Lung Cancer in Argentina

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Introduction and Epidemiology

Argentina, the southernmost country in Latin America (LATAM), spans over 1 million square miles with a population of 46 million as of 2022, marking a 15.3% increase since 2010[1] (Fig. 1). With 18% of its population aged over 65 and 92% residing in urban areas, Argentina presents a diverse landscape both geographically and demographically. It is divided into 24 departments or provinces, including the Autonomous City of Buenos Aires. Almost 70% of the population lives in the richest six central provinces. Life expectancy is 76 years (73 y for men and 79 y for women).[2] The country's health care system is characterized by fragmentation, with the population covered by a mix of mandatory Social Security (60%), private health care providers (13%), and state-funded public health care (36%). Retired citizens have full medical coverage from the Programa de Asistencia Médica Integral.[3] This fragmentation often leads to disparities in health care outcomes across different regions and subsystems (Fig. 2*A*).[4]

In 2022, cancer accounted for 15.6% of all deaths in Argentina, making it the third leading cause of death after cardiovascular and respiratory diseases. According to the Global Cancer Observatory, the age-adjusted incidence of lung cancer in 2022 was 215.48 cases per 100,000 inhabitants, positioning lung cancer as the third most common cancer after breast and colorectal cancer, but the leading cause of cancer mortality in both sexes.[5] Although lung cancer mortality has decreased in men over the past 20 years, this trend only began to emerge in women after 2015 (Fig. 2*B*). This reduction is largely attributed to the country's ongoing efforts against tobacco consumption. The economic burden of lung cancer in Argentina in 2023 was estimated to be U.S. $556.20 million ($396.96–$718.20), approximately 1.4% of the total health care expenditure for the country.[6]

National Cancer Institute, Scientific Societies, and Regulatory Agency

The National Cancer Institute is responsible for the development and implementation of public health policies, and the coordination of integrated actions for the prevention and control of cancer. Since 2016, it has been a decentralized body of the National Public Administration with its own legal personality and a regimen of functional, administrative, economic, and financial autonomy, operating under the orbit of the Secretariat of Health Quality of the Ministry of Health of the Nation.

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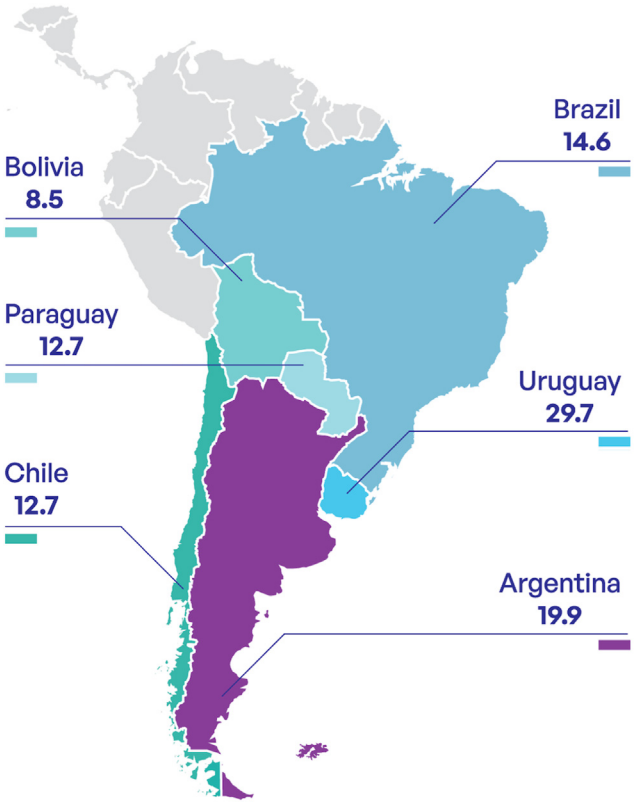


Figure 1. Estimated age-standardized lung cancer incidence (both sexes, all ages) in South America. Data derived from Global Cancer Observatory (Globocan 2020, https://gco.iarc.fr/). GLOBOCAN, Global Cancer Observatory.

The Argentinean Association of Clinical Oncology was founded in 1967 and nowadays is the biggest national cancer society. There are also many regional societies convening physicians from the same union.[7]

It has recently been established a Collaborative Group for Thoracic Oncology whose main objectives are education and investigation.

The National Administration of Drugs, Food, and Medical Technology is a decentralized body under the jurisdiction of the Ministry of Health of the Nation. It is an autonomous entity with authority throughout the entire territory of the Nation. One of its main functions is to approve, monitor the efficacy, and detect the adverse effects resulting from the consumption and use of drugs and medicines intended for human medical use.

Tobacco Use and Its Impact

Tobacco use remains a remarkable public health challenge in Argentina. The 2018 National Risk Factor Survey indicated that 22.2% of adults aged over 18 years were smokers, with a higher prevalence among men (26.1%) compared with women (18.6%). Smoking rates are notably higher among those with incomplete secondary education and individuals relying solely on public health care. Despite these challenges, smoking prevalence has declined by 25% since 2005. Among teenagers aged 13 to 15 years, smoking rates dropped from 22% to 16%,[8] although a concerning 75% of teenagers begin smoking before the age of 14 years. A modeling study estimated 8591 deaths, 9538 new cancer events, and 218.342 years of life lost because of smoking-related lung cancer in 2020.[9]

Argentina's regulatory framework for tobacco control includes National Law 26.687, which governs tobacco use, smoke-free environments, and advertising. Nevertheless, the country has yet to ratify the United Nations Framework Convention for Tobacco Control, and tobacco-producing provinces often resist stricter tobacco control measures. Recently, changes in taxation have led to a decrease in cigarette prices, potentially undermining progress in local tobacco control efforts.

Diagnosis and Staging of Lung Cancer

In recent years, Argentina has made strides in lung cancer screening and early detection. In 2022, a group of Argentine experts issued guidelines for Lung Cancer Screening Programs,[10] with 23 hospitals currently developing pilot programs, 10 of which are actively recruiting patients. In addition, Argentine professionals have collaborated with a LATAM group to establish requirements for early detection centers,[11] and a national policy from the Ministry of Health is under development.

Pathologic diagnosis of lung cancer in Argentina follows the WHO 2021 classification.[12] Nevertheless, not all pathology laboratories have access to advanced immunohistochemistry (IHC) techniques, and molecular testing is predominantly centralized in Buenos Aires. Although some laboratories have the capability to perform molecular tests, they often face reimbursement challenges.

Argentina has the highest molecular testing rate (79%) for patients with NSCLC, compared with other countries in LATAM. Nevertheless, access to molecular testing in the public sector is still limited (41%). This disparity in access to testing impacts treatment decisions and patient outcomes.[13]

The most used molecular testing techniques include IHC for *ALK* (D5F3 Ventana antibody) and ROS1 (Cell Signaling or Ventana antibody), fluorescence in situ hybridization for *ROS1* to confirm IHC positive cases, and quantitative polymerase chain reaction for *EGFR* mutations (Cobas V2, Therascreen, and Idylla). For IHC programmed death-ligand 1 (*PD-L1*) testing, all antibodies are available, with the Ventana platform being the most frequently used. The DAKO platform is available in only a few laboratories. Virtually all patients could be tested for these biomarkers in the context of pharma programs.

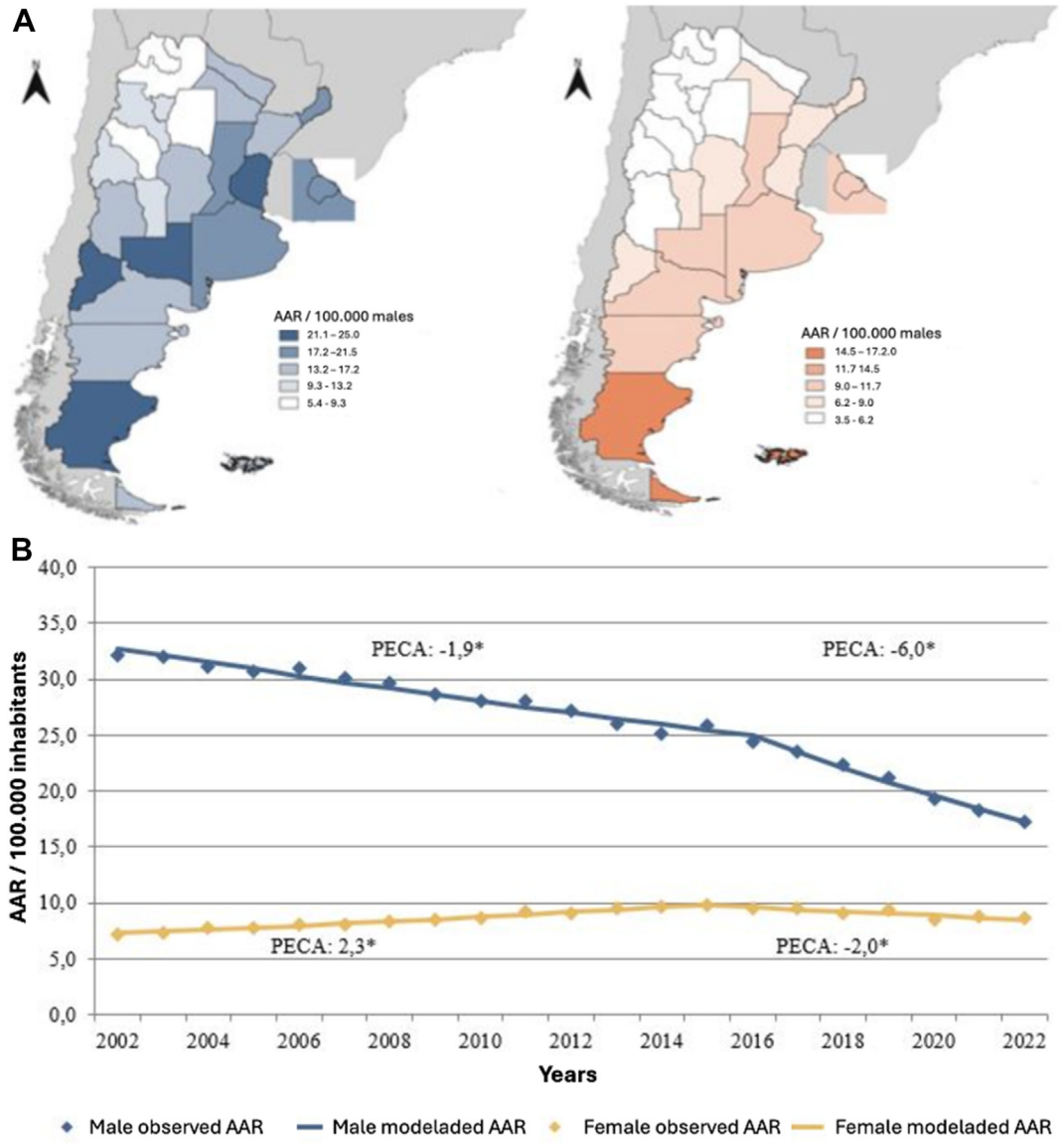


Figure 2. (*A*) Lung cancer mortality by jurisdiction. Age-adjusted rates for men and women per 100,000 inhabitants grouped into mortality quintiles. Argentina, 2022. (*B*) Trend in mortality and estimated annual PECA for lung cancer in men and women. AARs per 100,000 inhabitants according to the world population. Argentina, 2002–2022. Adapted from: https://www.argentina.gob.ar/salud/instituto-nacional-del-cancer/estadisticas/mortalidad-cp. AAR, age-adjusted rate; PECA, percentage change.

Next-generation sequencing is locally available (Ion Torrent and Oncomine Focus Assay). Some laboratories have incorporated the Illumina platform and have begun to validate larger panels. Next-generation sequencing in liquid biopsy is not yet available for clinical application. Next-generation sequencing is not reimbursed but, at this moment, there is a pharma program to sequence patients with NSCLC who are treatment-naive.

Lung Cancer Treatment Overview

Treatment decisions in Argentina are often guided by Local Tumor Boards, particularly in academic centers. Nevertheless, in many parts of the country, oncologists and surgeons work independently, lacking access to multidisciplinary teams. To address this, the Argentinean Association of Clinical Oncology has launched virtual Tumor and Molecular Boards, providing access to expert recommendations for specialists who cannot establish their own boards.

Surgical Treatment

Thoracic surgery in Argentina has been a recognized specialty for over 30 years, with training programs ranging from two to four years. Currently, there are 123 specialists accredited by the society. Although there is no unified national registry of thoracic surgeons, it is estimated that around 1000 pulmonary resections are performed annually, with lobectomy being the standard

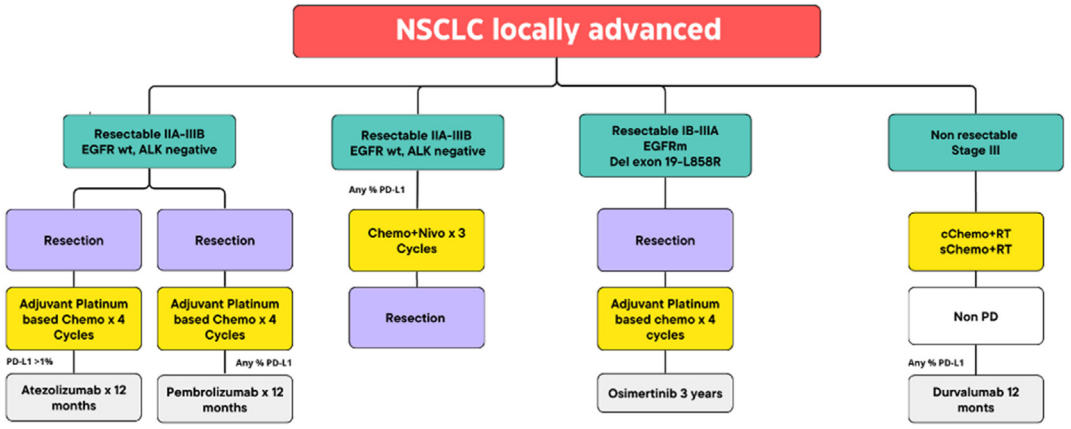


Figure 3. Locally and locally advanced NSCLC treatment options in Argentina. cChemo+RT, concurrent chemo-radiotherapy; chemo, chemotherapy; Del, deletion; EGFRm, EGFR mutated; Nivo, nivolumab; PD, progression diesease; PD-L1, programmed death-ligand 1; sChemo+RT, sequential chemoradiotherapy; wt, wild-type.

procedure for stage I and II lung cancer. With the dissemination and ease of obtaining computed tomography scans, along with initial lung cancer screening programs, the detection of early-stage lesions has allowed some centers to begin developing sublobar resections, including wedge resection and anatomical segmentectomy. Minimally invasive procedures are used in about 30% of lobectomies, with robotic surgery still in its beginnings owing to limited access and high costs.

Radiotherapy

Radiotherapy or Radiation oncology is a growing specialty in Argentina. In recent years, new and modern equipment has been incorporated that allows us to meet the challenges that patients with lung cancer present to us.

We have been pioneers in LATAM with the first Gammaknife outside of Sweden in the 1980s, the initial development of the TERADI 800 cobalt therapy equipment, the development of linear accelerator–based radiosurgery by Betty and Derechinsky, and ongoing construction of the first Proton Therapy Center that is being carried out in the City of Buenos Aires as part of the National Plan for Nuclear Medicine and Radiotherapy.[14]

The Sociedad Argentina de Terapia Radiante Oncologica brings together more than half of approximately 270 radiation oncologists, of which 214 have permits to use radiation with linear accelerators, in more than 130 devices available throughout the country.[15]

According to Global Cancer Observatory 2020, lung cancer ranks fourth among malignant diseases requiring radiotherapy in Argentina, with 8120 new cases per year that will use lung radiotherapy by 2030.[16]

With technological innovation and better biological knowledge, there is a very clear trend toward hypofractionation, the use of stereotactic body radiation therapy and stereotactic radiosurgery for patients with lung cancer, with a well-established role in the early stages, locally advanced, metastatic, and palliative care. The challenge remains to achieve uniform access for the population to these advances.

Systemic Treatment

In early-stage lung cancer, adjuvant chemotherapy, typically platinum-based, remains the standard of care. Recent approvals in Argentina include adjuvant immunotherapy with atezolizumab and pembrolizumab for stage II to IIIA tumors with PD-L1 expression of greater than or equal to 1% and all comers, respectively, after platinum-based chemotherapy. Adjuvant osimertinib for patients with EGFR mutations is also approved in the early stages. For locally advanced stages, neoadjuvant protocols followed by surgery are increasingly adopted, with neoadjuvant treatments such as nivolumab combined with chemotherapy approved for resectable NSCLC (Fig. 3).

For advanced and metastatic stages, treatment is on the basis of molecular profiling. In nonsquamous carcinomas, the prevalence of actionable mutations such as EGFR, ALK, and KRAS is consistent with global data,[17–20] guiding the use of targeted therapies. For targetable alterations of EGFR, ALK, ROS1, BRAF, MET_Ex14, and NTRK, first-line targeted treatments with osimertinib, afatinib, dacomitinib, gefitinib and erlotinib, alectinib/lorlatinib/brigatinib, crizotinib/entrectinib, dabrafenib plus trametinib and encorafenib plus binimetinib, tepotinib, and entrectinib/larotrectinib, respectively, are approved. Targeted therapies are also approved for KRAS G12C (sotorasib), and EGFR insertion exon 20 (amivantamab) in second-line setting.

When no actionable mutations are found, treatment decisions are on the basis of PD-L1 expression and histologic subtype, with pembrolizumab monotherapy

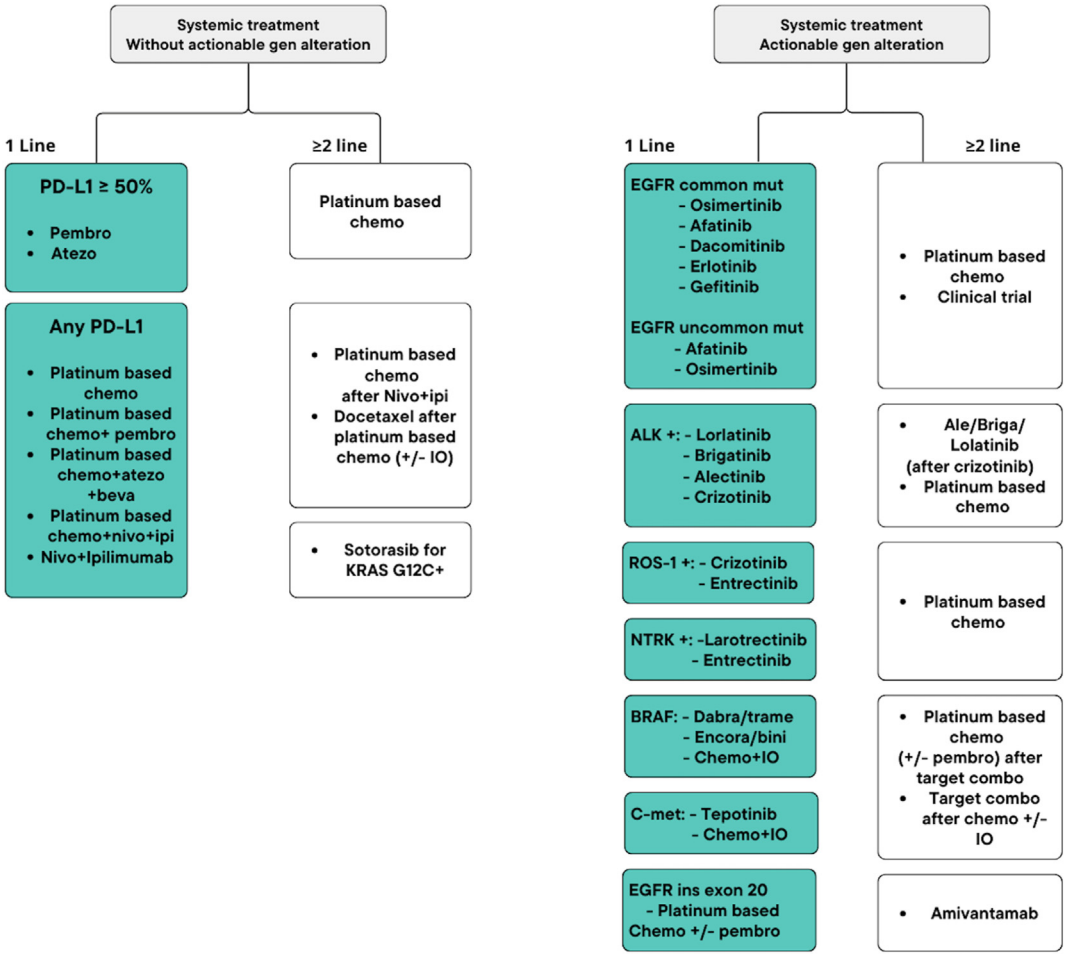


Figure 4. Advanced NSCLC treatment options: available palliative systemic treatment options in Argentina. Atezo, atezolizumab; Bini, binimetinib; chemo, chemotherapy; Dabra, dabrafenib; Encora, encorafenib; IO, immunotherapy; Ipi, ipilimumab; Nivo, nivolumab; PD-L1, programmed death-ligand 1; Pembro, pembrolizumab; Trame, trametinib.

being standard for tumors with high PD-L1 expression (>50%) (Fig. 4).

Although all of these treatments are approved and available, global and timely access remains a challenge for the health system.

Research and Innovation

Clinical research in Argentina has seen significant growth, with a 150% increase in investment since 2017 and a record number of research protocols submitted in 2021. This growth reflects the country's commitment to advancing cancer treatment and improving patient outcomes through innovative research and clinical trials.[21]

Conclusion and Challenges

Argentina's approach to lung cancer treatment is marked by significant advancements in screening, diagnosis, and treatment, despite challenges related to health care fragmentation and resource distribution. Ongoing efforts in clinical research and the adoption of new treatment protocols continue to enhance the quality of care for patients with lung cancer in the country. Nevertheless, addressing the disparities in access to advanced diagnostics and treatments remains a crucial task for the future.

CRediT Authorship Contribution Statement

Manglio Miguel Rizzo: Conceptualization, Methodology, Supervision, Validation, Writing -original draft, Writing - review and editing.

Máximo Barros: Conceptualization, Writing - original draft, Writing - review and editing.

Domingo Chimondeguy: Conceptualization, Writing - original draft, Writing - review and editing.

Mercedes Liliana Dalurzo: Conceptualization, Writing - original draft, Writing - review and editing.

Nicolás Minatta: Conceptualization, Writing - original draft, Writing - review and editing.

Carmen S. Pupareli: Conceptualization, Writing - original draft, Writing - review and editing.

Eduardo Richardet: Conceptualization, Writing - original draft, Writing - review and editing.

Alejandro J. Videla: Conceptualization, Writing - original draft, Writing - review and editing.

Gonzalo Recondo: Conceptualization, Validation, Writing - original draft, Writing - review and editing.

Declaration of Generative AI and AI-Assisted Technologies in the Writing Process

During the preparation of this work the author(s) used ChatGPT to improve grammar. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.

Disclosure

The authors declare no conflict of interest.

References

1. Instituto Nacional de. Estadística y Censos (Argentina). Censo Nacional de Población, Hogares y Viviendas 2022. *Resultados Provisionales*; 2023. https://www.indec.gob.ar/indec/web/Nivel4-Tema-2-41-165. Accessed November 20, 2024.
2. World Bank Group. Life expectancy at birth. https://data.worldbank.org/indicator/SP.DYN.LE00.FE.IN?locations. Accessed September 1, 2024.
3. INSSJP - Instituto Nacional de Servicios Sociales para Jubilados y Pensionados. https://www.pami.org.ar/tramite/medicamentos-oncologicos. Accessed September 7, 2024.
4. Palacios A, Espinola N, Rojas-Roque C. Need and inequality in the use of health care services in a fragmented and decentralized health system: evidence for Argentina. *Int J Equity Health*. 2020;19:67. https://doi.org/10.1186/s12939-020-01168-6
5. Argentina.gob.ar. Mortalidad por cáncer de pulmón. https://www.argentina.gob.ar/salud/instituto-nacional-del-cancer/estadisticas/mortalidad-cp. Accessed August 25, 2024.
6. Alcaraz A, Rodriguez-Cairoli F, Colaci C, Silvestrini C, Gabay C, Espinola N. Lung cancer in Argentina: a modelling study of disease and economic burden. *Public Health*. 2024;232:86–92.
7. aaoc.org.ar. Historia. https://www.aaoc.org.ar/historia/. Accessed August 26, 2024.
8. Google. Redirect notice. https://www.google.com/url?q=https://www.fagran.org.ar/documentos/seccion/otros/2020/01/encuesta-mundial-de-salud-escolar-2018/&sa=D&source=docs&ust=1724528399854329&usg=AOvVaw1_NV0eryBC_VjqEHt3plA7. Accessed August 25, 2024.
9. Food and Agriculture Organization of the United Nations. *El Estado Mundial de la Agricultura y la Alimentacion*. Rome, France: Fao Inter-Departmental Working Group; 2013.
10. Boyeras I, Roberti J, Seijo M, et al. Argentine consensus recommendations for lung cancer screening programmes: a rand/UCLA-modified Delphi study. *BMJ Open*. 2023;13:e068271.
11. Respirar. Estandarización de requerimientos mínimos para la formación de centro de detección temprana de cáncer de pulmón en América Latina. https://respirar.alatorax.org/index.php/respirar/article/view/188/179. Accessed September 1, 2024.
12. WHO Classification of Tumours Editorial Board. *WHO Classification of Tumours. Thoracic Tumours*. Lyon, France: IARC Publications; 2021.
13. Martin C, Cuello M, Barajas O, et al. Real-world evaluation of molecular testing and treatment patterns for EGFR mutations in non-small cell lung cancer in Latin America. *Mol Clin Oncol*. 2022;16:6.
14. Argentina.gob.ar. Centro Argentino de Protonterapia. https://www.argentina.gob.ar/cnea/centro-argentino-de-protonterapia. Accessed September 8, 2024.
15. Argentina.gob.ar. Listado de equipos y prácticas asociadas a Radioterapia. https://www.argentina.gob.ar/arn/listado-de-equipos-y-practicas-asociadas-radioterapia. Accessed September 8, 2024.
16. Sarria GR, Martinez DA, Li B, et al. Leveling up the access to radiation therapy in Latin America: economic analysis of investment, equity, and inclusion opportunities up to 2030. *Int J Radiat Oncol Biol Phys*. 2023;116:448–458.
17. Arrieta O, Cardona AF, Martín C, et al. Updated frequency of EGFR and KRAS mutations in NonSmall-cell lung cancer in Latin America: the Latin-American consortium for the investigation of lung cancer (CLICaP). *J Thorac Oncol*. 2015;10:838–843.
18. Arrieta O, Cardona AF, Bramuglia G, et al. Molecular epidemiology of ALK rearrangements in advanced lung adenocarcinoma in Latin America. *Oncology*. 2019;96:207–216.
19. Blaquier J, Cerini M, Denninghoff V, et al. P86.18 prevalence, clinical characteristics and survival of patients with KRAS mutant lung cancer in Argentina. *J Thorac Oncol*. 2021;16:S680.
20. Dalurzo ML, Avilés-Salas A, Soares FA, et al. Testing for mutations and rearrangements in advanced non-small-cell lung cancer: considerations for countries in emerging markets. *Onco Targets Ther*. 2021;14:4671–4692.
21. CAEME. Sobre la industria. Ideatón Salud 2023: CAEME premió proyectos que impulsan la investigación clínica. https://www.caeme.org.ar/ideaton-salud-2023-caeme-premio-proyectos-que-impulsan-la-investigacion-clinica/. Accessed September 7, 2024.