.e., COVID-19.
Number of deaths	Total number of deaths due to the disease i.e., COVID-19.
Proportion of mild cases	Cases that are asymptomatic/mild; do not require hospitalization. They experience the least symptoms than other cohorts. They can be quarantined at houses/health centers.
Proportion of moderate cases	Cases that require hospitalization. Additional disabilities, as compared to mild cases, could be attributed to these cases.
Proportion of critical cases	Cases that require critical care in hospitals. They represent the population with the highest disability. External oxygen support equipment might be required.
Time to recovery for mild and moderate cases	The duration between acquiring the disease and recovery. It might include either period of home isolation or a stay in the hospital.
Time of stay in critical care	Duration of stay in ICU or under external oxygen support.
Disability weights of the symptoms experienced	Disability weights indicate the level of disability associated with each symptom experienced by an infected individual.
Isolation period post-recovery	Quarantine is required after being tested negative/recovery. This translates to an additional burden post-recovery (Assumption to enact Sensitivity Analysis).
Reduction in Life expectancy due to incidence	Incidence of the disease shortens the life expectancy (Assumption to enact Sensitivity Analysis).
Total population	People of all age groups within the scope of study in the location being studied.
Proportion of working population	Proportion of people from the total population who are employed and fall within the productive age groups.
Life expectancy at the age of death	Additional duration for which a person would have lived in the absence of premature mortality due to disease.
Discount rate for value of life	It is a measure used to indicate the risk at the workplace by trading-off health and the economy.
Discount rate (Financial benchmark)	A measure that gives the present value of future cash flows.
Age of retirement	Signifies the upper slab of the productive age group. Used to compute productivity losses.
Work days in a week	Number of productive days in a calendar week.
Per capita Net Domestic Product	Indicates the capital consumed by an individual in a year.

3. Data collection

Data collection plays a vital role as the availability, accessibility, quality, and accuracy of data influence the reliability of the estimates. Also, the data gathered need to be fit as per the disease model failing which both have to be tuned to be synchronous with each other. Data could be gathered from peer-reviewed articles, grey literature, online reports and articles, government websites, preprint repositories, hospital observations, etc. Collecting data to the lowest level possible would yield specific results for various cohorts distinguished by age, gender, work status, location, etc. However, assumptions are to be made clearly in cases of data unavailability or inadequacy. Studies make assumptions; some of them made by John et al. (2021, 2023) include considering the same disability duration for male and female cohorts of a given age group, the retirement age of all working populations to be the same, the number of working days for all employees to be the same, etc. These lower-level estimates augment tailored interventions that are of interest to the policymakers. This also allows drawing inferences on the effect of each variable based on which data are distinguished. The collected data must be representative of the population/region being studied with respect to time. Various demographic and epidemiological data required to compute the estimates have been tabulated (Table 1):

3.1. Disability-adjusted life-years

DALY, one of the prominently used public health measures, is calculated as the sum of Years Lived with Disability (YLD) and Years of Life Lost (YLL).[12,13] The former component explains the loss due to deaths, while the latter explains the loss due to incidence. The number of cases, which is one of the primary inputs for DALY, could be obtained using three approaches, viz., direct, attribution, and transition approaches. Given that the developed model is an outcome-based model, a direct approach/incidence-based approach in which the data would be available either in totality or based on age, gender, and other features is appropriate. Considering the DW of different symptoms experienced by the patients could bring in the influence of multimorbidity, thereby enhancing accuracy.[12] The Combined Disability Weights (CDW) could be determined by maximum limit, multiplicative, and additive approaches as in equations (4)–(6).[12] A major proportion of the DALYs are shared by YLL, which increases due to the younger population's higher mortality rate and/or higher mortality.

$$YLD = \frac{I * DW * D\,(1 - e^{-rD})}{r} \tag{1}$$

where r = Discount for value of life; D = Disability duration (Time to recovery in years); I = Number of cases

$$YLL = \frac{N}{r}\,(1 - e^{-rL}) \tag{2}$$

where L = Life expectancy at the age of death (years); N = number of deaths.

$$DALY = YLL + YLD \tag{3}$$

$$Dw_{ij} = DW_i + DW_j + \ldots + DW_n \tag{4}$$

$$DW_{ij} = 1 - (1 - DW_i) * (1 - Dw_j) * \ldots * (1 - Dw_n) \tag{5}$$

$$DW_{ij} = \max\,(DW_i, DW_j, \ldots, DW_n) \tag{6}$$

where 'i', 'j', and 'n' indicate the various disabilities.

3.2. Productivity Losses (YPPLL and CPL)

YPPLL and CPL estimates due to an event determine the productivity losses considering the productive years a person would have lived otherwise. Therefore, only those cohorts that represent the working population are to be used to compute these estimates. The minimum employment and retirement age denote the lower and upper slabs for the productive population. The temporary and permanent loss components of CPL are due to absenteeism and premature mortality, respectively. They are often computed using the human capital approach.[14]

$$YPPLL = \sum_{i=1}^{n} D_i * w_i * d \quad \Big| \quad i = 1, 2, \ldots, n \tag{7}$$

where 'i' iterates over 'n' cohorts; D_i = Number of deaths 'i'th cohort; w_i = Productive years remaining at the age of death. Calculated as the difference between the cohort's retirement age and midpoint age 'i' (years); d = Discount rate (Financial Benchmark). The discount rate is inapplicable to the first year.[15]

$$CPL = \sum_{j=1}^{J} YPPLL_j * \text{ per capita GDP} * P \tag{8}$$

$$CPL_{absenteeism} = \sum_{j=1}^{J} S * L_j * N_j * P_j \tag{9}$$

where S = daily salary; L_j = time to recover in 'j'th cohort; N_j = Incident cases in 'j'th cohort; P_j = proportion of the working population in 'j'th cohort.[16,17]

3.3. Years of Potential Life Lost

YPLL indicates the period for which an individual would have lived in the absence of an external event. It is calculated based on life expectancy giving lower priorities to old-age deaths and vice versa.

$$YPLL = \sum_{i=0}^{\infty} d_i \times L_i \tag{10}$$

where L_i is the life expectancy at age 'i' and d_i is the number of deaths in 'i'th cohort.

$$\text{Standardised } YPLL = YPLL \times \frac{P_{i,r}}{N_r} \times \frac{N}{P_i} \tag{11}$$

$P_{i,r}$ is the population in 'i'th cohort and N_r is the overall population being studied. P_i is the population infected in the 'i'th cohort, and N is the infections in the overall population.

3.4. Premature Years of Potential Life Lost

PYPLL explains the social and economic impacts brought about by an event in the form of premature deaths. The upper age limit depends on the purpose of the study. Life expectancy is considered in the present study.

$$PYPLL = \sum_{i=0}^{U} d_i \times (U - i) \tag{12}$$

d_i is the death at 'i'th age, and U is the upper age limit. U is chosen based on the average life expectancy of the population.

$$\text{Standardised } PYPLL = PYPLL \times \frac{P_{i,r}}{N_r} \times \frac{N}{P_i} \tag{13}$$

$P_{i,r}$ is the population in 'i'th cohort and N_r is the overall population below U. P_i is the population affected in the 'i'th cohort, and N is the overall infected population below U.

3.5. Working Years of Potential Life Lost

WYPLL refers to the losses incurred by the working population. Deaths of people aged below 15 carry a fixed weight, 'W', while those for the other age groups are the difference between the upper age limit and the midpoint of the age group considered.

$$WYPLL = \sum_{i=0}^{U} d_i \times (R - W) + \sum_{i=0}^{U} d_i \times (R - i) \tag{14}$$

Where d_i is the deaths in 'i'th age, R and W are the upper and lower slabs for the working population.

$$\text{Standardised } WYPLL = WYPLL \times \frac{P_{i,r}}{N_r} \times \frac{N}{P_i} \tag{15}$$

$P_{i,r}$ is the population in 'i'th cohort and N_r is the overall population studied. P_i is the infected population in 'i'th cohort, and N is the overall infections in the population.

3.6. Value of Statistical Life

VSL presents the rate of substitution between the survival possibility and earning. This is of much importance for governments to perform risk monetization and cost-benefit analysis as the measures consider health risk at the workplace based on the nature of work and personal attributes.[8] The Value of Statistical Year and hence the VSL are computed as follows:

$$VSLY_i = VSL_p / L_i \tag{16}$$

$$VSL = \sum_{i=1}^{U} YPLL_i \times VSLY_i \tag{17}$$

Where VSL_p is the VSL of the population, $VSLY_i$ is the Value of Statistical Year of 'i'th cohort. However, the policymaking based on VSL and its Cost-benefit Analysis lacks grounding. The VSL estimates captured using the Value of Statistical Life Years (VSLY), population average, and textbook have differences. The textbook value is counterintuitive as richer individuals are assigned a higher risk reduction, and the population average treats all age groups equally.[8]

4. Data validation

Acquiring data from trusted online websites, reports, official bulletins, published works, etc., could enhance the authenticity of the estimates.[4,5,7,14,18–25] Using rational, accepted techniques to compute the values supplements the accuracy of the estimates.[2,14,15] Standard approaches to include the effect of multimorbidity promotes accuracy by the inclusion of a range of symptoms experienced.[13] Research by Rumisha et al. (2020), Wyper et al. (2021), Etheridge & Spantig (2020), and Dubey & Mohanty (2014) were much useful in computing the estimates.[7,21,26,27] The CDWs were derived based on the suggestions by Hilderink et al.[13] The value of life and discount rate for finance were used as given by Shanmugam[28] and the Reserve Bank of India (RBI), respectively.

5. Public involvement

The methodology explained in this paper requires the use of secondary data. Hence, the involvement of the public/patients might not be essential for any of the phases of research.

6. Web-based calculator

The DALY and productivity losses assist policymakers in quantifying the impact of COVID-19 on the population. Some of the characteristics of the Calculator are discussed subsequently:

i. The Calculator allows the users to enter the variables separately for each age-gender cohort so as to determine and identify the most vulnerable ones to devise suitable intervention strategies.
ii. Though DALY is computed based on an incidence-based approach in the Calculator, its ability to capture specifics such as the number of cases, deaths, disability duration, and life expectancy for each age-gender cohort separately makes it possible for the policymakers to define different values of the variables for the cohorts of different levels of severity. i.e., the DALY estimates for mild, moderate, and critical patients can be computed by entering their respective incidence, deaths, and disability duration.
iii. Users can specify the symptoms experienced by the patients from the following: Cough, Fever/Chills, Shortness of breath, Myalgia, Diarrhea, Nausea/Vomiting, Sore throat, Headache, Chest pain, Abdominal pain, and Altered mental status/Confusion. The aforementioned symptoms are the ones experienced by people infected with COVID-19.[27]
iv. Weighted scores are given to the DWs based on the proportion of people who were reported to have experienced each symptom.
v. CDWs are computed based on the chosen method presented in equations (4)–(6).

Calculation of productivity losses involves the following:

Table 2
DALY (YLD and YLL), YPLL, standardized YPLL, and VSL.

Age	Deaths		Cases		Life Expectancy	Life Expectancy (Male)	Population	Disability days	YLL (Discounted)		YLD		DALY		YPLL (Male)	Standardized YPLL (Male)	VSL (INR million) (Male)
	Male	Female	Male	Female					Male	Female	Male	Female	Male	Female			
0–15	38	22	45,744	38,260	71.65	70.7	11,745,401	15.13	1146.3	663.6	20.25	16.94	1166.5	680.6	2686.60	12197.04	1697.90
16–30	194	144	160,102	188,113	59.05	58	15,574,298	13.64	5482.7	4069.6	57.61	67.68	5540.3	4137.3	11252.00	19353.49	8675.30
31–45	1042	507	256,164	205,648	44.8	43.7	12,004,110	14.29	26130.8	12714.3	101.16	81.21	26232.0	12795.5	45535.40	37729.31	46582.70
46–60	3217	1928	199,442	192,895	30.85	30	7,916,504	14.21	65587.9	39307.9	77.88	75.32	65665.8	39383.2	96510.00	67734.04	143799.90
61–75	5269	2994	185,719	134,708	18.55	17.9	3,673,672	15.85	75593.1	42954.2	90.22	65.44	75683.3	43019.6	94315.10	32987.02	235504.80
75+	2614	1895	67,700	37,463	8.95	8.6	827,870	14.63	20605.7	14937.9	28.02	15.51	20633.7	14953.4	22480.40	4860.66	116830.60
							Using Formula		194546.4	114647.6	375.14	322.10	194921.6	114969.7	272779.50	174861.58	553091.20
							Calculator		194868.6	114848.8	375.14	322.10	195243.7	115170.9	272779.5	174861.4	553091.28
							Error Percentage		0.17	0.18	0	0	0.17	0.18	0.06	0.000106	1.46E-05

Table 3
YPPLL and CPL (premature mortality and absenteeism).

Age	Midpoint age	Working population (%)	Cases	Disability Duration	Deaths	YPPLL	CPL – Premature Mortality	CPL – Absenteeism
16–30	23	21.25	188,113	13.64	144	1190.76	30680760.97	182870088.1
31–45	38	31.55	205,648	14.29	507	4654.07	178050116.85	310833606.6
46–60	53	29.39	192,895	14.21	1928	10513.53	374754672.43	270017191.3
					Using Formula	16358.37	583485550.26	763720886.1
					Calculator	16358.372	583454983.12	756493399.6
					Error Percentage	2.04213E-07	0.005	0.946

Table 4
PYPLL, standardized PYPLL, WYPLL, and standardized WYPLL.

Age	Cases	Deaths	Population	Mid-Pt Age	PYPLL	Standardized PYPLL	WPYPLL	Standardized WYPLL
0–15	45,744	38	11,745,401	7.5	2396.68	10239.58	1706.50	6135.21
16–30	160,102	194	15,574,298	23	9249.98	14972.18	7175.03	9772.82
31–45	256,164	1042	12,004,110	38	34089.49	26580.70	22934.83	15048.49
46–60	199,442	3217	7,916,504	53	56937.27	37605.16	22517.56	12514.80
61–72	185,719	5269	3,673,672	66.5	22129.64	7283.71		
			Using Formula		124803.06	96681.33	54333.92	43471.32
			Calculator		124799.5	96698.26	54,331	43481.55
			Error Percentage		0.0028	0.0175	0.005	0.023

i. For YPPLL estimation, users are required to enter the retirement age, number of deaths, and discount rate for the required age group.
ii. The discount rate is applicable to all the years, excluding the first year during the computation of YPPLL.
iii. In addition to the values entered for computation of YPPLL, per capita GDP and proportion of the working population are required to compute the CPL due to premature mortality.
iv. For CPL, due to absenteeism, the number of working days and disability duration is additionally required.
v. The total population and the total population affected by the disease in the cohort being studied, the number of deaths and life expectancies are required to compute YPLL, PYPLL, and WYPLL.
vi. The Value of Statistical Year is required to compute VSL.

7. Validation based on calculator

To validate the methodology employed and the working of the Calculator, the estimates were computed using the formulas presented in equations (1)–(17) in Excel according to the original source paper to ensure consistency of outputs and also using the calculator.[3] The data considered by John et al. (2023) to compute the estimates for West Bengal were used for validation. The following tables provide the data used for computing the estimates, the values obtained using the formula, Calculator, and the difference between the computed values. The differences between the values computed in Tables 2–4 are negligibly small and associated with rounding off decimal places. Table 2 shows the overall DALY computed for Male and Female cohorts, YPLL, Standardized YPLL, and VSL for Male cohorts. YPPLL, CPL – Premature Mortality and CPL – Absenteeism in Table 3 are for Female cohorts, whereas the estimates in Table 4 are for Male cohorts. A screenshot of the computation using the Calculator are provided in Fig. 3 as an example. All other computations with screenshots have been uploaded onto the link https://osf.io/4w72v/?view_only=46e7b450f2bf4eeda798dd727dcb93ac. The Web-based Calculator can be accessed at http://coviddaly.cphr-mant.org/index.php.

8. Future directions

We will continue to work on our DALY calculator to extend to other diseases such as cardiovascular diseases, oral cancer, and mental illness, which is currently underway.

9. Implications

While other calculators exist for calculating DALYs none are able to estimate to estimate the complex disease pathway involving COVID-19 (see Fig. 1).[6,28,29] While previous calculators have used web-based interfaces which are user-friendly,[6,29] ours is the only calculator for use for COVID-19 but also it various extensions such as YPPLL, CPL, YPLL, PYPLL, WYPLL, and VSL.

Economic evidence, such as incremental cost-effectiveness ratios, can be used to prioritize resource allocation decisions. To improve comparability across studies in various disease areas the practice guidelines in economic evaluations recommend using generic measures of health outcomes, such as quality-adjusted life years (QALYs) or disability-adjusted life years (DALYs). The DALY, a measure of disease burden that captures both reductions in life expectancy and quality of life due to disability, has been increasingly used in economic evaluations, particularly studies for India and other low-middle income countries (LMICs). However, many studies still measure and report the study findings in the disease-specific units, such as COVID-19 cases averted, limiting the comparability of study findings across disease areas. (e.g., which intervention is more cost-effective: $100 per COVID-19 case averted vs. $100 per TB case averted?).

A decision-maker, particularly in India and other LMICs where data scarcity is a common problem, would like to use all of the existing information in their resource prioritization. To help this process, we developed a tool that can convert COVID-19 health outcomes expressed in non-DALY metrics (e.g., cases or deaths averted) into DALYs. Converted DALY measures can then be used to compare cost-effectiveness ratios of interventions comparing COVID-19 and across different disease areas.

10. Limitations

The web-based calculator was developed using data available from published sources. However, it might be that data will not be available. For example, in our paper estimating DALYs for COVID-19 in Kerala we had to assume that the percentage deviations in the distribution of cases for each age–gender cohort in India for 2020 and 2021 and those of Kerala were assumed to be similar (2). In cases of missing data of certain input values for a particular state in Kerala or any other country suitable assumptions will need to be made.

The study has used the human capital approach and taken into account the impact of multimorbidity depending on the different

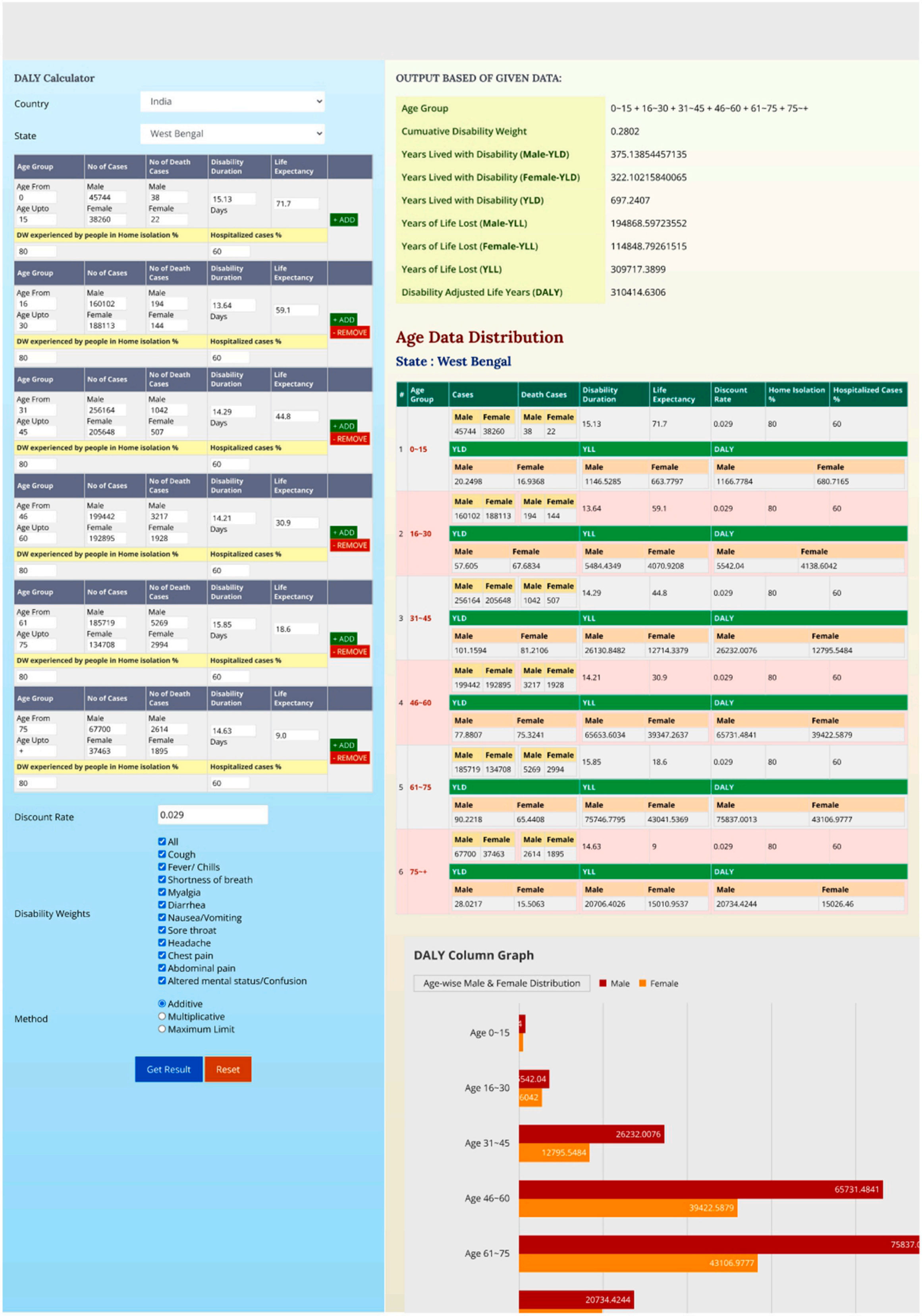

Fig. 3. Screenshot of DALY (YLD and YLL).

symptoms encountered. For the purpose of calculating DALY, three different approaches to calculating CDW have been considered. The cohorts producing greater financial losses can be identified with the aid of productivity losses like YPPLL and CPL brought on by early mortality and morbidity. While WYPLL and VSL provide work-related losses, YPLL and PYPLL give losses based on life expectancies. VSL facilitates decision-making by clarifying the health risks connected with labour and the corresponding income. The availability of data and the reliability of the sources determine the estimates' accuracy and level of detail. The report also explains the necessary inputs and how they are used to calculate these estimations. It is important to take into account the difference in Kaldor-efficiency Hick's between CBA and VSL since the former highlights Pareto superiority while the latter gauges willingness to pay. Because of this ideological disparity, results for higher risks, such as COVID-19,[8] may be erroneous. This could be useful when utilising the web-based calculator to calculate estimates instantly.

11. Conclusions

The current work offers a logical procedure and an explanation of a web-based calculator that can be used to calculate COVID-19 productivity losses and DALYs. Rather than depending solely on mortality and less complex metrics, politicians, academicians, and others may find this to be a useful tool in carefully predicting the long-term effects and identifying the critical/vulnerable cohorts that contribute more to the losses. The use of the web-based calculators free up more time for governments and policymakers to address crisis circumstances more effectively by cutting down on the time they need to calculate estimates and develop analytical approaches. When diseases or occurrences occur often within a community and require specialised care, these techniques may come in useful.

Funding

No funding was received for conducting this study.

Author contributions

The conception and design of the study, acquisition of data, or analysis and interpretation of data –; DJ, MSN, PB, NM, JM, AB.

Drafting the article or revising it critically for important intellectual content – MSN, DJ, PB, NM, AB, JM.

Final approval of the version to be submitted – DJ, JM, AB.

Ethical statement

The study has been conducted using publicly available data. No ethical approvals were sort for this study.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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