



# Respiratory causes of death in Mexico 2021

## Muertes de origen respiratorio en México en 2021

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**ABSTRACT. Introduction:** in the international classification of diseases (ICD-10), deaths of primary respiratory origin are scattered across several sections, uncommonly compiled together as often happens with neoplasias and cardiovascular deaths, leading to underestimation of the impact of respiratory diseases and the influx of resources to the patients.

**Material and methods:** mortality statistics for Mexico for 2021 coded with the ICD-10 were reviewed. All causes of death, primarily respiratory, were added, both from section J, and from those distributed in other sections, and compared against those that occurred in 2015. **Results:** in 2015, 79,383 respiratory deaths (12.6% of the total) were coded, of which 54,173 were in the respiratory «J» codes and the rest (25,210) in other codes, while in 2021 there were 349,491 (31% of the total), an impressive increase due to the COVID-19 pandemic. The most common causes of death were COPD, pneumonia-influenza, malignant tumors of the chest, neonatal respiratory deaths, disorders of the pulmonary circulation, interstitial diseases, asthma, and tuberculosis. **Conclusions:** respiratory diseases are an important cause of death in Mexico with and without respiratory pandemic, so the appropriate training of personnel and granting sufficient resources to care for the sick must be supported.

**RESUMEN. Introducción:** en la clasificación internacional de enfermedades (ICD-10) las muertes de origen primario respiratorio se encuentran dispersas por varios apartados y cuando no se agrupan todas se infravalora su importancia, lo que puede reducir el impacto público de las enfermedades respiratorias y la afluencia de recursos y tratamientos para los pacientes. **Material y métodos:** se revisaron las estadísticas de mortalidad de México de 2021 codificada con la décima clasificación internacional (ICD-10). Se sumaron todas las causas de muerte primariamente respiratoria tanto del apartado J, como las distribuidas en otros apartados y se compararon contra las ocurridas en 2015. **Resultados:** se codificaron en 2015, 79,383 muertes respiratorias (12.6% del total), de las cuales 54,173 estaban en los códigos respiratorios «J» y el resto (25,210) en otros códigos mientras que en 2021 fueron 349,491 (31% del total), un incremento impresionante debido a la pandemia de COVID-19. Dejando de lado el COVID-19, las causas más comunes de muerte de origen respiratorio fueron la enfermedad pulmonar obstructiva crónica, la neumonía-influenza, los tumores malignos del tórax, las muertes respiratorias neonatales, los trastornos de la circulación pulmonar, las enfermedades intersticiales, el asma y la tuberculosis. **Conclusiones:** las enfermedades respiratorias son causa importante de muerte en México con y sin pandemia respiratoria, por lo que se debe apoyar el entrenamiento de personal capacitado y recursos suficientes para la atención de los enfermos.

**Keywords:** ICD-10, respiratory tract diseases, mortality.

**Palabras clave:** ICD-10, enfermedades del tracto respiratorio, mortalidad.

### INTRODUCTION

Respiratory diseases are a primary cause of mortality and morbidity in the world,<sup>1</sup> much more remarkable once acute and chronic causes are added, as well as infectious and non-infectious ones. This fact can be intuited by observing that, worldwide, several respiratory diseases appear in the first 10 causes of disease and death, chronic

obstructive pulmonary disease (COPD) is the third cause of death.<sup>2</sup>

In the current International Classification of Diseases (ICD-10) the main acute and chronic respiratory diseases of the entire respiratory tract and chest are in section «J»;<sup>3</sup> however, many others are classified in other sections.<sup>2</sup> The objective of this work, an update of the one carried out in 2015,<sup>4</sup> is to describe the main causes of respiratory death

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Received: X-21-2023; accepted: XI-15-2023.

**How to cite:** Pérez-Padilla JR. Respiratory causes of death in Mexico 2021. *Neumol Cir Torax.* 2023; 82 (2):79-83. <https://dx.doi.org/10.35366/115394>

in Mexico in 2021 and compare them with those of 2015. This description is important, since the causes of respiratory origin are scattered throughout several chapters of the ICD-10, and at the national and international level there is an underestimation of the importance of respiratory diseases that can decrease awareness about them in general and especially about chronic diseases, this in turn can lead to a scarce budget allocation and poor patient care, in addition to a decreased influx of people interested in training in respiratory diseases at least in some countries, who maybe deficient in qualified personnel to care for them.

## MATERIAL AND METHODS

For this work, the mortality statistics of Mexico in 2021, codified with the tenth edition of the International Classification of Diseases (ICD-10),<sup>3</sup> were analyzed. Those of 2015 were taken from the World Health Organization (WHO) website, which are the statistics that each country reports and were the reason for a previous study.<sup>4</sup> As ICD-10 incorporates in its latest versions thousands of diagnostic codes and procedures, we use clinical classification software (CCS) that reduces the diagnostic codes to 285 mutually exclusive (Table 1)<sup>5</sup> and additionally according to the scheme of Becker and collaborators<sup>6</sup> that reduces them to less than 100, in order to describe in a standardized way the main certified causes of death that include a classifiable cause. Subsequently, all causes of death of respiratory origin classified within any chapter of ICD-10<sup>2</sup> were grouped, including those within and outside respiratory group «J».

## RESULTS

Table 1 shows the respiratory deaths coded outside group J (25,210) and those within group J (54,173), for a total of 79,383 deaths of respiratory origin in 2015, of which approximately one third were classified outside section J. In 2021, respiratory deaths totaled 349,491 (31% of the total). These grouped totals are calculated in the same way, summing scattered causes in different chapters of the classification and, therefore, have overlapping codes. For example, respiratory cancers appear in the total of respiratory deaths and in the total of cancer deaths, and pulmonary vascular diseases appear in both respiratory and cardiovascular diseases. Table 2 describes the main causes of death in Mexico according to clinical classification software (CCS)<sup>5</sup> with mutually exclusive groupings.

## DISCUSSION

The results described highlight the importance in Mexico of respiratory diseases, much more notable in 2021 due to the COVID-19 pandemic, a primarily respiratory disease.

While recognizing that SARS-CoV-2 generates multi-system complications especially in the so-called prolonged COVID, the main cause of death is respiratory failure. In addition, the respiratory ailments, frequent and not, that caused certified deaths in Mexico are described. This information is important for planning services and training respiratory disease experts. Except for COVID-19, the distribution in 2015 and 2021 is similar with the exception of some codes that increased in 2021 substantially compared to 2015, but which may be contaminated by the COVID-19 pandemic such as influenza and pneumonia, respiratory failure, and acute respiratory distress syndrome (ARDS) (Table 1).

Several groups of diseases that would need to be reinforced in assistance and training programs for adults and children draw attention. In adults are notable *cor pulmonale*, pulmonary arterial hypertension, diseases of the pulmonary vasculature and the obesity syndrome hypoventilation and sleep apnea, which already causes significant morbidity and is growing in proportion to obesity. They also highlight benign and malignant chest tumors, HIV respiratory complications, and acute and chronic respiratory failure. But without a doubt, COPD, pneumonia and influenza cause the majority of respiratory deaths.

In general, respiratory diseases, especially chronic ones, are under diagnosed and under treated, while a growing increase in their causal factors can be demonstrated: smoking, exposure to polluted air, overcrowding, survival of premature children with bronchopulmonary dysplasia, population aging and the persistence of other factors such as poverty, the use of solid fuels and limited access to health services.

The determinants of the minimization of respiratory diseases are undoubtedly several, and include the efficient management of groups interested in other diseases, which can contribute to the heterogeneous way of classifying deaths, since some codes are derived from etiology, while others are based on pathophysiological mechanisms, and others are classified by affected organ or system.

This heterogeneous way of classifying weakens the position of specialists focused on an apparatus or system, such as the respiratory system, whose causes of death are broken down into several sections of the ICD-10.<sup>2</sup> For example, perinatal respiratory problems and those related to pregnancy, childbirth and the puerperium are classified separately from group J, which helps to highlight the significant health risk posed by the reproductive phenomenon, especially in some regions. The same applies to respiratory complications of rheumatic diseases and those of external agents.

However, this strategy is done at the expense of diluting the relevance of the respiratory system as an organ of shock and in a health system that competes for limited and fixed resources, whether economic or human, it can

**Table 1:** Respiratory deaths in and out of ICD-2015 and 2021 «J» codes.

Deaths due to respiratory disorder	2015	2021
COVID-19	–	238,677
COPD, emphysema, BC (J41-44)	23,851	21,212
Influenza and pneumonia (J10-18)	18,458	54,596
Malignant tumors of the chest (C30-40)	7,825	7,678
Neonatal hypoxia, aspiration, neonatal pneumonia	6,817	4,840
Drowning	4,949	3,778
Interstitial lung disease* (J45-46)	3,181	3,962
Other respiratory diseases (J98)	2,768	1,885
Cor pulmonale, thromboembolism, PAH (I26-28)	2,108	2,464
Tb and complications (A15, A16, A19, B90.9)	1,983	2,133
Asthma (J45-46)	1,296	1,426
NS low ARI (J22)	743	405
HIV and <i>P. jirovecii</i> or with pneumonia	697	747
Pulmonary edema (J81)	657	664
Lung damage from external agents (J68-70)	645	710
Respiratory failure (J96)	550	909
Effusion, pneumothorax, and pleural diseases (J90-94)	524	779
Pulmonary or pleural suppuration (J85-86)	394	504
Acute bronchitis (J20)	376	252
Congenital respiratory malformations	294	184
Unspecified bronchitis (J40)	208	69
ARDS (J80)	164	882
Pulmonary cystic fibrosis	144	169
Superior ARI (J0-6)	136	87
Diseases of the nose, sinuses, throat, larynx (J30-39)	135	144
Acute bronchiolitis (J21)	87	35
Air or fat embolism, traumatic or for other cause	72	55
Obesity-hypoventilation syndrome (E66.2)	62	49
Poorly specified thoracic tumors (C76.1)	54	37
Sleep apnea (G47.3)	43	71
Ear and mastoid problems	38	34
Pertussis	36	19
Benign chest tumors (D14, 15, 19)	26	5
Lung aspergillosis	15	28
Congenital and acquired chest deformities	14	7
Pulmonary coccidioidomycosis	8	10

**Table 1 continues:** Respiratory deaths in and out of ICD-2015 and 2021 «J» codes.

Deaths due to respiratory disorder	2015	2021
Pulmonary candidiasis	8	13
Pulmonary histoplasmosis	5	12
Pneumocystosis	4	10
Pulmonary zygomycosis	0	4

ICD = International Classification of Diseases. COPD = chronic obstructive pulmonary disease. BC = chronic bronchitis. ARI = acute respiratory infection. NE = non-specific. HIV = human immunodeficiency virus. ARDS = acute respiratory distress syndrome.

Deaths in J codes are identified in the table. Total non-respiratory deaths 548,254, group respiratory deaths were 54,173 (25,210 out of group J). One reported case of non-tuberculous mycobacteriosis, pulmonary nocardiosis, cryptococcosis: pulmonary, pulmonary toxoplasmosis and pulmonary paracoccidioidomycosis and two deaths from HIV and lymphoid interstitial pneumonia and pulmonary actinomycosis.

\* Includes idiopathic, by rheumatic disease and external factors, organic and inorganic powders. See annex for ICD-10 codes not specified in the table. In 2021 total coded deaths 1,116,705, 767,214 non-respiratory. One death due to non-tuberculous mycobacteriosis (A31), HIV and LIP (B22.1), pulmonary cryptococcosis B45, pulmonary or respiratory echinococcosis, pulmonary sarcoidosis D86, pulmonary toxoplasmosis B58.

**Table 2:** Main grouped causes of death (Mexico 2015 and 2021).

Disease	2015	2021
COVID-19 (U7-10)	–	238,781
Diabetes (E10-E14)	96,508	140,729
Myocardial ischemia (I20-I25)	85,967	176,639
Cirrhosis, hepatitis and other liver diseases (K70-K76)	34,932	41,890
Cerebrovascular diseases (I60-I69)	33,409	37,169
Chronic diseases of the lower airway (J40-J47)	25,424	22,748
Hypertensive disease (I10-I15)	22,754	31,382
Homicides (X85-Y09)	19,968	35,700
Influenza and pneumonia (J10-J18)	18,458	54,596
Traffic accidents (V00-V89)	16,148	15,066
Perinatal deaths (P00-P96)	12,844	10,331
Total deaths of the year	665,688	1'116,705

Grouping of deaths classified by ICD-10 according to LC-CODE grouping.

be disadvantageous for the adequate care of respiratory diseases, especially those that lack well-defined etiological agents, or when they are multiple, as well as for having personnel trained in these diseases. It is still contradictory from the historical point of view for the respiratory specialty that tuberculosis, the origin of pneumology, is classified outside the respiratory group and within infectious diseases, very correct by etiological agent, but excluded from the respiratory group. From a practical point of view, the classification by etiology, and not by organ or system, or by altered function, or as it originally occurred, by symptoms or syndrome, is the most recent and advanced, and allows to identify preventive measures. However, we have examples where having an etiological agent, such as smoking, with multiple consequences and damaged

organs, a group based on a relatively non-specific functional alteration is maintained, such as chronic obstruction to the passage of air, which immediately calls for intervention with bronchodilators, but not with measures to stop smoking, the main cause in almost everyone.

The data shown have known limitations, since they are based on death certificates<sup>7</sup> and on using, in general, only one cause of death and not several described in the certificate.<sup>8-10</sup> When multiple causes of death are used, an even greater increase in the contribution of respiratory diseases is expected than that described in this work using only one.<sup>10-12</sup> But similar results are obtained from widely used estimates based on disease models and risk factors, such as those of the Global Burden of Diseases<sup>1</sup> information with which an analysis of the health situation in Mexico was made.<sup>13</sup>

## CONCLUSION

In addition to mortality, it is important to consider other health indicators, such as the disease itself, disability and the use of health services that undoubtedly contribute to the burden of disease in a country. Within respiratory diseases, asthma and several diseases of the upper airway generate a considerable burden of disability and care services, but on the other hand the impact on deaths is limited, although relevant since they are considered preventable deaths (*Table 1*).

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**Conflict of interests:** the author declares that he has no conflict of interests.