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The economics of COVID-19: a systematic literature review

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Abstract

Purpose – A systematic, PRISMA-guided literature review was conducted using four databases (ProQuest, PubMed, EconLit and Scopus) to analyze research published between February 2020 and August 2021. This review included 31 studies out of 1,248 that were identified.

Design/methodology/approach – In addition to the serious health issues it causes, severe acute respiratory syndrome coronavirus 2 (COVID-19) has a destructive impact on the global economy. The objectives of this study are (1) to examine the growing literature on variations of economic factors due to COVID-19 (2) to review the literature on the governmental response to the pandemic and (3) to discover the perspective and the gaps and outline the future avenues for further research.

Findings – All selected studies (31) have used the macroeconomic, household and health economic factors to analyze the economic impacts of the COVID-19 pandemic. Among these studies, 22 articles examined the economic consequences and macroeconomic activities, 7 analyzed microeconomic costs and healthcare trade-offs and 2 studies reviewed economic uncertainty and macroeconomic expectations.

Research limitations/implications – This study comprises the most relevant research articles to measure the economic consequences of COVID-19. As a result of the lockdown and other containment initiatives, price levels, employment and consumption patterns have all suffered.

Practical implications – Therefore, the government's requirement to develop policy tools and approaches to ensure a full recovery from the pandemic should lead to greater long-term economic resilience.

Originality/value – This study examines the economic implications of COVID-19, with the aim of not only analysing COVID-19's negative economic effects but also, those measures that provide new directions in the form of short-run economic impacts and policy decisions.

Keywords COVID-19, Pandemic, Economy, Healthcare, Systematic literature review

Paper type Research paper

Introduction

SARS-CoV-2 (COVID-19), which is now a global pandemic, is a highly transmittable viral contamination with inevitable profound changes to all aspects of human life, from individual health concerns to entire global economic systems. There have been 192 million confirmed cases of COVID-19 and 4.1 million deaths reported globally as of the end of July 2021 (World Health Organization, 2021). The global economic impact of the COVID-19 pandemic has been enormous, with an average loss of global gross domestic product (GDP) of 84,000 million USD in 2020, and the global economy has contracted by 16.04% of total GDP (Jackson *et al.*, 2020). According to the World Health Organization (2021), global spending on health in 2020 recorded USD 8.3 trillion, which was 10% of global GDP.

The governments have responded to the effect of the pandemic on public health in a strong and united way. Meanwhile, non-pharmaceutical strategies such as lockdown policies,

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containment health measures and stringent rules have been implemented to reduce the risk of COVID-19, which is considered one of the most health and economically costly pandemics in recent history (Boissay and Rungcharoenkitkul, 2020). On the other hand, the global economy utilizes containment and mitigation efforts to prevent the interruptions of agriculture, manufacturing, education and the financial sector activities of the economy (Jin *et al.*, 2021). COVID-19 is negatively affecting global trade and financial market liquidity by creating demand and supply shocks (Roy, 2020). Furthermore, the pandemic has had a significant impact on macroeconomic expectations for inflation, job insecurity, unemployment, illness, school and business closures and fiscal and monetary policy decisions (Binder, 2020). Therefore, the economics of COVID-19 emerges as an important area of scientific study (both quantitative and qualitative) in the contemporary pandemic environment.

Since the economics of the COVID-19 pandemic has created a high level of global anxiety, many studies have been conducted on the various socioeconomic aspects of the pandemics and its durations (Keogh-brown *et al.*, 2020; Martin *et al.*, 2020; Ehrenberg *et al.*, 2021). Numerous studies have examined the impact of COVID-19's stringent health policies on the economy with the GDP changes, estimation of the economic cost and fiscal and monetary policy changes (Chudik *et al.*, 2021; UNDP, 2021; Hossain and Rahamanv, 2021; Rasul *et al.*, 2021; Kolahchi *et al.*, 2021).

The research question of this study is, what are the effects of COVID-19 on the economy or macroeconomic factors? The literature on the impacts of COVID-19 on the economy or macroeconomic variable is increasing daily. Therefore, it is critical to comprehend and synthesise the data to reduce the risk of lacking relevant information from the systematic literature review (SLR). To mitigate this risk, we have limited the papers that were published from February 2020 to August 2021 and this SLR is formulated on the well-prescribed selection criteria of SLR and guided by PRISMA guidelines.

The vast majority of COVID-19 and economic related studies are peer-reviewed journal papers that have mainly employed descriptive data analysis. Although research detailing the economic consequences of COVID-19 has commenced, still there is very limited evidence and insufficient studies on the changes of all macroeconomic determinants due to COVID-19. In this context, there are several gaps in the studies that can be addressed with additional research. The economic effects of COVID-19 vary depending on various parameters, such as the current status of the virus spread, socioeconomic policy changes, fiscal support policies and economic growth changes. On the other hand, it differs in the impacts of macroeconomic factors such as exports, imports, foreign direct investment, financial development, interest rates and inflation. Meantime, a country- or regional-level comparison that takes into account all of these factors will yield a more reliable estimate of the pandemic's economic impact.

In order to do so, it is important to provide a comprehensive overview of the available evidence and explore if there is any obvious omission in the current literature on the economics of COVID-19. The study attempts to (1) study the main economic research approaches in COVID-19 literature, (2) review the literature on the fluctuations and estimations of the economic factors caused by COVID-19 and finally, (3) investigate the knowledge gaps to identify avenues for future research. This paper summarises key features of the economics of COVID-19 literature such as study design, measurement aspects, assessment methods of the quality of the reported results and a narrative structure of the key findings.

Further, this study investigates the economic consequences of COVID-19, with the goal of analysing not only the negative economic effects of COVID-19 but also those measures that provide new directions in the form of short-run economic impacts and policy decisions. Furthermore, this SLR covers interventions aimed at demonstrating the long-term impacts of the economy that are expected to demonstrate.

Methods

This study employed the preferred reporting items for systematic reviews and meta-analysis (PRISMA) criteria to develop the SLR. For review protocol, the study is in the process of registration with the International Prospective Register of Systematic Reviews (PROSPERO) (Application ID number 277848- on September 13, 2021). Each step of the review was independently reviewed by WR and RK, and MMR was consulted in case of any discrepancy.

Literature search

The databases used were ProQuest, PubMed, EconLit, and Scopus. This review drew on the estimations of the economics of COVID-19 in the various geographical and socio-economic settings. The majority of published articles were peer-reviewed, and a small number were governments reports. Since all studies were recently published papers which were based on the COVID-19 pandemic, the time frame is limited from February 2020 to August 2021.

The literature search was performed by including the above keywords. The search string included COVID-19/Coronavirus, economics/economic impacts and economic consequences (Table 1). Synonyms were used for every subject to ensure full access to the available literature. The search strategy is shown in detail in the PROSPERO protocol. EndNote (X9) software was used to organise and manage the references.

Eligibility criteria

Journal articles included the following criteria: (1) the published research study needed to be a peer reviewed work (including all review papers) in the English language; (2) the research article examined economic factors; (3) the study explicitly revealed whether it has quantitatively or qualitatively specified economic consequences on death rates or infection rates of COVID-19.

This review excluded studies identified as the papers that used the title "Economics of COVID-19 pandemic" but focused on a specific field (stock market, bond market, forex market, etc.) or industry (tourism, oil, aviation, etc.). The studies that placed a greater emphasis on socio-demographic factors and a focus on medical expenses (dental practices, surgeries, etc.) were also removed. Quantitative studies on "Threats and Opportunities for the Post-Pandemic World," "Epidemic Prevention and Control Measures and Economic-Social Development," "Improving sanitation and hygiene," "Improving nutrition," and "Ambient Air Pollution" were also left out. Finally, all papers involving medical resources and health inequalities were also eliminated.

Study selection and data extraction

The review searched relevant studies and filtered out duplicates under the independent evaluation process. WR, RK and MMR screened the titles, abstracts, and keywords to assess

Table 1. Search terms used for different relationships (without synonyms)

Keywords	Operator	Keyword grouping	Operator	Keywords
COVID-19 Pandemic	AND	Economic Impacts OR Economics	AND	Healthcare
Coronavirus	AND	Economy OR Economic Consequences	AND	Health Economics
SARS-CoV-2	AND	Economic Impacts OR Economic Consequences	AND	Health Economics

their eligibility for inclusion. When eligibility was unclear from the titles and abstracts, then the full text was reviewed to check the eligibility for inclusion. The Excel forms were designed to identify review patterns among the heterogeneity of study characteristics and outcomes. The data of searched studies consisted of three parts: General Information (author/authors, year of publication, countries examined); Study Characteristics (type of the study, statistical methods, study area); and Summary of Findings (factors used and main findings). The research study was based on PRISMA 2020. The method included four stages: (1) identification of records via databases and registers; (2) selection of records; (3) review of qualifications; and (4) inclusion in the study (Page *et al.*, 2021).

Regardless of the design of the included studies, the PRISMA 2020 statement has been created primarily for systematic reviews of studies that assess the effects of health interventions (Page *et al.*, 2021). Therefore, this study used PRISMA 2020 updated review template for selecting eligibility studies. The data-charting forms used by the research team were used to categorise the full-text studies that were reviewed. These Excel forms were designed to identify review patterns among the heterogeneity of study characteristics and outcomes. Forms were divided by the various relationships available in terms of the research question and were used for data extraction by including relevant notes and keywords for each article.

Quality assessment

The quality of these thirty-one papers was selected using the Joanna Briggs Institute Critical Appraisal checklist of systematic reviews (Appendixes 2 and 3). Two reviewers made decisions on their eligibility and quality and disagreements that arose were solved through negotiations. Finally, 31 papers gained the required quality score of 6.5 from 120 research articles. This study excluded review articles, pilot studies, working papers, reports or unpublished Ph.D. dissertations, books, symposiums, supplementary, prospective, or intervention studies, and those published in other languages.

Results

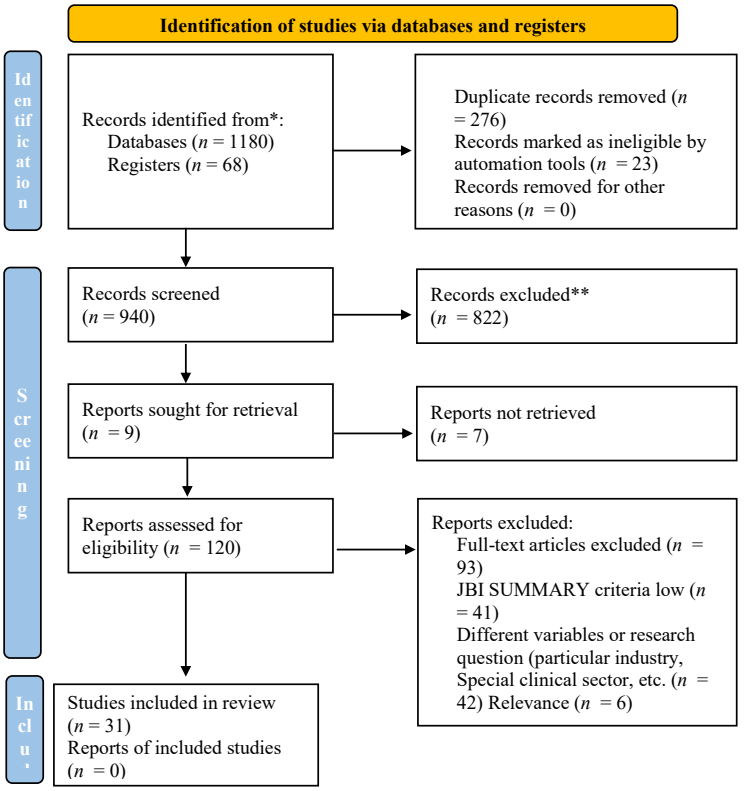
Identification of studies

In this review study, total of 1,248 articles were initially retrieved, and 276 duplicates were removed before entering the first phase of screening. A total of 940 articles were assessed for the first phase of screening based on their title and abstract. So, in the first phase of screening, only 120 articles retained while 822 studies have been rejected. Consequently, in phase two of screening, 201 papers were assessed based on their full text. Out of them, only 31 articles met the inclusion criteria for further evaluation. Hence, the remaining 31 studies were considered eligible for this review (Appendix 1). Among these studies, twenty were based on descriptive analysis, four were on time-series, two were on panel data analysis, one on cross sectional data, and one study on GCE equilibrium model, another two on NiGEM macro models, and two used mathematical model (see Figure 1).

Study characteristics

Out of 31 chosen articles, 19 articles examined the economic impacts of COVID-19 on a particular nation, region, or the entire world. Meanwhile, seven research studies estimated macroeconomic costs, two papers basically analysed socio-economic impacts while the remaining two papers examined economic uncertainty and macroeconomic expectations.

The outbreak of COVID-19 was first reported to the World Health Organisation (WHO) on December 31, 2019 (World Health Organization, 2020). On January 30, 2020, the WHO declared the COVID-19 outbreak a global health emergency. Therefore, the study is limited to



Source(s): (Page *et al.*, 2021)

Figure 1.
The economics of COVID-19 PRISMA (2020) flow diagram

the short time period. Then this study reviewed all articles that were published between February 2020 to August 2021. Slightly more than half of the included articles were related to developing countries (Sub-Saharan Africa = 5, South Asia = 3, China = 1, Peru = 1, Pakistan = 1, Congo = 1 and Montenegro = 1). Meanwhile, 40% of studies came from developed countries (USA = 4, UK = 3, EU = 2, Canada = 1, and Australia = 1), while 6 articles were global or multi-country studies.

Furthermore, the methodological nature and comprehensiveness of the structure of the studies ranged from average to excellent with the use of the AIM(RaD)C framework: Abstract, Introduction, Materials/Methods, repeated Results, Discussion, and Conclusion. Studies used a variety of research methods and tools to evaluate the economics of COVID-19.

Most of the studies used quantitative methods (23 papers) and four studies employed qualitative methods. Economic models such as the General Equilibrium Model, the Markov-switching model, Mathematical model like standard Susceptible, Infected, and Removed (SIR) model and the Social Accounting Matrix (SAM) multiplier model were used in three studies. Except for one article, which used primary sources to collect data, all studies relied on secondary sources.

The study outcomes of interest mainly were the direction, impact, and statistical significance of the COVID-19 cases and Gross Domestic Product, Inflation, Unemployment, labour market, human development and International Trade. Some studies compared the

association between direct and indirect costs of COVID-19 pandemic and healthcare facilities using Econometric tools and techniques. Table 2 summarises the characteristics of the included studies.

Descriptive statistical methods were the most widely used methodologies, while some studies used the ordinary least square models. One-fourth of the studies employed a time series, panel data analysis, and cross-sectional studies. Further popular models like Robust Statistical Bayesian Model, the CGE general equilibrium model, Markov-switching model,

Table 2. Characteristics of the included studies ($n = 31$)

Study area	*n*	Percentage	Sources
Economic impacts	*22*	*70.90*	
Marginal impact of lockdowns on income, total expenditure and remittances	1	3.20	Gupta *et al.* (2020), Varona and Gonzales (2021), Pinilla *et al.* (2021), McKibbin and Fernando (2020), Alhassan *et al.* (2020), Hayat *et al.* (2021), Burger and Calitz (2020), Ngepah (2021), Ke and Hsiao (2021), Rasul *et al.* (2021), Sarkodie and Owusu (2021), Martin *et al.* (2020), Iluno *et al.* (2021), Béland *et al.* (2020), Bitanihirwe and Ssewanyana (2021), Li *et al.* (2021), Lim *et al.* (2021), Islam and Muyeed (2020), Amewu *et al.* (2020), Natuhoyila *et al.* (2021), Parveen *et al.* (2021)
Impact on economic activities	1	3.20	
Macroeconomic variable changes	11	35.40	
Economic impacts – public health expenditure and economic growth	4	12.90	
Economic impact – household level	1	3.20	
Short-term economic impacts	1	3.20	
Socioeconomic factors	2	6.40	
Economic cost	*7*	*22.50*	
Microeconomic costs	3	9.60	Ataguba (2020), Donaldson and Mitton (2020), Boissay and Rungcharoenkitkul (2020), Villaverde and Jones (2020), Djurovic *et al.* (2020), Keogh-Brown *et al.* (2020), Rowthorn and Maciejowski (2020), Argente *et al.* (2022)
Healthcare trade-offs	1	3.20	
Mortality and GDP loss	2	6.40	
Economic uncertainty	*1*	*3.20*	Van Der Wielen *et al.* (2021)
Macroeconomic expectations	*1*	*3.20*	Binder (2020)
Study setting			
Developing country	13	44.4	Sub Saharan Africa, India, Nigeria, Pakistan, Congo, Montenegrio
Developed country	12	37	United Kingdom, Canada, USA, Spain, European Union
Global	4	11.1	USA, Global Economy
Multiple country category	2	7	[Argentina Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan Mexico, Korea, Russia, Saudi Arabia South Africa, Turkey United Kingdom, United States of America], [South Asia]
Publication year			*Data sources* *n* *%*
2020	16	55.6	Secondary 30 96.2
2021	15	44.4	Primary 1 3.7
Methodology			
Quantitative	21	74.1	Time series 3 11.1 OLS 4 14.8 Panel data 1 Cross-sectional study 1 3.7 Descriptive statistics 2 70.3
Qualitative	5	14.8	Literature-based studies 1 3.7
Models	5	11.1	General equilibrium model, Markov-switching model, SIR model, social accounting matrix (SAM) multiplier models

Social Accounting Matrix (SAM) multiplier models and SIR models used to quantify and analyse the economic impact of COVID-19.

Summary of the key findings

All of the studies in this review included critical economic parameters and factors on the COVID-19 pandemic. Figure 2 illustrates the variables and their frequency of use by the included articles. Gross Domestics Product variable was the most frequently used factor.

Out of 31 studies, fifteen investigated the impact of COVID-19 on GDP and six studies focused on consumption, unemployment, labor market outcome and four papers assessed government policies and economic growth during COVID-19. It is worth noting that the majority of the studies examined multiple variables at the same time.

Economic structural changes during the pandemic

The agriculture and food production sector has encountered significant disruptions due to the COVID-19 crisis and associated lockdown restrictions. Several studies have analysed the impact of COVID-19 on the agricultural processes (Amewu *et al.*, 2020; Bitanihirwe and Ssewanyana, 2021). For example, Amewu *et al.* (2020) estimated the economic costs of COVID-19 policies and external shocks focusing on agri-food system impacts and calculated value was 19.8% of GDP. In contrast, sector-level production has faced a sharp decline in sector-level activity following the suppression strategy. Hotels, restaurant services, and recreational activities have dropped gradually, while processed food sectors were much less affected (Bitanihirwe and Ssewanyana, 2021).

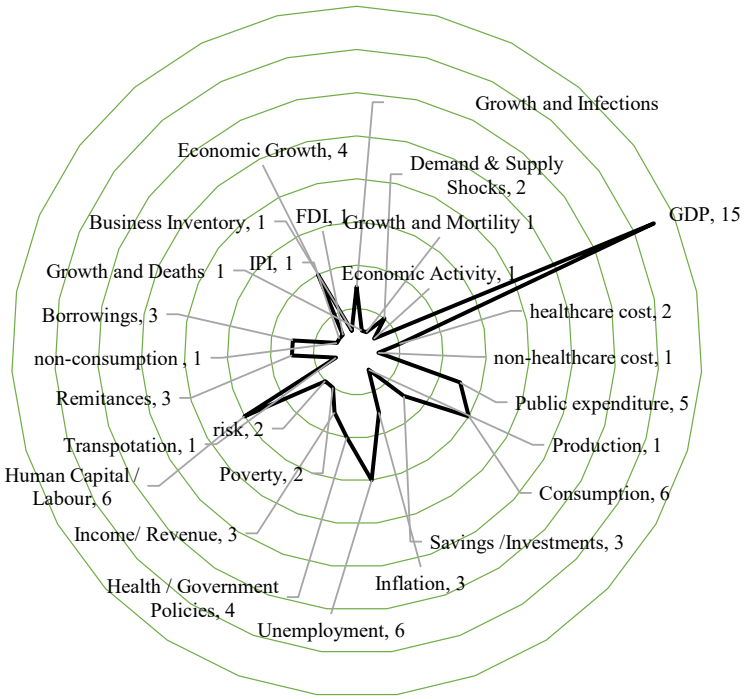


Figure 2.
Factors examined and their frequencies in the included studies

The COVID-19 pandemic has caused an unprecedented decline in industrial production. The manufacturing of durable consumer products and capital equipment was affected the most, with respective falls during strict confinement (Pinilla *et al.*, 2021).

Impacts of COVID-19 on the labour market

Six out of 31 studies investigated the impacts of COVID-19 on human capital development and the labour market, with only one study coming under the economic cost calculations (from Montegerio).

Djurovic *et al.* (2020) considered human capital as a supply-side factor, and the impact of the disease incapacitated a portion of the employment force. The implication is that having a high life expectancy will provide economies with the labor force needed to improve the country's GDP productivity (Alhassan *et al.*, 2020). In the meantime, infectious disease outbreaks have had an impact on labor supply and productivity across industries, owing to reduced work time for infected workers or time lost by caregivers (Keogh-brown *et al.*, 2020). The negative impacts on labor market outcomes due to the pandemic are larger for men, younger workers and less educated workers. This situation suggest that COVID-19 had increased labor market inequalities and also, COVID-19 cases and deaths had eventually affected the economy directly by affecting the labor supply of infected individuals (Béland *et al.*, 2020). According to the Mckibbin and Fernando (2020) mortality due to infection, morbidity due to infection, and morbidity arising from caregiving for affected family members have created a shock to the labour supply in each country.

Impacts of COVID-19 on unemployment

Six studies examined unemployment changes due to the COVID-19 pandemic. Out of these studies, 66% were based on developed countries (two studies based on the USA, one study conducted as a comparison of the USA and global context, and one study based on Spain). 'The rest of the studies were conducted based on African and South Asian Countries.

Medium level businesses and manufacturing firms could not sustain themselves through the lockdown, leaving many informal sector workers unemployed; economic losses accumulated due to reduced demand, restriction of movement, lack of access to markets, and the loss of mobility of people and goods have all affected workers (Rasul *et al.*, 2021). Meanwhile, there has been a significant increase in unemployment and underemployment in developing countries as a result of COVID- 19. And also, COVID-19 restrictions have brought major economic activities to a standstill and have closed the operation of business except a few health-related enterprises (Ataguba, 2020; Rasul *et al.*, 2021). For an instance, Binder (2020) revealed that only 6.5% of Americans expected lower unemployment in 2020, while 57.4% expected roughly the same amount of unemployment and 36.1% expected more unemployment. The COVID-19 crisis also disrupted the Spanish labor market. According to Pinilla's (2021) projections, the unemployment rate was rice by 11.9% in 2020.

Impacts of COVID-19 on consumptions

Six research papers identified consumer spending as one of the key factors impacted by the COVID-19 pandemic, with 75% studies indicating a considerable decrease in consumer spending during the pandemic.

Martin *et al.* (2021) found that even simple containment health policies have reduced people's consumption expenditure. They mentioned that higher containment rates make consumption more costly, so people cut back on the amount they consume and work. Meanwhile, consumption losses are smaller across all income quintiles, with the lowest drop occurring among the poorest individuals because benefits from the assistance program can be greater

than pre-crisis income, average consumption losses are most likely to be the smallest. On the other hand, consumers put less effort into searching and comparing non-durable goods before purchasing them because the pandemic's impact on the purchase of durable goods is uncertain because such purchases are frequently preceded by an information-gathering process (Van Der Wielen *et al.*, 2021). Except for groceries, he documented absolute decreases in spending in all sectors and consumption was vary seasonally (Gupta *et al.*, 2020). However, there has been a rise in the relative consumption of products and services that could be consumed at home or purchased online during the pandemic period (Van Der Wielen *et al.*, 2021). For instance, according to the Li *et al.* (2021) consumption was fell sharply in the first and second quarters due to the effects of lockdowns and the restrictions of daily activities for US citizens. However, owing to the relaxation of COVID-19 lockdown restrictions across the country, consumption expenditures has rebounded sharply in the September quarter in Australia (Melbourne being the exception) (Lim *et al.*, 2021).

Impacts of COVID-19 on size and the composition of public expenditure and healthcare costs

Seven studies revealed different results on health care facilities and government spending due to the COVID-19 epidemic. Among these, five papers investigated government spending, while two studies looked at variations of healthcare costs during the pandemic.

Public spending has had a significant negative impact on contemporary economic activity. Therefore, governments should focus on using fast and expensive measures to ensure that the circular flow of money is not interrupted to flatten the recession curve and minimize the damage caused to the economy (Varona and Gonzales, 2021). However, Burger (2020) discussed that, while the expenditure increases the debt, it also causes GDP to rise sufficiently to economic stability or even improve the debt to GDP ratio.

Some policymakers fear that cutting expenditure may undermine growth and fail to restore fiscal sustainability. Since the beginning of the COVID-19 pandemic, governments have argued in favour of increased government spending, believing that through the expenditure multiplier, such spending would generate a sufficient increase in economic growth (Burger and Calitz, 2020; Alhassan *et al.*, 2020).

According to the Donaldson and Mitton (2020), increased healthcare spending and social and economic support packages thrown at COVID-19 by various governments should include an assessment of the opportunity cost of patients whose procedures and treatments were curtailed. And also, McKibbin and Fernando (2020) stated that, to prevent the outbreak from spreading further, governments around the world have taken more precautionary measures, such as strengthening health screening at ports and investing in strengthening healthcare infrastructure. Further, Donaldson and Mitton (2020) mentioned that COVID-19 had brought a large-scale problem in terms of health versus the economy, and it had increased healthcare expenditures thrown at COVID-19.

Impacts of COVID-19 on savings and investment

A total of three studies were identified that examined the impact of COVID-19 on the savings and Investments. The COVID-19 has reduced global trade in goods, trade in services, and foreign direct investment dramatically. For an instance, the severe COVID-19 lockdown in China's Hubei province reduced fixed capital investment by 169 billion yuan in February 2020. By March 2020, the value of the loss dropped to 279 billion. During the lockdown period, the average loss was −224 billion yuan or about 82% of the counterfactual (Ke and Hsiao, 2021). Furthermore, Alhassan *et al.* (2020) recommended that governments prioritise investment in human capital development through the provision of healthcare facilities, personnel training, monitoring, and evaluation, and making access to healthcare facilities affordable to mitigate the risks of COVID-19.

Martin *et al.* (2020) presented a household-level model to examine the socioeconomic consequences of COVID-19 on per capita consumption, savings, and benefits of government interventions. According to their findings, the most individuals depleted their savings to smooth consumption, with some people fully deplete their savings.

Impacts of COVID-19 on GDP

GDP, which has been affected in various ways, was the most commonly examined parameter (in 15 studies). Ten studies out of 15 have examined the effects of the pandemic on GDP, and most of them were based on high COVID-19 fatality countries.

Per capita GDP showed a downward trend during the COVID-19 pandemic in many studies (Iluno *et al.*, 2021; Pinilla *et al.*, 2021; Boissay and Rungcharoenkitkul, 2020). Since GDP depends on some factors, such as COVID-19 mortality, population, etc., it is considered that COVID-19 mortality is the main contributor to the downward trend, even when GDP per capita remains constant (Iluno *et al.*, 2021). The decline in GDP attributable to the pandemic has been exogenous to the country and is beyond the government's control, as it is dependent on the global dynamics of the pandemic and the countries that are economically most interconnected. Furthermore, necessary restrictions on social interactions and "avoidable" restrictions on economic activity that exceed optimal restrictions cause a drop in GDP (Pinilla *et al.*, 2021). For example, Spain's economy is based on the services sector mainly, and it had larger dropdowns from COVID-19 In 2020 while reducing GDP by 11.41% as a result of COVID-19 (Boissay and Rungcharoenkitkul, 2020). And also, the national GDP of Ghana was expected to fall by 28% during their lockdown period (Amewu *et al.*, 2020). On the other hand, the GDP of Australia fell by a record 7% in the second quarter of 2020, following a 0.3% drop in the March quarter, recording the country's first technical recession since 1991 (Lim *et al.*, 2021). These results imply that GDP losses are much higher in developing countries than developed countries.

Impacts of COVID-19 on economic growth

This SLR identified four studies that examined the association between the impacts of COVID-19 and economic growth. Hayat *et al.* (2021) examined the linkages between inflation, interest rate, and economic growth in Pakistan under the influence of COVID-19 pandemic using a Wavelet Transformation Approach. Their findings indicate that the inflation rate-growth and interest rate–growth relationships are not unidirectional or bidirectional across all time scales. Therefore, they suggested that the monitory authority should attempt to maintain inflation and interest rate at a low level in the short-run and medium run instead of putting too much pressure in the long-run to achieve an economic growth. The GDP growth rate decreased in most countries during the pandemic. In some countries (Italy, Spain, the USA, the Netherland, Belgium, and Australia), the GDP growth rates started decreasing in the first quarter of 2020. Apart from that, the GDP growth rate decreased significantly from the fourth quarter of 2019 to the first quarter of 2020 in Germany, France, Sweden, and Canada. Among the countries with more than a thousand corona-affected cases, Malaysia is the only one whose GDP growth rate has not been affected by the Covid-19 (Islam and Muyeed, 2020).

Impacts of COVID-19 on international trade

According to Ke and Hsiao (2021) export and import decreased as a result of the COVID-19 lockdown policies. However, after the implementation of the unlock policy, both exports and imports have further declined. Therefore, they suggested that advancement of international trade permitted to restart of production immediately by finding alternative domestic or

foreign suppliers during the COVID-19 pandemic. The depreciation of the exchange rate has increased exports and decreased imports in countries losing capital, resulting in a current account adjustment that was consistent with the capital account adjustment (Mckibbin and Fernando, 2020). Meantime Lim *et al.* (2021) stated that the immediate economic burden of the sharp declines in net exports of services was, to a large extent, borne by sectors that were most exposed to international trade.

Impacts of COVID-19 on remittances

Three research papers examined the economic impact of COVID-19 on remittances; all studies found a considerable decrease in remittance income during the pandemic. These three studies analyzed the effects of Covid-19 on key social and economic areas, including migrant remittances (Gupta *et al.*, 2020; Islam and Muyeed, 2020; Rasul *et al.*, 2021). Households' capacity to purchase necessary food and non-food items to support their livelihoods has been harmed by a significant drop in remittance income following the lockdown (Gupta *et al.*, 2020). The COVID-19 epidemic made a substantial impact on the migration and remittance industries. Initial projections reveal that remittances may drop significantly across the board in South Asian nations (Rasul *et al.*, 2021).

Impacts of COVID-19 on demand and supply shocks, and price level

Three studies revealed the effects of inflation, and two papers discussed demand and supply shocks caused by the COVID-19 pandemic. According to the Pinilla *et al.* (2021), the decline in business activity was directly related to the sharp decrease in demand during the pandemic, and the decline in the Industrial Production Index, which discouraged the supply side during the pandemic. Meanwhile, lockdowns, travel restrictions, and shop closures, including informal grocery stores, bars, and restaurants, caused a significant decline in demand (Ataguba, 2020).

The inflation expectations were distinct from country to country during the COVID-19 pandemic. For an example, the impact of COVID-19 was expected to cause slightly higher inflation in South Asian countries in 2020. With the exception of Pakistan, all other South Asian countries were expected to have low inflation in 2020, compared to 2019 inflation rates (Rasul *et al.*, 2021). Moreover, coronavirus was associated with more pessimistic unemployment expectations and higher inflation expectations. This is consistent with the findings that consumer pessimism is linked to higher inflation expectations (Binder, 2020). The imports from countries highly affected by COVID-19 pandemic were reduced, the general price levels had increased in some countries (Ataguba, 2020).

Impacts of COVID-19 on poverty and wellbeing

The Covid-19 outbreak has had an immediate impact on people's health and economic activity, threatening the livelihoods of the poorest and most vulnerable groups. Two studies were examined impact of Covid-19 on poverty and human wellbeing. One study focused on South Asian countries, while the other focused on Sub-Saharan Africa. Both studies highlighted the significance of assisting and implementing policy measures to mitigate the pandemic's negative effects on the poor and most vulnerable segments of society and promote economic recovery (Amewu *et al.*, 2020; Rasul *et al.*, 2021).

According to Amewu *et al.* (2020), the national poverty headcount increased during the lockdown period. This significant, albeit temporary, increased resulted in an additional 3.8 million people falling into poverty during the lockdown. Governments required to provide social security to the poorest citizens, especially when they lose their informal employment opportunities. Improving the poor's saving habits, providing access to banking services, and providing safety nets during times of crisis reduce people's socioeconomic vulnerability (Rasul *et al.*, 2021).

Impacts of COVID-19 on socio-economic factors

Three studies have discussed socio-economic factors and human development while analysing the economic impact of COVID-19. Women, liberal occupations, a low level of education, and attendance at revival churches all had a significant socio-economic impact due to the COVID-19 pandemic (Natuhoyila *et al.*, 2021). On the other hand, lack of awareness of the spread of COVID-19, insufficient information transmission, and rude and social distancing procedures caused to made the COVID-19 epidemic vast danger (Parveen *et al.*, 2021). Therefore, governments must consider socioeconomic fundamentals when making health policy decisions because that can be useful in lowering household exposure to alcohol and cigarettes, reducing poverty rates, ensuring economic inclusion, and fine-tuning government control measures to minimise harm to the population while effectively curbing mortality (Ngepah, 2021).

Futher, Argente *et al.* (2022) used the SIR model to calibrate the impact of the change in commuting patterns following the public disclosure of information on the transmission of the virus and the economic losses due to the change in commuting patterns. He found that the economic welfare declined by 0.3% at the height of illness because workers have realized the cost of getting infected and changed their commuting behavior.

Discussion

This paper provides a comprehensive review of the economics of COVID-19 using the literature published between March 2020 to August 2021 (Appendix 1). It takes into account mainly economic impacts, cost, and uncertainty. The changes in economic factors and containment health policies have been considerations in the decision-making process of nations. It is important to identify behaviors of macroeconomic factors during the pandemic and their impact on entire economies while reviewing stringent policies of COVID-19 in each country. This study compiled data from over 60 countries, including the United States, India, and Brazil, which had significant COVID-19 mortality rates. Because all countries were interrelated regionally and worldwide in trade, travel, tourism and other socio economic conditions, the COVID-19 virus spread quickly and had long-term economic consequences for the entire world. When investigating the economic effects of COVID-19, gross domestic product, health spending, consumption, and the labor markets had encountered significant obstacles (Pinilla *et al.*, 2021; Béland *et al.*, 2020; Hayat *et al.*, 2021). Further, according to the study by Rasul *et al.* (2021) COVID-19 is likely to have an impact on economic growth by increasing the fiscal deficit and monetary burden, increasing the risks of macroeconomic instability, decreasing migration and remittances, and decreasing income from travel and tourism.

Economic impacts

The studies were categorised according to effects COVID-19 on economic variables. The pandemic has behaved as a systemic shock on the price level, consumption, unemployment, and savings at the macroeconomic level (Varona and Gonzales, 2021). Meantime, household savings and consumption have dropped significantly. The crisis was exacerbated by a general decrease in demand, people's change in consumer behavior, and a general slowdown in economic activities (Martin *et al.*, 2020). According to Villaverde and Jones (2020), most countries, regions, and cities fall into one of two categories: high GDP losses with high fatality rates (New York City, Lombardy, United Kingdom, etc.) or low GDP losses with low fatality rates (Germany, Norway, Kentucky). Only a few states, primarily California and Sweden, differ from this pattern. Those countries with the highest mortality reduced economic activity dramatically to reduce social contacts and slow the spread of the pandemic through a combination of government mandates and voluntary changes in behaviour. In comparison, areas that were able to control the virus from the start could maintain economic activity while

suffering fewer deaths. In addition, the tourism, hospitality, aviation, textile, agriculture, construction, and jewelry industries were primarily responsible for the economy and job creation. Those sectors have reported significant losses during the pandemic (You *et al.*, 2020). As Van der Wielen *et al.* (2021) proposed, a targeted policy response is required to boost economic recovery and reduce the risk of unemployment due to the severe labor market difficulties that have arisen as a result of the COVID-19 epidemic.

Economic cost

COVID-19 has the potential to inflict severe economic costs on both regional and global economies (Pak *et al.*, 2020). The high direct costs on human health and economic activities during the pandemic pose the most adverse effects on the livelihoods of the poor and the most vulnerable communities. For a example, COVID-19 has imposed unprecedented economic costs on the UK economy, and the duration of school and business closures were crucial to determining the indirect cost of the pandemic (Keogh-brown *et al.*, 2020). On the other hand, the strict COVID-19 containment policy resulted in Hubei's economy in China holding massive costs. However, the size and scope of huge losses have quickly reduced after re-opening the Chinese economy (Ke and Hsiao, 2021). Although all countries have suffered hardships due to Covid-19, South Asian countries, in particular, have had to face challenging situations with their large population, poor health facilities, high poverty rates, low socio-economic circumstances, and inadequate social protection systems. As a result, the economic and social consequences of the COVID-19 pandemic in South Asia are anticipated to be significant and long-lasting (Rasul *et al.*, 2021). According to the calculations of Argente *et al.* (2022), the average economic welfare loss per day compared to the no disclosure case declines by 0.3% in South Korea. Under partial disclosure and under no disclosure, the daily economic welfare loss for the young and old is 0.04% and 0.14%, respectively.

The global consumption, as a major source of economic activity, collapsed during the first wave of the pandemic in early 2020. The coronavirus has had a wide range of effects on individual consumption expenditure, even though its economic impact has been uneven. Since some companies continued to pay wages during lockdown has made huge costs, and some households may have had savings to fall back on to sustain consumption, it may overstate the experience of being poor (Rasul *et al.*, 2021; Amewu *et al.*, 2020).

Government policies

As countries begin to emerge from the most severe phase of the COVID-19 pandemic, they have used different policy tools to reduce health risks and monitor economic activities. The economic shocks of the COVID-19 have been more than just a demand management issue; they are a multifaceted crisis that will necessitate monetary, fiscal, and healthcare policy responses (Mckibbin and Fernando, 2020). For instance, the public debt to GDP ratio was budgeted to be around 80% in 2020/21, which was nearly 15% points higher than anticipated in the February 2020 budget due to the Covid-19 crisis in South Africa (Burger and Calitz, 2020). As a result, health economists should take the lead in developing policies for current and future pandemics. Therefore, many governments have used contingency funds for emergency pandemic response, including for urgent health needs, such as establishing testing labs, setting up special wards to boost hospitalisation and care capacity and procuring critical medical supplies (Donaldson and Mitton, 2020).

Further, The COVID-19 pandemic has prompted large-scale emergency government assistance for businesses and industries. The design and implementation of this assistance are essential in avoiding medium- and long-term aggregate demand and supply distortions (Binder, 2020). All countries have increased health spending, including improvements in virus diagnostics, vaccine purchases, hospital equipment purchases, and clinic and hospital

construction. Furthermore, many developed countries provided assistance to workers and vulnerable groups, such as increased transfers to unemployment insurance benefits and payments to minimum-wage workers (Martin *et al.*, 2020; Sarkodie and Owusu, 2021; Bagchi *et al.*, 2020).

Contributions to the literature

The study's findings contributed to the literature in a variety of ways. The COVID-19 literature relating to economics have been placed in a clear and understandable context. This study has visualised knowledge gaps by graphing these relationships and visualising their various connections, demonstrating their mutual influences.

Through the study, we have been able to provide empirical evidence of the economic impacts, economic costs, economic uncertainty, and macroeconomic variable changes of the COVID-19 pandemic. The results of the study have indicated that these variables have influenced each other in different ways. More importantly, developing countries have an above-average leverage effect on macroeconomic performance as those countries have strong impacts on their economies.

Many studies have been conducted to examine the macroeconomic variable changes, impacts on public health expenditure, and economic growth as a result of the pandemic. There were a few studies on the short-term relationship between economic risks, expectations, and costs. There was almost no sufficient literature on the relationship between fiscal support and performance of economic activities during the pandemic, which may be surprising considering the incentives of the containment policies that exist in several countries. In addition to the fact that very few studies have investigated the abovementioned relationships, another area of research can investigate to what extent countries can recover their economic loss while implementing containment health practices.

Limitations

An overview containing a diverse body of literature on the economics of COVID-19 through an examination of the multidimensional aspects may provide an understanding about mitigating practices of the adverse economic impacts of the pandemic. This review does not examine the financial impacts of COVID-19, though it is very much related to the economic performance of a country. The study mainly reviewed the economic consequences to illustrate the idea of the economics of COVID-19. Although this study made an attempt to cover both macroeconomic and household sector economic situations, there are some broad areas that cover microeconomic aspects, health financing, and efficiency of health resource utilisation, and have used a wide range of heterogeneous methods and measures. This study did not judge studies by their impact on ecological, demographical, and social impacts of the COVID-19 pandemic. In the meantime, the review is limited by the JBI summary quality framework of the underlying studies.

Conclusion

The COVID-19 pandemic has affected the economies of countries adversely while creating significant pressure on health systems. As the world becomes more interconnected, the economic impact of the pandemic has become more serious. In this sense, the current study contributes to a multidisciplinary stream of research on the economics of the COVID-19 pandemic. It has opened up a future research path to investigate the decision-making policies of the economy during the pandemic. This study documented the most relevant research articles to measure the economic consequences of the COVID-19 pandemic from 2020 to 2021. The study examined the economic impacts of COVID-19 focusing on the behavior of

macroeconomic variables during the COVID-19 pandemic. This study aims to guide governments, firms and households to take future decisions and act rationally by reducing the impacts caused by any future pandemic.

The lockdowns and other containment policies have had adverse effects on the price level, employment and GDP. In the meanwhile, it caused a significant drop in consumption and investment spending for many goods and services and manufacturing processes. Therefore, governments need to follow more development policy tools to ensure that the recovery from the pandemic leads to greater long-term resilience. Governments have been at the forefront of keeping economies and societies afloat. They have had to make difficult policy decisions immediately to prevent the spread of the virus especially as it affected the economy. Many countries have implemented government responses on public health, and social protection, and provided a test for budgeting, public employment, regulation, digital and infrastructure systems.

There were several guidelines to discuss the economic consequences of the pandemic, which were indicated by the future research studies referred to by authors from selected published studies. As a result, more comprehensive studies can be conducted to determine the threshold levels of inflation, interest rates and fiscal and monetary policy responses during the pandemic (Hayat *et al.*, 2021; Binder, 2020). A view of macroeconomic impacts and analysis to understand the short-run and long-run impacts of the macroeconomic factors while mitigating the risks of outbreaks of economic threats has been proposed to facilitate further study (Li *et al.*, 2021).

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Appendix 1
Included studies on economics of COVID-19 pandemic

Source	Countries examined	Method	Findings: Objective	Findings: Main finding
Ataguba (2020) -April	Africa	Qualitative	To discuss the economic burden or cost of the COVID-19 pandemic, especially in Africa	Full economic impact of COVID-19 on the economies of countries in Africa cannot be ascertained at the moment as the situation unfolds
Gupta *et al.* (2020) - Dec	India	OLS	To estimate the impacts of India's COVID-19 lockdown on household income, food security, welfare, and access to local loan markets	Weekly household local income fell by INR 1,022 (US$ 13.5), an 88% drop compared to the long-term average with another 63% reduction in remittance
Varona and Gonzales (2021) - Jan	Peru	Time Series- ARDL Model	To analyze the dynamics of the short-term behavior of economic activity/To explain the causal relationships in a Pandemic context based on the basic number of spread (Re) of COVID-19 per day	A negative and statistically significant impact of the COVID-19 shock was found on the level of economic activity and a long-term Cointegration relationship with an error correction model (CEM), with the expected sign and statistically significant at 1%
Pinilla *et al.* (2021)-March	Spain	Time Series	To analyze macroeconomic impact of the COVID-19 Pandemic in 2020 using key indicators of the Spanish economy	Adverse impact of the COVID-19 on the GDP was 11.41% in 2020/Immediate decrease in Demand-Families reduce consumption and began to save more, it leads to losses of jobs and reduced activity/National Unemployment rate increases of 11.%
Donaldson and Mitton (2020) - May	United Kingdom and Canada	Qualitative	To study trade-offs with respect to enhancing health system capacity and the impact of the mix of private-public financing	Health economics, it may be argued, should play a much bigger role in policymaking when it comes to current and future pandemics
Mckibbin and Fernando (2020)- March	Multiple Countries	General equilibrium model	To provide guidance to policymakers regarding the economic benefits of globally coordinated policy responses to tame the virus	Consumer and investor confidence reinforce negative multiplier effects in a downward spiral between labor and output markets. The three potential "shapes"
Mckibbin and Fernando (2020) - May	Nigeria	time-series data - ARDL	To assess the regional economic impact of the lockdown measures ordered by the national government to prevent the spread of COVID-19	Health expenditure has negative impact on economic growth./The significant positive effect of life expectancy on economic growth/Impact of death rate on economic growth is negative and significant
Hayat *et al.* (2021) - April	Pakistan	time-series data - ARDL - Monthly data	To understand the impact of inflation and the interest rate on output growth in the context of Pakistan using the wavelet transformation approach	Inflation growth and interest rate growth are out of phase, indicating the negative relationship between variables. Keeping the inflation rate at a low level is very essential for growth in Pakistan in these tough economic times due to the COVID-19 pandemic

(*continued*)

Source	Countries examined	Method	Findings	
			Objective	Main finding
Burger and Calitz (2020) - March	South Africa	Markov-switching model- Qualitative	To explore the past efforts of government to maintain or restore fiscal sustainability by estimating a fiscal reaction function using a Markov-switching model	Need to establish the deficit financing, expenditure and revenue adjustments that the government will have to make to restore fiscal sustainability
Ngepah (2021) - Jan	196 counties	Panel Data	To examines the different socio-economic determinants of the fatalities associated with the COVID-19 pandemic globally in social determinants of health frameworks	An improved adequate health infrastructure for both testing and treatment is necessary, but not sufficient. Health systems ultimately become overwhelmed and ineffective in managing cases and reducing mortality in the face of the rising pandemic. Complementary social, economic, physical and environmental factors are necessary for curbing deaths
Boissay and Rungcharoenkitkul (2020)	USA and Global Economy	Descriptive Statistics	To review studies on past epidemics, and then turn to the latest quantitative estimates of Covid-19's impact on global growth	A better understanding of the transmission channels of the Covid-19 shock to the economy, the interaction between economic decisions and the epidemic, and the policy trade-offs is therefore needed
Villaverde and Jones (2020)	USA	Descriptive Statistics	To study time-varying contact rate in order to capture behavioral and policy-induced changes associated with social distancing	The mortality rate of SARs-CoV-2 in Spain is between 1 and 1.1%. Because many of the early deaths in the epidemic were linked with mismanagement of care at nursing homes in Madrid and Barcelona that could have been avoided, we pick 1% as our benchmark value
Djurovic *et al.* (2020) - Nov	Montenegrio	OLS - SVARX model of GDP	To diagnoses, and assesses appropriate macroeconomic policy responses of the Montenegrin Government to the outbreak of COVID-19	Forecasted reduction of the GDP_GAP is to−3.2% and−7.0%, respectively, from January 2020 to December 2020
Van Der Wielen *et al.* (2021)- Nov	27 EU members	Panel Data	To document the changes in households' economic sentiment in the EU following the outbreak of the COVID-19 pandemic and ensuing lockdown	The labour market impact of this crisis is more pervasive, at least in the people's minds
Ke and Hsiao (2021) - August	China	Panel Data	To evolute the economic consequences of the drastic lockdown policy in the epicenter of COVID-19 —the Hubei Province of China during worldwide curbs on economic activity	The total GDP decreased 37% in 2020./Private components of GDP, investment, consumption, export, and import lost 82%, 30%, 36%, and 25% of their respective counterfactual values

(*continued*)

Source	Countries examined	Method	Findings: Objective	Findings: Main finding
Rasul *et al.* (2021) - Feb	South Asia	Descriptive Statistics	To analyse existing and prospective impacts, risks and challenges of Covid-19 on key social and economic sectors including migration, tourism, informal sector, agriculture and rural livelihoods	COVID-19 affected to economic growth, increase of fiscal deficit and monetary burden, increase the risks of macroeconomic instability, decrease migration and remittance, reduce income from travel and tourism, and result in dwindling micro-small and medium industries and informal businesses. This is likely to deepen poverty and increase unemployment and the risks of hunger and food insecurity
Binder (2020) - Oct	USA	OLS	To study the formation of consumer expectations and response to information or Fed communication	The possible increases in consumer inflation expectations in the next few months of the COVID-19 crisis might best be interpreted as increases in pessimism rather than as improved expectations of aggregate demand
Sarkodie and Owusu (2021) - May	Global	Descriptive Statistics	To analyse global environmental, health and economic dimension of the effect of COVID-19 using qualitative and empirical assessments	COVID-19 global pandemic uncertaintyFootnote1 ranks the UK (128.36 index) as the country with the highest uncertainty level among 143 countries towards COVID-19 pandemic.The highest total economic stimulus occurs in Bahrain (31.30% of GDP) across 162 countries
Martin *et al.* (2020) - May	Global	Descriptive Statistics	To analyse the socio-economic impacts of the COVID-19 containment at the household level	Household savings and consumption drop significantly, The long recovery time after the crisis will be further exacerbated by a general decrease in demand, people's change in consumption behavior, and general slowdown of economic activities
Keogh-brown *et al.* (2020) - April	UK	Sensitivity analysis	To assess the potential macroeconomic impact of COVID-19, together with policies to mitigate or suppress the pandemic	The total cost to the economy is £308bn (13.5% of GDP); £66bn (2.9% of GDP) of which is attributable to labour lost from working parents during school closures, and £201bn (8.8% of GDP) of which is attributable to business closures
Iluno *et al.* (2021) - March	Nigeria	Regression Analysis	To model the effect of COVID-19 mortality per population, a proxy for COVID-19 on the GDP per capita per COVID-19 cases	There is a non-linear relationship between COVID-19 mortality and the economic wellbeing of Nigerians

(*continued*)

Source	Countries examined	Method	Findings: Objective	Findings: Main finding
Béland *et al.* (2020) - April	USA	OLS	To explore the short-term economic consequences of COVID19 on employment and wages in the United States	COVID-19 increased the unemployment rate, decreased hours of work and labor force participation and had no significant impacts on wages. The negative impacts on labor market outcomes are larger for men, younger workers, Hispanics and lesseducated workers
Bitanihirwe and Ssewanyana (2021) - April	Sub-Saharan Africa	Qualitative	To analyse health and economic burden associated with COVID-19 in SSA	Sub-Saharan Africa, remain tenuous and will require context-appropriate interventions. Control measures to tackle COVID-19 in SSA should therefore be informed through lessons learned from past outbreaks and emergencies on the continent
(Li *et al.*, 2021) - April	USA	Descriptive Statistics	To examine the impact of the global financial crisis, and the COVID-19 pandemic on the macroeconomic variables of the US economy	The impact of the crisis on the recession probabilities in the current pandemic is lower than that at the time of the global financial crisis
Lim *et al.* (2021) - April	Australia	Descriptive Statistics	To describe the economic growth and labour market ramifications associated with COVID-19, and the fiscal and monetary policies implemented to help counter its effects	COVID-19 lockdowns and the closure of borders have had a massive negative and pervasive impact of Australia's performance in 2020
Islam and Muyeed (2020) - March	Global	Descriptive Statistics	To find out the crucial impacts of Coronavirus pandemic on the global economy and predicting the scenario which will face the world economy	30%–40% foreign investment has been decreased and unemployment rate will rose to more than 25% all over the world. This crisis could cost 2.7 Trillion US dollar which is about 3.06% of the global GDP
Amewu *et al.* (2020) -May	Ghana	Social Accounting Matrix (SAM) multiplier models	To estimate the economic costs of COVID-19 policies and external shocks in a developing country context, with a focus on agri-food system impacts	Heavy economic costs will impose. National GDP is estimated to fall by 27.9% while agri-food system GDP losses are estimated at 19.8%
Rowthorn and Maciejowski (2020)	United Kingdom	SIR Model	To quantify the benefits of early intervention to control the disease and examine how the government's valuation of life influences the optimal path	Under the Baseline scenario, the value of life is £2m and the optimal lockdown lasts for 5.3 weeks. Holding other parameters constant, it becomes optimal to dispense with the lockdown altogether once the value of life drops below £1.68 m
Natuhoyila *et al.* (2021)	Congo	cross-sectional	To measure the impact of the COVID-19 pandemic on the living conditions of households	Approximately 85% households surveyed had a significantly socioeconomic impact due to the pandemic which highlights the need for more longitudinal studies to be conducted on this age group

(*continued*)

Source	Countries examined	Method	Findings	
			Objective	Main finding
Parveen *et al.* (2021)	Pakistan	Descriptive Statistics	To examine the medical, socio-economic challenges facing during the COVID-19 pandemic	Due to health, social, economic and political structure, the Pakistani government will not be able to take any action against COVID-19
Argente *et al.* (2022)	South Korea	SIR Model	To quantify the effect of public disclosure on the transmission of the virus and economic losses in Seoul	The daily economic welfare loss for the young (old) is 0.04 (0.05) percent under partial disclosure and 0.14 (0.17) percent under no disclosure

Appendix 2

Validity assessments with JBI critical appraisal check list after adjudication

Index	Index	
	Yes	No
1. Is the review question clearly and explicitly stated?	78	22
2. Were the inclusion criteria appropriate for the review question?	79	21
3. Was the search strategy appropriate?	67	33
4. Were the sources and resources used to search for studies adequate?	74	26
5. Were the criteria for appraising studies appropriate?	70	30
6. Was critical appraisal conducted by two or more reviewers independently?	100	0
7. Were there methods to minimise errors in data extraction?	66	34
8. Were the methods used to combine studies appropriate?	65	35
9. Was the likelihood of publication bias assessed?	19	81
10. Were recommendations for policy and/or practice supported by the reported data?	85	15
11. Were the specific directives for new research appropriate?	93	7

Note(s): JBI: Joanna Briggs Institute

Appendix 3
Methodological quality assessment and depth of reporting

	Background/ Rational	Objective	Setting	Eligibility of the participants	Variables	Data sources/ measurement	Study size	Quantitative variables	Statistical methods with	Sensitivity analysis	Participant number	Descriptive data	Main results	Category of continuous variables	Key results	Limitations	Interpretation	Funding. Items
Ataguba (2020)	y	y	y	y	y	y	y	n	y	n	y	n	y	n	y	y	y	y
Gupta *et al.* (2020)	y	y	y	n/a	y	y	n	y	y	n	n/a	n	y	y	y	y	y	y
Varona and Gonzales (2021)	y	y	y	n/a	y	y	y	y	y	n	n/a	n	y	y	y	y	y	y
Pinilla *et al.* (2021)	y	y	y	n/a	y	y	y	y	y	n	n/a	n	y	y	y	y	y	y
Donaldson and Mitton (2020)	y	y	y	n/a	y	y	y	n	y	n	n/a	n	y	n	y	y	y	y
McKibbin and Fernando (2020)	y	y	y	n/a	y	y	y	y	y	n	n/a	n	y	y	y	y	y	y
Alhassan *et al.* (2020)	y	y	y	n/a	y	y	y	y	y	n	n/a	n	y	y	y	y	y	y
Hayat *et al.* (2021)	y	y	y	n/a	y	y	y	y	y	n	n/a	n	y	y	y	y	y	y
Burger and Calitz (2020)	y	y	y	n/a	y	y	y	y	y	n	n/a	n	y	y	y	y	y	y
Ngepah (2021)	y	y	y	n/a	y	y	y	y	y	n	n/a	n	y	y	y	y	y	y
Boissay and Rungcharoenkitkul (2020)	y	y	y	n/a	y	y	y	y	y	n	n/a	y	y	y	y	y	y	y
Villaverde and Jones (2020)	y	y	y	n/a	y	y	y	y	y	n	n/a	y	y	y	y	y	y	y
Djurovic *et al.* (2020)	y	y	y	n/a	y	y	y	y	y	n	n/a	n	y	y	y	y	y	y
Van Der Wielen *et al.* (2021)	y	y	y	n/a	y	y	y	y	y	n	n/a	n	y	y	y	y	y	y
Ke and Hsiao (2021)	y	y	y	n/a	y	y	y	y	y	n	n/a	n	y	y	y	y	y	y
Rasul *et al.* (2021)	y	y	y	n/a	y	y	y	y	y	n	n/a	y	y	y	y	y	y	y
Binder (2020)	y	y	y	n/a	y	y	y	y	y	n	n/a	n	y	y	y	y	y	y
Sarkodie and Owusu (2021)	y	y	y	n/a	y	y	y	y	y	n	n/a	y	y	y	y	y	y	y
Martin *et al.* (2020)	y	y	y	n/a	y	y	y	y	y	n	n/a	y	y	y	y	y	y	y
Keogh-Brown *et al.* (2020)	y	y	y	n/a	y	y	y	y	y	y	n/a	n	y	y	y	y	y	y
Iluno *et al.* (2021)	y	y	y	n/a	y	y	y	y	y	n	n/a	n	y	y	y	y	y	y
Béland *et al.* (2020)	y	y	y	n/a	y	y	y	y	y	n	n/a	n	y	y	y	y	y	y
Bitanihirwe and Ssewanyana (2021)	y	y	y	n/a	y	y	y	n	y	n	n/a	n	y	n	y	y	y	y
Li *et al.* (2021)	y	y	y	n/a	y	y	y	y	y	n	n/a	y	y	y	y	y	y	y
Lim *et al.* (2021)	y	y	y	n/a	y	y	y	y	y	n	n/a	y	y	y	y	y	y	y
Islam and Muyeed (2020)	y	y	y	n/a	y	y	y	y	y	n	n/a	y	y	y	y	y	y	y
Amewu *et al.* (2020)	y	y	y	n/a	y	y	y	y	y	n	n/a	n	y	y	y	y	y	y
Rowthorn and Maciejowski (2020)	y	y	y	n/a	y	y	y	y	y	n	n/a	n	y	y	y	y	y	y
Natuhoyila *et al.* (2021)	y	y	y	n/a	y	y	y	y	y	n	n/a	n	y	y	y	y	y	y
Parveen *et al.* (2021)	y	y	y	n/a	y	y	y	y	y	n	n/a	y	y	y	y	y	y	y
Argente *et al.* (2022)	y	y	y	n/a	y	y	y	y	y	n	n/a	n	y	y	y	y	y	y
	100	100	100	3	100	100	97	90	100	0	3	3	29	100	90	100	100	100

Note(s): y: present n: not present n/a: not applicable
Source(s): Rana *et al.* (2020)