

Analytic Matrix of vulnerability to Covid-19 among the adult population: an integrative review

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Abstract: **Objective:** To synthesize the elements of vulnerability to Covid-19 among the adult population. **Method:** Integrative review carried out between August and November 2020, with defined criteria of inclusion, exclusion and retrieving of studies. Data were extracted and synthesized by means of the categorical thematic analysis, and systematized by the vulnerability concept. **Most relevant results:** From 2247 articles retrieved, 70 original studies were selected, fully read and assessed. Four vulnerability markers emerged: *Chronic Health Conditions; Daily Life Experiences; Social Insertion; and Health Services and Actions.* **Main conclusions:** The identified vulnerability markers may support health professionals in the identification of patients with less autonomy and resources for self-care and protection against Covid-19. They may also foster the adoption of health and intersectoral interventions to protect patients against Covid-19, as well as the reduction of SARS-Cov-2 transmission rates within communities and other settings, with significant decline in the impact of the virus on society.

► **Keywords:** Adult. Middle-Aged People. Social Health Determinants. Health Vulnerability. Covid-19.

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Introduction

This study proposes the reconstruction of an instrument that allows health professionals to recognize the elements of vulnerability in adults for the Coronavirus disease 2019 or Covid-19. In addition, it may help them identify patients' real needs, facilitating the adoption of integral health care.

Covid-19 is caused by the SARS-CoV-2 (Severe Acute Respiratory Syndrome - Coronavirus 2) virus, a beta Coronavirus from the same subgenre as the Middle East respiratory Syndrome (MERS), but from another sub-type (ORTIZ-PRADO *et al.*, 2020). This microorganism, currently troublesome for global health, causes a potentially lethal disease (ROTHAN; SIDDAPPA, 2020). The virus ascendance has likely evolved from the large number of infected people exposed to the animal market in the city of Wuhan, China, suggesting the probable zoonotic origin of the Covid-19 (TAZERJI *et al.*, 2020).

Until May 2022, about 525,039,437 confirmed cases were reported worldwide, totaling 6,282,176 deaths. The United States of America has been the epicenter of the disease with 82,811,372 confirmed cases and 1,000,430 deaths due to the SARS-CoV-2. In Brazil, there were 30,701,900 confirmed cases and 665,216 deaths due to Covid-19 (JOHNS HOPKINS CORONAVIRUS RESOURCE CENTER, 2022).

Community transmission of the SARS-CoV-2 was confirmed in all countries around the globe, primarily occurring by means of the contact with respiratory droplets and/or aerosols from symptomatic or asymptomatic infected patients. Incubation period varies from 0 to 14 days, an estimation of 5 to 6 days after infection (LU *et al.*, 2020; BRASIL, 2022).

Suspected cases of Covid-19 are commonly reported as: flu syndrome, “acute respiratory condition characterized by at least two of these signs and symptoms – fever (even though reported), chills, sore throat, headache, cough, rhinorrhea, olfactory or gustatory disorders”; or severe acute respiratory syndrome (SARS), “dyspnea or respiratory discomfort or chest pressure or persistent pain or O₂ saturation below 95% in the environment air or bluish color (cyanosis) of lips or face” (BRASIL, 2022, p. 22). However, a Covid-19 case (flu syndrome or SARS) must be confirmed or ruled out following these criteria: clinical, clinical-epidemiological, clinical-imaging tests and laboratory tests (molecular biology, immunology and search for

antigens) in asymptomatic or symptomatic, vaccinated or non-vaccinated subjects against Covid-19 (BRASIL, 2022).

People with certain chronic morbidities are more vulnerable to develop SARS. Thus, older individuals – over 80 years old – with chronic respiratory diseases, hypertension and cardiovascular diseases are considered risk groups for SARS (YANG *et al.*, 2020). Covid-19 may have inflammatory outcomes to heart, kidneys and/or liver due to generalized inflammation in response to the infection (TAHIR *et al.*, 2020).

Thus, death rate has been estimated in 10.5% for cardiovascular diseases, 7.3% for Diabetes Mellitus, 6.3% for chronic respiratory diseases, and 6% for hypertension (MOREIRA, 2020). From a demographic perspective, 60% of Covid-19 cases were observed to affect individuals between 18 and 59 years of age, 30% of individuals over 60 years, and 54.3% of males (LO *et al.*, 2020; SOHRABI *et al.*, 2020).

Regarding the above-mentioned factors of biological risk, this study assumes that the vulnerability of adult individuals to Covid-19 is related to the available prevention resources, as well as subjects' self-care and autonomy to make their own decisions. Such elements can be understood under the concept of vulnerability in health, that is, a set of individual, social and political conditions that concomitantly determine the health preservation of subjects and communities, and their protection against diseases and/or disabilities (AYRES; PAIVA; FRANÇA JÚNIOR, 2011; SILVA *et al.*, 2016).

In the context of the Covid-19, worldwide, millions of human beings live in densely populated communities, poor housing quality, lack of basic sanitation and access to water treatment. Such groups have no resources or autonomy to adopt prevention measures against the spread of SARS-Cov-2, such as social distancing and frequent hand washing (THE LANCET, 2020). Greater incidence of Covid-19 among African-Americans and its disproportionate effects reflect the racial inequality and social exclusion of these groups, already existent before the pandemic (KIM; BOSTWICK, 2020).

Those conditions of vulnerability are grouped and organized as markers of vulnerability, encompassing a health care technology. This instrument may subsidize health professionals for the identification of patients with less autonomy and resources for self-care and protection against Covid-19 (CARNEIRO; AYRES, 2021). This scale of vulnerability degrees enables the adoption of intersectoral health interventions,

which provide those people with better protection against Covid-19 infection. In addition, they reduce SARS-Cov-2 transmission rates within communities and other settings, with significant reduction of the virus impact on the society.

Acknowledging the most vulnerable groups allows equity-based planning of public policies, a tenant from the Unified Health System (SUS), as well as the whole-person care within health-care services. Thus, this study aimed to synthesize the vulnerability markers to Covid-19 among the adult population.

Method

Integrative review grounded in the research question: “What conditions determine the vulnerability to Covid-19 among the adult population? The following methodological steps were taken: definition of the criteria for study inclusion (participants, exposure factors, results and types of studies, definition of the search strategies, data extraction and synthesis), aiming at the necessary clarity and strictness for the study (WHITTEMORE; KNAFL, 2005).

Inclusion and exclusion criteria were established for the selection of the studies. Regarding the participants, studies developed with males and females between 20-59 years of age were considered due to the magnitude of the cases of Covid-19 within this age range in the searched studies (LO *et al.*, 2020).

Regarding the exposure factors, biological, psychosocial, socioeconomic and sociocultural conditions, leading to the Covid-19, were considered. Included studies were as follows: studies addressing risk factors, studies measured by means of prospective and retrospective statistical methods, as well as logistic regression and correlation.

The selected studies addressed the Covid-19 disease, described by the International Classification of Diseases and Related Health Problems, code (ICD -10) – U07.1, used for hospital discharges after April 1 2020. The code was developed by the World Health Organization (WHO), and must be used as the main diagnosis (KADRI *et al.*, 2020).

The included studies were as follows: observational cohort studies, case-control or cross-sectional studies, quasi-experimental, qualitative, exploratory, theoretical, ethnographic studies, action-research and case study. The idioms of the published studies comprised English, Portuguese and Spanish, as researchers master such languages. The timespan 2019-2020 (1 retrospective year) was chosen due to its current evidence, considering that the first outbreaks of the disease occurred at the

end of 2019. The studies were retrieved between October 2020 and January 2021.

The excluded studies were established as follows: studies addressing clinical conditions, tests of therapeutic efficacy, diagnostic accuracy, and those that did not report correlated risk factors; secondary studies of systematic, integrated and narrative review, theses, dissertations, technical documents, and articles published in other idioms rather than the selected ones.

For study retrieval, the following databases were selected: CINAHL (Cumulative Index of Nursing and Allied Health Literature), BDENF (Nursing Database - Base de Dados de Enfermagem); IBECs (Spanish Bibliographic Index of the Health Sciences) and LILACS (Scientific Health Literature from Latin-American and Caribbean countries) – accessed at the BVS portal (Virtual Health Library); and MEDLINE (Index Medicus) – accessed at the BVS e PubMed (National Library of Medicine) portals.

Search strategies were built for each database in order to ensure more focused and accurate search. Such strategies were built with descriptors and/or keywords, validated to conduct the search, according to table 1, below.

Table 1. Search strategies used for article retrieval. São Paulo, 2020

Portal / Databases	Search strategies
BVS (BDENF, IBECs, LILACS and Medline)	“Populações Vulneráveis” AND “Infecções por Coronavírus” AND mh:(“Populações Vulneráveis” OR “Populações Vulneráveis” OR “Populações Vulneráveis” OR “Populações Vulneráveis”) AND mj:(“Infecções por Coronavírus”)
Pubmed (Medline)	(“vulnerable populations”[MeSH Terms] OR vulnerable populations[Text Word]) AND (“Covid-19”[All Fields] OR “severe acute respiratory syndrome coronavirus 2”[All Fields] OR “severe acute respiratory syndrome coronavirus 2”[All Fields] OR “2019-nCoV”[All Fields] OR “SARS-CoV-2”[All Fields] OR “Wuhan”[All Fields]) AND (“coronavirus”[MeSH Terms] OR “coronavirus”[All Fields])
CINAHL	(vulnerable populations or groups or people) AND (covid-19 or coronavirus or 2019-ncov or sars-cov-2 or cov-19)
Web of Science	(ALL=(“vulnerable populations” AND “Covid-19” OR “severe acute respiratory syndrome coronavirus 2” OR “2019-nCoV” OR “SARS-CoV-2”)

Source: Research data.

The articles retrieved from the databases were tabulated in the Endnote® Platform and, after the exclusion of the repetitions, had their titles and abstracts fully read. By means of the inclusion and exclusion criteria, the final sample of the assessed articles was obtained. The selected studies from the databases and portal had their methodological quality evaluated by the *PRISMA-P* © strategy (*Preferred Reporting Items for Systematic review and Meta-Analysis Protocols*), and their titles and abstracts fully read, being applied the established inclusion and exclusion criteria (MOHER *et al.*, 2015).

The articles included at this step of the study were fully read and their contents were tabulated in the Microsoft Excel® spreadsheet. The determinant conditions of life for Covid-19 comprised the corpus for data synthesis. Thematic analysis of the categories was used (BARDIN, 2010). Data were presented in a descriptive way, with their synthesis shown in graphic representation, and the categories emerging from this study were named as vulnerability markers (AYRES; PAIVA; FRANÇA JÚNIOR, 2011).

Results

From 2,247 retrieved articles, 95 repeated studies were excluded, identified in the Endnote® platform. Thus, 2,152 articles were selected, their titles and abstracts fully read; 2,082 studies, which did not meet the inclusion criteria, were excluded. Therefore, 70 original, fully-read studies were assessed, according to description in Figure 1.

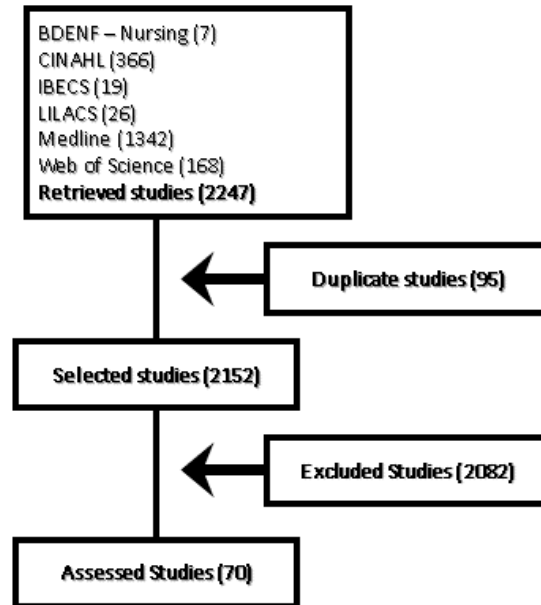


Figure 1. Process of retrieval, selection, exclusion and inclusion of the original studies (MOHER *et al.*, 2015). São Paulo, 2021

By means of the full reading of the 70 assessed studies, the elements of vulnerability were grouped according to subjects' individual conditions, the sociocultural, socioeconomic elements, and the availability of health care actions and services, subsequently shown.

Finally, the reflection on the exclusion of studies which “are not available for free search”. Although it is justifiable, in times when the so called Open Science has been claimed, it may result in a selection bias, as many highly relevant studies are sent to renowned and prestigious journals, which charge for the access to their publications.

Chronic health conditions

The first synthesized marker refers to the conditions of health and disease that curb adult subjects to access care to their health needs during the pandemic. Their components are the physical disability (LAKHANI, 2020; MESA VIEIRA *et al.*,

2020), communication disorders (SHER; STAMPER; LUNDY, 2020), Alzheimer disease and/or related dementias (BROWN *et al.*, 2020), and psychiatric disorder (SERAFINI *et al.*, 2020).

Thus, adult subjects with chronic diseases, such as cardiopathy, pneumopathy, systemic arterial hypertension, diabetes mellitus, neoplasia, nephropathy, smoking and HIV/AIDS (ADAMS *et al.*, 2020; ALCÁNTARA MONTERO *et al.*, 2020; BASU, 2020; BERHAN, 2020; FORMIGA; TARAZONA-SANTABALBINA, 2020; DE LUSIGNAN *et al.*, 2020; KALICHMAN *et al.*, 2020; KUDERER *et al.*, 2020) are also vulnerable. From the life cycles, pregnant women were also considered vulnerable (BERHAN, 2020), as well as older people (PRINA, 2020; GÓMEZ-MORENO *et al.*, 2020; KNIGHTS *et al.*, 2020; MARCON *et al.*, 2020; MESA VIEIRA *et al.*, 2020).

Daily life experiences

The second synthesized marker points out all living situations of adult subjects regarding their cultural, humanistic, geopolitical status that hinder their access to healthcare during the pandemic of Covid-19. The immigrant condition is considered a component of this marker. (TACKLE..., 2020; BRITO, 2020; CLARK *et al.*, 2020; KOH, 2020; MESA VIEIRA *et al.*, 2020; SURESH; JAMESR, 2020; BRITO, 2020; CLARK *et al.*, 2020; HAMIDIAN JAHROMI; HAMIDIAN JAHROMI, 2020), as well as the refugee status (BRITO, 2020).

Adult people are also limited by cultural barriers (AHMAD *et al.*, 2020; BRADLEY; KIRBY; WHEATSTONE, 2020; KHAZANCHI *et al.*, 2020), such as the ethnic minorities (CUPERTINO *et al.*, 2020; DÍAZ DE LEÓN-MARTÍNEZ *et al.*, 2020; GRAY *et al.*, 2020; KHAZANCHI *et al.*, 2020; MESA VIEIRA *et al.*, 2020; RAIFMAN; RAIFMAN, 2020; DE LUSIGNAN *et al.*, 2020; HAMIDIAN JAHROMI; HAMIDIAN JAHROMI, 2020; NIEDZWIEDZ *et al.*, 2020), and women oppressed by a misogynist and male-chauvinist culture (BETRON *et al.*, 2020; AMALAKANTI; RAMAN AREPALLI; KOPPOLU, 2020).

In their daily lives, mothers without family and social support are vulnerable individuals (CHOI; BYOUN; KIM, 2020), sex workers (PLATT *et al.*, 2020), LGBTQIA+ population (SALERNO; WILLIAMS; GATTAMORTA, 2020), dwellers in shelters or halfway houses (PAHO, 2021), and institutionalized elders (BURKI, 2020; DANIS *et al.*, 2020).

Still in the humanitarian context, there is more vulnerability among the prison population (BARNERT, 2020; MESA VIEIRA *et al.*, 2020; MONTOYA-BARTHELEMY *et al.*, 2020; DE LUSIGNAN *et al.*, 2020), and street population (TACKLE..., 2020; BARBIERI, 2021; MESA VIEIRA *et al.*, 2020).

Social insertion

The third synthesized marker addresses the population's material living conditions and their limitations to ensure their support and biosafety during the current pandemic. This marker comprises the conditions of low educational level (AHMAD *et al.*, 2020; CALDERÓN-LARRAÑAGA *et al.*, 2020; CHRISTOFFEL *et al.*, 2020; HIMMELFARB; BAPTISTE, 2020; AMALAKANTI; RAMAN AREPALLI; KOPPOLU, 2020), low family income (AHMAD *et al.*, 2020; CALDERÓN LARRAÑAGA *et al.*, 2020; CHRISTOFFEL *et al.*, 2020; CUBRICH, 2020; HIMMELFARB; BAPTISTE, 2020; KANTER; SEGAL; GROENEVELD, 2020; RAIFMAN; RAIFMAN, 2020), unemployment (AHMAD *et al.*, 2020; CALDERÓN-LARRAÑAGA *et al.*, 2020; CHRISTOFFEL *et al.*, 2020; HIMMELFARB; BAPTISTE, 2020; KHAZANCHI *et al.*, 2020), and work in food services (PARKS *et al.*, 2020).

That material deprivation makes vulnerable those living in poor housing conditions (AHMAD *et al.*, 2020; CALDERÓN-LARRAÑAGA *et al.*, 2020; CHRISTOFFEL *et al.*, 2020; HIMMELFARB; BAPTISTE, 2020; KIRBY, 2020), homelessness (DE LUSIGNAN *et al.*, 2020; ("TACKLE CORONAVIRUS IN VULNERABLE COMMUNITIES", 2020; KHAZANCHI *et al.*, 2020). Therefore, dwellers in overcrowded cities have more vulnerability and fewer resources for their health care (SURESH; JAMESR, 2020), the population living in cities with high pollution levels (DÍAZ DE LEÓN-MARTÍNEZ *et al.*, 2020), and those who live in isolated rural communities (FORTALEZA *et al.*, 2020), in the outskirts of urban areas (SANTOS *et al.*, 2020), with poor transportation system (KHAZANCHI *et al.*, 2020).

Health services and actions

The fourth and last synthesized marker is related to the availability of human and physical resources to deliver care to patients affected by Covid-19, and their protection in the face of the community transmission by the SARS-Cov2 virus.

It encompasses the availability of primary health care services (RAIFMAN; RAIFMAN, 2020; ATIF; MALIK, 2020; BENJAMIN, 2020), home care and/or palliative care (LAKHANI, 2020), and tertiary health care, which provides hemodynamic ventilation support for those who developed severe Covid-19 symptoms (KANTER; SEGAL; GROENEVELD, 2020).

The adult population requires health care services with proper conditions to meet their health needs. Such services need the availability of personal protective equipment, such as masks, face shields, glasses, aprons, among others (SMITH, 2020; BELINGHERI; PALADINO; RIVA, 2020), as well as their implementation must meet the daily health care routine (CANOVA *et al.*, 2020).

Health care services must qualify professionals and users to the early recognition and isolation of probable Covid-19 cases (HEINZERLING *et al.*, 2020; NG *et al.*, 2020), and provide guidance on handwashing, use of 70% alcohol, use of masks in public places, social distancing, among others (BELINGHERI; PALADINO; RIVA, 2020; KIKUCHI *et al.*, 2020; BORRACCIGIGLIO, 2021). Similarly, governments must provide fast responses to the monitoring of migration flows (DING *et al.*, 2020).

Discussion

Chronic Health Conditions point to social groups that have fewer conditions to access health care and social services, more possibility for isolation and complications in their clinical conditions due to the lack of social support (LAKHANI, 2020). Therefore, these people may have lower adherence to preventive measures and self-care due to their difficulty in understanding the infection hazards and treatment to Covid-19, associated to senility and other comorbidities (PRINA, 2020; SHER; STAMPER; LUNDY, 2020).

During the pandemic, those chronic patients may have discontinued their visits to the health care services, not taking their medication for continuous treatment, and not performing their clinical follow-up and laboratory testing (FORMIGA; TARAZONA-SANTABALBINA, 2020). It must be considered that most health care services altered their workflow, not seeing their patients with chronic conditions in order to meet the high demand of Covid-19 cases (ADAMS *et al.*, 2020; KUDERER *et al.*, 2020).

The Daily Life Experiences entail the barriers imposed by social, cultural, humanistic, geopolitical and economic issues, which are decisive for the increase of vulnerability among those people during the pandemic (BRITO, 2020; HAMIDIAN JAHROMI; HAMIDIAN JAHROMI, 2020).

Linguistic and cultural adversities hinder the access to information on prevention, such as hand hygiene and use of masks, which contributes to the greater spread of the coronavirus in the community (RAIFMAN; RAIFMAN, 2020). Many times, there has been difficulty in delivering care to this group, which may have their access to the health care services prevented due to legal migration issues (CLARK *et al.*, 2020; KHAZANCHI *et al.*, 2020).

Worldwide, many minority groups are observed to suffer lack of access to health, education and the basic human rights, fundamentally among the refugees, LGBTQIA+ people, sex workers and women from patriarchal, authoritarian societies (BETRON *et al.*, 2020; SALERNO; WILLIAMS; GATTAMORTA, 2020). Institutionalized people, prison inmates have greater chance to get infected by Covid-19 due to the overpopulation within such institutions, and the lack of health care infrastructure for them (BARNERT, 2020). Similarly, people who live on the streets, where there are no hygiene or isolation conditions in case of infection (BARBIERI, 2021).

The *Social Insertion* points to the lack of material resources among needier social classes, which hinders their subsistence, and directly reflects on the control and prevention of the Covid-19 (AHMAD *et al.*, 2020). Such people are uneducated, which makes them perform precarious, informal jobs, with fewer resources for their protection, thus, they become more vulnerable to the disease (CHRISTOFFEL *et al.*, 2020).

The unemployment is an important element of vulnerability among those populations, as they have to search for survival by performing menial, subhuman labor activities. Many of them survive by collecting garbage and recycling materials, or begging and collecting contributions on the streets and public places (CALDERÓN LARRAÑAGA *et al.*, 2020). Therefore, low educational level, inserted in lower social classes, hinders their access to information and subsequent understanding of prevention and fight against the pandemic (HIMMELFARB; BAPTISTE, 2020).

Such communities live in isolated areas or in overcrowded settings, without the access to the health care sectors, determinant conditions for the vulnerability of

these groups (DÍAZ DE LEÓN-MARTÍNEZ *et al.*, 2020). Similarly, the pollution in big cities and the lack of basic sanitation for their dwellers also contribute to the increase in the risk of SARS-CoV-2 Transmission (SURESH; JAMES, 2020).

Therefore, the *Health Actions and Services* represent the availability of physical and human resources to deliver care to people with signs and symptoms of Covid-19, as well as the measures of prevention and control of the community transmission of the SARS-CoV-2 (BELINGHERI; PALADINO; RIVA, 2020). The lack of personal protective equipment promoted greater exposure to the infection among health professionals and increase in cases of hospital cross infection caused by the Covid-19 (SMITH, 2020; CANOVA *et al.*, 2020).

The huge demand of ill patients overcrowded health care services, hindering the early risk classification and diagnosis of the disease. Although it is acknowledged that the access of the population to the Primary Care Attention was ensured (RAIFMAN; RAIFMAN, 2020; ATIF; MALIK, 2020; BENJAMIN, 2020), difficulties in referring severely ill patients to secondary and tertiary health care services, in addition to the occurrence of delays in monitoring patients with Covid-19 were observed (KANTER; SEGAL; GROENEVELD, 2020).

Conclusion

The vulnerability of the adult population to the Covid-19 is determined by chronic health conditions, humanistic, cultural and geopolitical issues, social inequality, poverty and health care services with poor physical and human structure, in addition to the lack of flows and guidance processes to professionals and population.

This analytic matrix is a theoretical construct elaborated from this review, and requires semantic, clinical validation to be used in primary health care services, emergency and urgency units or hospital services. This technology may contribute to strengthen the equity in health care services, operationalizing professionals to identify which patients require more generalized and acute care.

Thus, in order to overcome the pandemic as an event of emergency in public health, it is necessary that countries over the world contribute, in a solidary way, to actions of health surveillance along their borders, distribution of vaccines, and socioeconomic support to the most vulnerable populations, which can make us more humane and ethical.¹

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Nota

¹ L. T. Pasquini e T. C. M. Silva participated in the article design, bibliographic research, data extraction and analysis, and final writing of the text. D. D. Wilbert co-oriented the work and contributed to the writing and final revision of the text. D. I. da Silva oriented the study, participating in the article design, bibliographic research, data extraction and analysis, writing and final revision of the text.

Resumo

Matriz analítica de vulnerabilidade da população adulta para Covid-19: uma revisão integrativa

Objetivo: Sintetizar os elementos de vulnerabilidade da população adulta para a Covid-19. **Método:** Revisão integrativa, realizada entre agosto e novembro de 2020, com critérios definidos de inclusão, exclusão e recuperação dos estudos, de extração e síntese dos dados, pela análise temática categorial e sistematização pela vulnerabilidade. **Resultados mais relevantes:** De 2.247 artigos recuperados, foram selecionados e avaliados 70 estudos originais com leitura integral. Emergiram da análise temática quatro marcadores de vulnerabilidade: *Condições crônicas de saúde; Experiências de vida e cotidiano; Inserção social; e Serviços e ações de saúde.* **Principais conclusões:** Os marcadores de vulnerabilidade identificados poderão subsidiar os profissionais de saúde na identificação dos pacientes com menos autonomia e recursos para o autocuidado e proteção contra a Covid-19, além da adoção de intervenções em saúde e intersetoriais que as protejam mais contra a infecção por Covid-19, diminuindo as taxas de transmissão do SARS-Cov-2 dentro das comunidades e outros espaços, com a redução significativa do impacto do vírus sobre a sociedade.

► **Palavras-chave:** Adulto. Pessoa de meia-idade. Determinantes Sociais da Saúde. Vulnerabilidade em saúde. Covid-19.

