

Supplementary Materials for

Indirect impact of COVID-19 pandemic on health and wellbeing: a narrative review

Teresa Valero-Gaspar, Cesar Garriga, Brigid Unim, Rodrigo Feteira-Santos, Luigi Palmieri, Asunción Díaz, Carmen Rodríguez-Blázquez and Maria João Forjaz

Corresponding author:

Brigid Unim, Dipartimento Malattie Cardiovascolari, Endocrino-Metaboliche e Invecchiamento, Istituto Superiore di Sanità, Via Giano della Bella 34, 00162 Rome, Italy. E-mail: brigid.unim@iss.it.

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Supplementary Material S1. PubMed search strategies

Burden of disease

((“COVID-19”[All Fields] OR “COVID-19”[MeSH Terms] OR “COVID-19 Vaccines”[All Fields] OR “COVID-19 Vaccines”[MeSH Terms] OR “COVID-19 serotherapy”[All Fields] OR “COVID-19 serotherapy”[Supplementary Concept] OR “covid 19 nucleic acid testing”[All Fields] OR “covid 19 nucleic acid testing”[MeSH Terms] OR “covid 19 serological testing”[All Fields] OR “covid 19 serological testing”[MeSH Terms] OR “covid 19 testing”[All Fields] OR “covid 19 testing”[MeSH Terms] OR “sars cov 2”[All Fields] OR “sars cov 2”[MeSH Terms] OR “Severe Acute Respiratory Syndrome Coronavirus 2”[All Fields] OR “NCOV”[All Fields] OR “2019 NCOV”[All Fields] OR (“coronavirus”[MeSH Terms] OR “coronavirus”[All Fields] OR “COV”[All Fields])) AND (“impact*”[All Fields] OR “impactful”[All Fields] OR “impacting”[All Fields]) AND (“indicator*”[All Fields] OR “health status indicator*”[All Fields] OR “Health Status Indicators”[MeSH Terms] OR “Health Status”[MeSH Terms]) AND (“Global Burden of Disease”[All Fields] OR “Global Disease Burden”[All Fields] OR “disease burden global”[All Fields] OR “Global Disease Burdens”[All Fields]) AND 2021/01/01:2022/11/30[Date - Publication] AND (2021:2022/11[pdat])

Life expectancy

((“COVID-19”[All Fields] OR “COVID-19”[MeSH Terms] OR “COVID-19 Vaccines”[All Fields] OR “COVID-19 Vaccines”[MeSH Terms] OR “COVID-19 serotherapy”[All Fields] OR “covid 19 nucleic acid testing”[All Fields] OR “covid 19 nucleic acid testing”[MeSH Terms] OR “covid 19 serological testing”[All Fields] OR “covid 19 serological testing”[MeSH Terms] OR “covid 19 testing”[All Fields] OR “covid 19 testing”[MeSH Terms] OR “sars cov 2”[All Fields] OR “sars cov 2”[MeSH Terms] OR “Severe Acute Respiratory Syndrome Coronavirus 2”[All Fields] OR “NCOV”[All Fields] OR “2019 NCOV”[All Fields] OR “coronavirus”[MeSH Terms] OR “coronavirus”[All Fields] OR “COV”[All Fields]) AND (“Global Burden of Disease”[Title/Abstract] OR “Global Disease Burden”[Title/Abstract] OR “disease burden global”[Title/Abstract] OR “Global Disease Burdens”[All Fields] OR “dalys”[All Fields])

Quality of life

((“COVID-19”[All Fields] OR “COVID-19”[MeSH Terms] OR “COVID-19 Vaccines”[All Fields] OR “COVID-19 Vaccines”[MeSH Terms] OR “COVID-19 serotherapy”[All Fields] OR “COVID-19 serotherapy”[MeSH Terms] OR “covid 19 nucleic acid testing”[All Fields] OR “covid 19 nucleic acid testing”[MeSH Terms] OR “covid 19 serological testing”[All Fields] OR “covid 19 serological testing”[MeSH Terms] OR “covid 19 testing”[All Fields] OR “covid 19 testing”[MeSH Terms] OR “sars cov 2”[All Fields] OR “sars cov 2”[MeSH Terms] OR “Severe Acute Respiratory Syndrome Coronavirus 2”[All Fields] OR “NCOV”[All Fields] OR “2019 NCOV”[All Fields] OR (“coronavirus”[MeSH Terms] OR “coronavirus”[All Fields] OR “COV”[All Fields])) AND (“impact*”[All Fields] OR “impactful”[All Fields] OR “impacting”[All Fields]) AND (“indicator*”[All Fields] OR “health status indicator*”[All Fields] OR “Health Status Indicators”[MeSH Terms] OR “Health Status”[MeSH Terms]) AND (“quality of life”[All Fields] OR “Life Quality”[All Fields] OR “health related quality of life”[All Fields] OR “health related quality of life”[All Fields] OR “HRQOL”[All Fields])) AND (2021:2022/11[pdat])

Cost of illness

((“COVID-19”[All Fields] OR “COVID-19”[MeSH Terms] OR “COVID-19 Vaccines”[All Fields] OR “COVID-19 Vaccines”[MeSH Terms] OR “COVID-19 serotherapy”[All Fields] OR “COVID-19 serotherapy”[Supplementary Concept] OR “covid 19 nucleic acid testing”[All Fields] OR “covid 19 nucleic acid testing”[MeSH Terms] OR “covid 19 serological testing”[All Fields] OR “covid 19 serological testing”[MeSH Terms] OR “covid 19 testing”[All Fields] OR “covid 19 testing”[MeSH Terms] OR “sars cov 2”[All Fields] OR “sars cov 2”[MeSH Terms] OR “Severe Acute Respiratory Syndrome Coronavirus 2”[All Fields] OR “NCOV”[All Fields] OR “2019 NCOV”[All Fields] OR (“coronavirus”[MeSH Terms] OR “coronavirus”[All Fields] OR “COV”[All Fields])) AND (“impact*”[All Fields] OR “impactful”[All Fields] OR “impacting”[All Fields]) AND (“indicator*”[All Fields] OR “health status indicator*”[All Fields] OR “Health Status Indicators”[MeSH Terms] OR “Health Status”[MeSH Terms]) AND (“Illness Cost”[All Fields] OR “Illness Costs”[All Fields] OR “Cost of Sickness”[All Fields] OR “Sickness Costs”[All Fields] OR “Sickness Cost”[All Fields] OR “Burden of Illness”[All Fields] OR “Illness Burden”[All Fields] OR “Illness Burdens”[All Fields] OR “Disease Burden”[All Fields] OR “burden disease”[All Fields] OR “Disease Burdens”[All Fields] OR “Costs of Disease”[All Fields] OR “Disease Cost”[All Fields] OR “cost disease”[All Fields] OR “Disease Costs”[All Fields] OR “Economic Burden of Disease”[All Fields] OR “Burden Of Disease”[All Fields] OR “Burden Of Diseases”[All Fields] OR “Cost of Disease”[All Fields])) AND (2021:2022/11[pdat])

Mental health status

((“COVID-19”[All Fields] OR “COVID-19”[MeSH Terms] OR “COVID-19 Vaccines”[All Fields] OR “COVID-19 Vaccines”[MeSH Terms] OR “COVID-19 serotherapy”[All Fields] OR “COVID-19 serotherapy”[Supplementary Concept] OR “covid 19 nucleic acid testing”[All Fields] OR “covid 19 nucleic acid testing”[MeSH Terms] OR “covid 19 serological testing”[All Fields] OR “covid 19 serological testing”[MeSH Terms] OR “covid 19 testing”[All Fields] OR “covid 19 testing”[MeSH Terms] OR “sars cov 2”[All Fields] OR “sars cov 2”[MeSH Terms] OR “Severe Acute Respiratory Syndrome Coronavirus 2”[All Fields] OR “NCOV”[All Fields] OR “2019 NCOV”[All Fields] OR (“coronavirus”[MeSH Terms] OR “coronavirus”[All Fields] OR “COV”[All Fields])) AND (“impact*”[All Fields] OR “impactful”[All Fields] OR “impacting”[All Fields]) AND (“indicator*”[All Fields] OR “health status indicator*”[All Fields] OR “Health Status Indicators”[MeSH Terms] OR “Health Status”[MeSH Terms]) AND (“status health”[All Fields] OR “Level of Health”[All Fields] OR “Health Level”[All Fields] OR “Health Levels”[All Fields] OR “Self-Perceived”[All Fields] OR “Self-report”[All Fields] OR “patient-reported”[All Fields]) AND 2021/01/01:2022/11/30[Date - Publication])

Supplementary Material S2
Indicator data extraction

Indicator's name	What it measures	Rationale (Why it is important)	Calculation	References where the indicator was applied (2 or 3 references)	General comments, strengths and weaknesses
Average expected disability-adjusted life-years (DALYs) per month of delay	The DALY reports disability weights for nonfatal health conditions. These weights represent the magnitude of health loss associated with the conditions, where 0 represents no loss (full health) and 1 all lost (death).	The DALY is the difference in quality of life weighted life years with and without surgical delay. A full DALY can be thought of as losing 1 year in full health.	The years lived with disability summed with the years of life lost (YLLs) to premature death.	Gravesteijn B, et al. Minimizing population health loss in times of scarce surgical capacity during the coronavirus disease 2019 crisis and beyond: a modeling study. <i>Value Health</i> . 2021;24(5):648-57. doi: 10.1016/j.jval.2020.12.010/sdfsdf COVID-19 Mental Disorders Collaborators. Global prevalence and burden of depressive and anxiety disorders in 204 countries and territories in 2020 due to the COVID-19 pandemic. <i>Lancet</i> . 2021;398(10312):1700-12. doi: 10.1016/S0140-6736(21)02143-7 Julien J, et al. Effect of increased alcohol consumption during COVID-19 pandemic on alcohol-associated liver disease: A modeling study. <i>Hepatology</i> . 2022;75(6):1480-90. doi: 10.1002/hep.32272.	A maximum possible DALYs can result from not performing a surgical procedure. The overall DALYs associated with not performing a surgical procedure should not be interpreted as an absolute estimate. The surgical procedures that were evaluated are often part of standard clinical practice. Therefore, data might be biased (eg, selection bias in the survival without treatment because patients opt for palliative care) or not available (it would be unethical now to perform RCTs evaluating surgery vs no surgery), no extra harm due to surgical procedure was assumed.
Estimates of life expectancy	Predictive change in LE due to the COVID-19 pandemic.	LE estimates are more sensitive to deaths at younger ages.	${}_n p_x^{20} = e^{\left(\frac{1}{nR_x} \log({}_n p_x^{17})\right)}$ ${}_n q_x^{20} = 1 - {}_n p_x^{20}$ ${}_n a_x^{20} = n + \frac{1}{nR_x} * \frac{{}_n q_x^{17}}{nq_x^{20}} * ({}_n a_x^{17} - n)$ ${}_{\infty} a_{85}^{20} = {}_{\infty} a_{85}^{17} * nR_x$	Aburto JM, Kashyap R, Schöley J, Angus C, Ermisch J, Mills MC, Dowd JB. Estimating the burden of the COVID-19 pandemic on mortality, life expectancy and lifespan inequality in England and Wales: A population-level analysis. <i>Journal of Epidemiology and Community Health</i> 2021;75(8):735-40. doi: https://doi.org/10.1136/jech-2020-215505 Andrasfay T, Goldman N. Reductions in 2020 US life expectancy due to COVID-19 and the disproportionate impact on the Black and Latino populations. <i>Proceedings of the National Academy of Sciences of the United States of America</i> . 2021;118(5). doi: https://doi.org/10.1073/pnas.2014746118 Ozyilmaz A, Bayraktar Y, Toprak M, Isik E, Guloglu T, Aydin S, Olgun MF, Younis M. Socio-Economic, Demographic and Health Determinants of the COVID-19 Outbreak. <i>Healthcare (Basel, Switzerland)</i> . 2022;10(4). doi: https://doi.org/10.3390/healthcare10040748	Evidence suggests that reversals and stagnation in life expectancy among developed countries are usually a result of mid-life mortality crises. In contrast, life expectancy losses during the pandemic have come about from sharp increases in older age mortality in both sexes. Estimates of excess mortality suggest that deaths attributed to COVID-19 account for only two-thirds to three-fourths of all excess deaths in the US. The impact of this underestimate of deaths in 2020 on life expectancy may be counteracted by harvesting – that is, the notion that COVID-19 might disproportionately affect frail individuals with severe health conditions who would thus be likely to die imminently from other causes in the absence of COVID-19.
EuroQoL-5-Dimensions (EQ-5D)	Health-related quality of life (HRQoL).	Due to public health and social measures governments adopted to mitigate outbreaks, and the disruptions it originated, daily activities and impairing the health-related quality of life of populations were impaired during and some years after the COVID-19 pandemic. Restrictions the patients were obligated to have when they were infected, e.g. mandatory quarantine, were also assessed as a potential harm for HRQoL.	Each EQ-5D item has three (EQ-5D-3L) or five (EQ-5D-5L) possible answers, which individuals are asked to tick the box next to the most appropriate statement that describes their health status in each dimension. The result ranges between 0 to 1 representing death to perfect health.	Kwon HY, Kim Y, Lee SY, Kim CB. Quarantining: a mentally distressful but physically comfortable experience in South Korea. <i>Health and quality of life outcomes</i> . 2022;20(1):144. doi: https://doi.org/10.1186/s12955-022-02051-4 Fernandes J, Fontes L, Coimbra I, Paiva JA. Health-Related Quality of Life in Survivors of Severe COVID-19 of a University Hospital in Northern Portugal. <i>Acta medica portuguesa</i> . 2021;34(9):601-7. doi: https://doi.org/10.20344/amp.16277	<i>Strengths</i> EQ-5D is a valid and well-known tool which has been broadly used to assess HRQoL, independently of the diseases or conditions the individuals have. Moreover, it is short and easy to complete. <i>Weaknesses</i> Data collection can be expensive and involve a large quantity of resources. Thus, the available data is not always enough for disaggregating as much as it is necessary to compare the HRQoL of all population's subgroups. When the data collection involves self-administered method, some population's subgroups can be less likely to participate and complete questionnaires, e.g., the elderly or the less favoured, impairing comparisons between groups.

Supplementary Material S2
Continued

Indicator's name	What it measures	Rationale (Why it is important)	Calculation	References where the indicator was applied (2 or 3 references)	General comments, strengths and weaknesses
Medical Outcomes Study Short Form 36-item health survey (SF-36)	HRQoL	Due to public health and social measures governments adopted to mitigate outbreaks, and the disruptions it originated, daily activities and impairing the health-related quality of life of populations were impaired during and some years after the COVID-19 pandemic. Restrictions the patients were obligated to have when they were infected, e.g., mandatory quarantine, were also assessed as a potential harm for HRQoL.	The SF-36 comprises 36 items, addressing eight dimensions: physical functioning, social functioning, role functioning, mental health, vitality and general health perception. Each dimension is scored from 0 to 100, and higher scores indicate a better HRQoL perception.	Verveen A, Wynberg E, van Willigen HDG, Davidovich U, Lok A, Moll van Charante EP, de Jong MD, de Bree G, Prins M, Knoop H, Nieuwkerk PT, RECoVERED Study Group. Health-related quality of life among persons with initial mild, moderate, and severe or critical COVID-19 at 1 and 12 months after infection: a prospective cohort study. <i>BMC medicine</i> . 2022;20(1):422. doi: https://doi.org/10.1186/s12916-022-02615-7 O'Brien K, Townsend L, Dowds J, Bannan C, Nadarajan P, Kent B, Murphy N, Sheill G, Martin-Loeches I, Guinan E. 1-year quality of life and health-outcomes in patients hospitalised with COVID-19: a longitudinal cohort study. <i>Respiratory research</i> . 2022;23(1):115. doi: https://doi.org/10.1186/s12931-022-02032-7	<i>Strengths</i> SF-36 assesses eight dimensions of HRQoL, which makes it a tool that gives a thorough and multi-dimensional evaluation of this measure. Moreover, SF-36 is a valid and well-known tool which has been broadly used to assess HRQoL. <i>Weaknesses</i> Assessing the population's HRQoL requires using any valid instrument, such as the SF-36, and collect primary data, which can be expensive and involve a large quantity of resources. Thus, the available data is not always enough for disaggregating as much as it is necessary to compare the HRQoL of all population's subgroups. When the data collection involves self-administered method, some population's subgroups can be less likely to provide and complete the questionnaires, impairing comparisons between groups. Moreover, applying the SF-36 is also not possible in people with mental disorders, which also impairs generalising the results to them.
KIDSCREEN-10 index	HRQoL in children and adolescents.	Children and adolescents have faced challenges in their daily life activities, e.g., school closures and moving to distant learning, which potentially isolated several or caused them stress and anxiety, leading then to mental health or quality of life impairments.	Ten questions on physical, psychological, social, and school-dependent items are presented on a 5-points Likert type scale. Responses are then scored as Rasch scales, and the results are translated into T-values to be interpreted then.	Barbieri V, Wiedermann CJ, Kaman A, Erhart M, Piccoliori G, Plagg B, Mahlknecht A, Ausserhofer D, Engl A, Ravens-Sieberer U. Quality of life and mental health in children and adolescents after the first year of the COVID-19 pandemic: A large population-based survey in South Tyrol, Italy. <i>International journal of environmental research and public health</i> . 2022;19(9):5220. doi: https://doi.org/10.3390/ijerph19095220 Ravens-Sieberer U, Kaman A, Erhart M, Devine J, Schlack R, Otto C. Impact of the COVID-19 pandemic on quality of life and mental health in children and adolescents in Germany. <i>European child & adolescent psychiatry</i> . 2022;31(6):879-89. doi: https://doi.org/10.1007/s00787-021-01726-5	<i>Strengths</i> Valid tool to assess HRQoL in children and adolescents, which is easy to administer, to score, and to analyse. Its development took into account different cultural perspectives, ensuring comparability and cross-cultural applicability. <i>Weaknesses</i> Assessing the population's HRQoL requires using any valid instrument, such as the KIDSCREEN-10, and collect primary data, which can be expensive and involve a large quantity of resources. Moreover, the KIDSCREEN-10 is measured as a single global score of HRQoL, which leads to the loss of information when compared, e.g., to other KIDSCREEN longer versions.
Productivity costs related to COVID-19		Productivity losses related to COVID-19 in terms of absenteeism (not being able to do one's work at all) and presenteeism (not being able to work at normal capacity while working at home or in the office).	Prevent and control of COVID-19 can decrease the economic impact of COVID-19 and improve human resources management during the pandemic.	Van Ballegoijen, H, Goossens L, Bruin RH, Michels R, Krol M. Concerns, quality of life, access to care and productivity of the general population during the first 8 weeks of the coronavirus lockdown in Belgium and the Netherlands. <i>BMC Health Services Research</i> . 2021;21(1). doi: https://doi.org/10.1186/s12913-021-06240-7 Faramarzi A, Javan-Noughabi J, Tabatabaee SS, Najafpoor AA,	The data to calculate the indicator (working hours, hourly income) is usually obtained from surveys (Productivity Cost Questionnaire - iPCQ) or from workplace database; hourly income could be obtained from national employment agencies. The information retrieved from the indicator's calculation is informative of productivity loss in a specific setting (hospital-based, general population-based) and country.

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Supplementary Material S2

Continued

Indicator's name	What it measures	Rationale (Why it is important)	Calculation	References where the indicator was applied (2 or 3 references)	General comments, strengths and weaknesses
Productivity costs related to COVID-19 (continued)				<p>Rezapour A. The lost productivity cost of absenteeism due to COVID-19 in health care workers in Iran: a case study in the hospitals of Mashhad University of Medical Sciences. <i>BMC Health Services Research</i>. 2021;21(1). doi: https://doi.org/10.1186/s12913-021-07200-x</p> <p>De Paiva LG, Santos WMD, Dalmolin GDL. The impact of the SARS-CoV-2 pandemic on sickness absenteeism among hospital workers. <i>Revista Brasileira De Medicina Do Trabalho</i>. 2022;20(01):65-71. doi: https://doi.org/10.47626/1679-4435-2022-787</p>	
Generalised Anxiety Disorder Score during the COVID-19 pandemic	The anxiety symptom severity.	To evaluate the effect of lock down or physical and interpersonal relation limitations due to the COVID-19 pandemic on the Generalised Anxiety Disorder. It can be used to measure the prevalence of anxiety in the general population and the association of health conditions with the risk of mental health complications.	Generalized anxiety disorder-7 (GAD-7) questionnaires is used for assessment of anxiety symptom severity over the last two weeks. Participants are asked to rate anxiety symptom severity on the four-point Likert-type scale with possible answers ranging from 'not at all' (score = 0) to 'nearly every day' (score = 3). Greater score on the GAD-7 indicates greater anxiety symptom severity. Respondents were considered as having anxiety symptoms if they scored ≥ 10 on the GAD-7.	<p>Buneviciene I, Bunevicius R, Bagdonas S, Bunevicius A. The impact of pre-existing conditions and perceived health status on mental health during the COVID-19 pandemic. <i>J Public Health (Oxf)</i>. 2022;7;44(1):e88-e95. doi: 10.1093/pubmed/fdab248</p> <p>Ho-Fung C, Andersson E, Hsuan-Ying H, Acharya G, Schwank S. Self-reported mental health status of pregnant women in Sweden during the COVID-19 pandemic: a cross-sectional survey. <i>BMC Pregnancy Childbirth</i>. 2022;22(1):260. doi: 10.1186/s12884-022-04553-x</p> <p>Davis MJ, Alqarni KA, McGrath-Chong ME, Bargman JM, Chan CT. Anxiety and psychosocial impact during coronavirus disease 2019 in home dialysis patients. <i>Nephrology (Carlton)</i>. 2022;27(2):190-4. doi: 10.1111/nep.13978</p>	<p>The data to calculate the indicator is easy to obtain by a self-administered questionnaire including 7 items. Overall, the GAD-7 score appears to be a valid measure of generalized anxiety symptoms in the general population, on the basis of good internal consistency, convergent validity and sensitivity to change, but does not perform well as a screener for GAD.</p> <p>The GAD-7 has demonstrated adequate validity, good clinical utility and generally strong psychometric properties in primary care settings and in the general population.</p> <p>Main strengths of the indicator are:</p> <ul style="list-style-type: none"> - the GAD-7 scale has shown promise as a measure with good clinical utility and strong psychometric properties in primary care and community settings; - the GAD-7 Scale is an easy-to-score, self-reported measure of core generalized anxiety disorder symptoms; - the GAD-7 Scale has good internal consistency and convergent validity with depression, anxiety, stress and worry, and is sensitive to change. <p>Main weaknesses are:</p> <ul style="list-style-type: none"> - the GAD-7 scale is based on a self-reported questionnaire; - the GAD-7 scale focuses on only 1 anxiety disorder, although there are many patients with other anxiety disorders, such as social phobia and posttraumatic stress disorder, who need clinical attention; - the GAD-7 provides only probable diagnoses that should be confirmed by further evaluation; - the GAD-7 does not perform well as a screener for GAD and should not be used to identify cases of GAD in acute psychiatric samples.