




2025, Volume 12, ID 745

DOI: [10.15342/ijms.2025.745](https://doi.org/10.15342/ijms.2025.745)

REVIEW

Overview, Infrastructural Challenges, Barriers to Access, and Progress for Rwanda's Healthcare System: A Review

Owen Selden¹ , Emmanuel Rusingiza^{2,3} , Rajesh Balkrishnan¹ 

1: Department of Public Health Sciences, University of Virginia School of Medicine, P.O. Box 800717 Charlottesville, Virginia, VA 22908, USA

2: Department of Pediatrics, University Teaching Hospital of Kigali, Kigali, Rwanda.

3: College of Medicine and Health Sciences, University of Rwanda.

ABSTRACT

The purpose of this review is to provide an overview of Rwanda's healthcare system, an understanding of the infrastructural challenges and barriers to accessing care for Rwandans, and areas where Rwanda has made progress in its healthcare system. We examined the literature published on Rwanda's healthcare system and social determinants of health. We analyzed government data over the past fifteen years to understand the progress that the healthcare system has made. We developed criteria for selecting articles for our review. The rebuilding of Rwanda's healthcare system was done through community-based healthcare, government insurance, and a robust public health system. The public health system was built on private-public partnerships, community-based health workers, and international partnerships, like Human Resources for Health. While Rwanda continues to improve its healthcare system, the urban-rural divide, human resource constraints, and challenges with system infrastructure are consistent issues which plague it. Altogether in the aftermath of one of the most horrific genocides in recorded history, Rwanda's progress serves as a beacon of hope and model for capacity-building.

Keywords: Health Systems, Health Policy, Sub-Saharan Africa, Public Health, Healthcare reform.

Correspondence: Rajesh Balkrishnan, PhD, Professor of Public Health Sciences, University of Virginia School of Medicine P.O. Box 800717 Charlottesville, VA 22908 United States. Email: rb9ap@virginia.edu

Copyright © 2025 Selden O et al. This is an open access article distributed under the [Creative Commons Attribution 4.0 International](https://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

1. INTRODUCTION

The 1994 Genocide against the Tutsi resulted in the death of 20% or nearly 1 million people in Rwanda [1,2]. Furthermore, over 40% of the population at this point were living in extreme poverty [1,2]. The genocide destroyed both the system infrastructure and killed most healthcare workers [1]. President Paul Kagame led the effort to rebuild Rwanda's healthcare by establishing a National AIDS Control Commission, Malaria and Tuberculosis Prevention Programs, and the Central Procurement Agency for Essential Medicine [3]. These administrative organizations combined with community-based health insurance rebuilt Rwanda's healthcare system [4]. Community-based interventions are essential as 72% of Rwanda's population lives in rural districts [5]. Community-based health insurance guarantees that out-of-pocket healthcare expenditures are only 10% of the cost of care [6]. Through health posts and centers, Rwanda has

focused on community outreach and primary care. Rwanda has utilized the large workforce of community-health workers to supplement its limited number of healthcare professionals. In doing so, Rwanda has emphasized access to care in its response to the decimation of its healthcare system.

2. METHODS

Information sources

We used Google and PubMed, two online databases to search for publications published between 2000 to 2023. We utilized keywords of Rwanda, Systemic Infrastructure, Healthcare System, Human Resources, Public Health, Challenges, Barriers to Access, Social Determinants of Health, Rwanda Genocide, Impact on Healthcare, Human Resource, Barriers to Access, and Urban-Rural Divide. Then, we limited criteria to papers which were written in

English on Google and PubMed. The population for this review comprised all citizens of Rwanda. Studies that discussed public health interventions, the state of the healthcare system in Rwanda, social determinants of health, and historical inequalities in Rwanda were included.

2.2 Data analysis

The National Institute of Statistics of Rwanda releases a Statistical Yearbook released in 2016 and 2022. This data was imported and analyzed in Excel. In Table 1, the health workers in the public sector were broken down into staff categories. A percentage change formula shown in equation #1 was used to measure the difference between 2012 and 2021.

$$\text{Percentage Change} = \frac{\text{Final Value} - \text{Initial Value}}{\text{Initial Value}} \quad (1)$$

In Table 1 and 2, the total population of Rwanda in August 2022 which was 13,246,394 sourced from the 2022 Statistical Yearbook was used to calculate the number of professionals per 10,000 people.

$$\text{Professional per 10000} = \frac{\text{Number of Professionals in 2021}}{\text{Population of Rwanda in August 2022}} \times 10000 \quad (2)$$

In Table 4, a mean formula was used to determine the regional variance of membership rates in 2009 by region. The data was sourced from the 2016 Statistical Yearbook and the mean of each of the district was calculated using equation #3.

$$\text{Mean} = \frac{\text{Sum of the Terms}}{\text{Number of Terms}} \quad (3)$$

3. FINDINGS

3.1 Overview of Healthcare System

3.1.A Overview of the healthcare resources

The Republic of Rwanda's public healthcare system is organized into five levels shown in Figure 1: 1700 health posts, 500 health centers, 42 district hospitals, 5 national referral and teaching hospitals [7,8]. The public health facilities represent 64% of Rwanda's non-private health facilities and 28% of them are run by faith-based organizations [9]. Nearly 45,000 community-based health workers (CHWs) conduct outreach and provide basic maternal, child health, and malaria care to 14,837 villages on a voluntary basis [10-12].

3.1.B Breakdown of the hierarchical structure of care

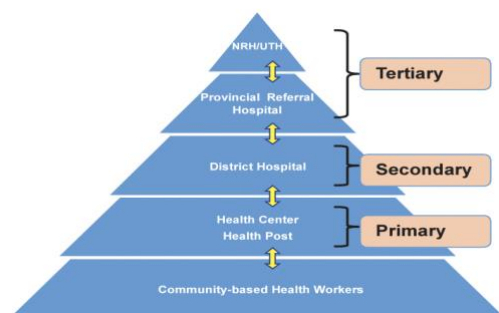


Figure 1. Levels of care in the public healthcare system

Source: Ministry of Health, Health Services Package.

Health posts are the mechanism through which Rwanda provides primary care, including general checkups, screenings, and family planning [13]. Nurses and midwives at health posts provide diagnosis, treatment, and referral for patients [14]. Health posts connect self-referred or CHW-referred patients to health centers and district hospitals [3]. Health centers provide 90% of the ambulatory care for patients in Rwanda, while also

providing immunization, premarital consultation, and antenatal care [3,15]. District hospitals provide prevention, family planning, and curative care [3]. District Hospitals also manage complex pregnancies, treat emergency patients, and perform basic surgeries [3]. Provincial and referral hospitals provide tertiary care in Rwanda including complex diagnostic, surgical, and medical treatments [3]. These hospitals have a greater capacity to care for critically ill patients as they are equipped with cardiac monitoring and mechanical ventilators [3]. The national referral and university teaching hospitals conduct research, train healthcare professionals, and provide the highest level of care [3,11].

3.1.C Breakdown of insurance system

Rwanda's insurance system is built through several public insurance schemes: Rwandaise d'Assurance Maladie for civil servants, Military Medical Insurance for military personnel, and Community-Based Health Insurance for citizens [16]. Ubudehe is the three-tiered premium scaling system which determines contributions to Community-Based Health Insurance [16]. In Figure 2, Community-Based Health Insurance has proven successful with a 96% coverage rate [16]. Rwanda's Health Financing Sustainability Model aims to fiscally decentralize by shifting payments from central to local governments based on need and performance [17-19]. A performance-based financing system reduces unmet need and lowers health expenditures [11].

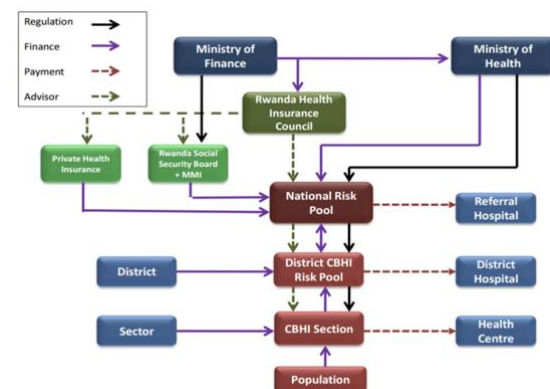


Figure 2. Structure of the CBHI system in Rwanda. In October 2015, CBHI was transferred to the Rwanda Social Security Board (RSSB).

Source: International Labor Organization (ILO).

3.1.D Leading causes of morbidity and mortality

Rwanda's healthcare system has relatively consistent causes of morbidity and mortality for all ages. The top ten causes of morbidity in children under the age of five in health centers between 2014 to 2020 were: neonatal illnesses, acute respiratory infections, cardiovascular disease, malaria, intestinal parasites, pneumopathies, tooth and gum disease, skin infections, and other disease [5]. The top causes of morbidity in health centers for all age groups from 2014 to 2020 were: acute respiratory infections, malaria, intestinal parasites, physical traumas and fractures, gastro-intestinal disease, tooth and gum disease, skin infections, eye problems, urinary tract infection, pneumopathies, diarrhea, other causes of morbidity, and ear diseases [5].

3.2 Challenges for Health Infrastructure

3.2.A Impact of the genocide

The Rwandan genocide shattered system and human resources. Many health workers were killed or fled the country as Rwanda's hospitals were decimated [19]. The mass rape of 250,000 women led to an epidemic of HIV/AIDS and cholera epidemic in refugee camps [19-20]. At this time, Rwanda's under-five mortality rate was the highest in the world [21-22]. With the death of more than one million people in the genocide against the Tutsi, Rwanda had become the poorest country in the world with the lowest life expectancy [1,19].

3.2.B Barriers to implementation of reforms

In Rwanda, suboptimal infrastructure and healthcare capacity are due to challenges with resource allocation, fragmentation in stakeholders, and inadequate support from international actors [23]. International engagement can overcome the existing challenges with financial and human resource [24]. Furthermore, Rwanda lacked graduate programs in public health until 2002 [25]. In 2002, the National University of Rwanda School of Public Health established the first master's program in public health. This development paved the way for the first generation of public health professionals in Rwanda.

3.2.C Standards of care

In an article in the *Annals of Global Health*, Jayaraman et. al demonstrate the need to standardize prehospital care in Rwanda [26]. Jayaraman et. al propose a Shared Mental Model which provides an immersion program for Rwandan leaders in emergency medicine, nursing, prehospital care, and policy through conference

participation and advocacy efforts [26]. Jayaraman et. al conclude that improving clinical service delivery can only be achieved through standardization of care and documentation [26].

3.2.D Inability for accurate and comprehensive data analysis

Rwanda has struggled with updating medical records [27]. In the *World Journal of Surgery*, Kim et. al found that inaccurate documentation and lack of statistics led to improper allocation of resources [28]. Database establishment in Rwanda will allow for disease prevention and management [29-30]. Rwanda has invested in an electronic health management system which has not been integrated into care due to poor data quality [31]. Implementation of electronic health records would allow for real-time statistics on patient outcomes. Rwanda continues to have challenges with data quality that persist and provide an impediment for further development of the healthcare system [32].

3.2.E Shortage of human resources

Rwanda has a shortage and maldistribution of trained healthcare workers between urban and rural communities [16]. Increasing the number and improving retention of healthcare workers would reduce delays and improve access to care [33-34]. In Table 1, data on health workers in the public sector shows a lack in each staffing category and at every level of the healthcare system. The shortage of workers has been attributed to insufficient salaries and benefits [34].

Table 1. Health workers in the public sector

Staff Category	2012	2013	2014	2015	2019	2020	2021	Percent Increase from 2012-2021 (%)	Population Context per 10,000 based on August 2022
Doctors	683	684	709	742	1,492	1,518	1,614	136.310	1.218
Dentists	115	108	113	127	242	212	286	148.696	0.216
Pharmacists	99	99	108	114	100	91	79	-25.316	0.075
Nurses	8,779	8,985	8,898	8,751	10,409	10,447	11,083	34.446	8.367
Midwives	451	622	692	910	1,562	1,562	1,604	255.654	1.211
Mental Health	140	151	149	208	355	412	621	343.571	0.469
Anesthesia Practitioners	237	243	253	263	1,879	1,652	1,827	670.866	1.379
Laboratory Technician	1,164	1,513	1,499	1,545	174	143	157	-86.512	0.119
Physiotherapists	119	117	133	125	353	381	381	220.168	0.288
Orthopedics	19	20	21	23	132	121	133	600.00	0.100
Radiologists	110	110	116	116	105	94	98	-10.909	0.074
Ophthalmologists	44	42	43	45	101	94	98	122.727	0.074
Public Health	140	157	157	180	174	132	157	12.143	0.119
Nutritionists	194	199	199	207	353	381	381	96.392	0.288
Environmental Health Officers	254	227	244	226	492	446	485	90.945	0.366
Clinical Psychologists	114	161	151	103	-	101	140	22.807	0.106
Social Workers	988	1,275	1,289	886	-	108	664	32.794	0.501
Administrative and Support Staff	2,471	3,108	3,176	4,006	4,742	5,487	5,078	105.504	3.833

Source: National Institute of Statistics of Rwanda (2016, 2022)

3.2.F Lack of system infrastructure

Rwanda lacks a comprehensive transportation and health system infrastructure (35). Several national campaigns aimed to develop policy on seat belts, speed limits, and vehicle inspections, and blood-alcohol levels that would result in fewer motor vehicle deaths [35]. The Ministry of

Health also established an emergency ambulance system called the *Service d'Aide Medicale Urgente* (35). Rwanda also lacks adequate infrastructure to house patients in its hospital system. In Table 2, data from 2020 shows that there were 20,936 hospital beds across each level of Rwanda's healthcare system [5].

Table 2. Number of beds by public health facility type

Facility Types	2015	2016	2017	2018	2019	2020	Population Context per 10,000 based on August 2022
Health Center	10,637	11,125	11,212	11,063	11,192	11,221	8.471
District Hospital	5,825	5,802	5,940	6,141	6,201	6,404	4.835
Provincial Hospital	684	687	691	761	774	784	0.592
Referral Hospital	2,146	2,166	2,123	2,181	2,306	2,527	1.908
Total	19,292	19,780	19,966	20,146	20,473	20,936	15.805

Source: National Institute of Statistics of Rwanda (2022)

3.2.G Need for decentralization

Due to human resource constraints, specialized care is centralized in national referral and university teaching hospitals. Rwanda's surgical care exists almost exclusively at this level leading to challenges in access to care [24]. Public health interventions, such as Hepatitis C management, are also executed almost exclusively at national referral hospitals [36]. Thus, Hepatitis C management needs to be integrated into routine clinical care, so that diagnostics and treatments are more accessible [36].

3.2.H Availability and affordability of medications

In Rwanda, prices and supply of medications are a challenge due to reliance on international supply chains and availability of transportation [37,38]. Even when drugs are available, they can still be extremely expensive for hospitals. Community-based health insurance contribution rates are low, so hospitals bear larger debts when providing patients medications [16]. For example, oxygen therapy is covered through a one-time, flat payment [40]. If patients need more oxygen than what is covered, hospitals are required to provide it at a loss.

Median public procurement prices for 16 out of 18 generic medicines in Rwanda are lower than international prices in the 2015 MSH-IMPFG, evidence that the procurement procedure in the Rwandan public sector is successful [41]. Despite the fair prices for generic medication, community-based health insurance does not cover all medicines utilized in public and faith-based sectors [41].

3.2.I Barriers to universal coverage

Despite Rwanda's progress toward Universal Health Coverage through socialized health insurance and community-based health workers, geographic distance remains a significant barrier [42]. Rwanda also requires integration of contracting, incentives, and relevant information to allow for strategic health purchasing that will allow for Universal Health Coverage [43]. In Table 3, there was a 54% increase in insurance coverage between 2005 to 2022 that made significant progress in this endeavor [44]. The next steps required to achieve Universal Health Coverage are to merge government insurance into a sustainable national risk pool to more effectively control cost [44].

Table 3. Percentage of individuals with Health Insurance

Year	2005/06	2010/11	2014/14	2016/17	2018/19	2022
Percentage of individuals with Health Insurance	43.3%	68.8%	70%	73.9%	87.3%	97.3%

Source: National Institute of Statistics of Rwanda (2022)

3.4 Barriers to access and social determinants of health**3.4.A General and socioeconomic barriers to access**

Barriers to utilization of healthcare system include: exposure to mass media, health insurance, distance to nearest health facility, socioeconomic status, marital status, and educational level [45-46]. These and other factors profoundly influence the likelihood of a patient receiving care. The delay in healthcare access, as well as geographic accessibility and affordability of care are large contributors to the under-five mortality rate [47]. A decomposition analysis indicated that income and gender explain a large share of the inequality in community-based health insurance payments [48].

The urban-rural divide – transportation and geographic barriers to coverage

The urban-rural divide in Rwanda leads to transportation and geographic barriers. The average time to reach a health center declined from 95.1 minutes in 2005 to 47.4 minutes in 2018 [5]. Progress has been made in this area, but for the 83% of Rwandans living in rural areas, travel times are longer, and care is less accessible [49]. The disproportionately underserved areas of Rwanda include

the western province, poorer areas, and rural areas [7]. In Table 4, the membership rate for community-based health insurance shows that Kigali City's rate is lower as residents have private insurance [50].

Table 4. Membership rates 2009 by province and district.

Province	District	Membership rate
Kigali City	Gasabo	75%
Kigali City	Kicukiro	84%
Kigali City	Nyarugenge	75%
Average Membership Rate in Kigali City:		78%
Southern	Gisagara	81%
Southern	Huye	55%
Southern	Kamonyi	94%
Southern	Muhanga	87%
Southern	Nyamagabe	92%
Southern	Nyanza	98%
Southern	Nyaruguru	98%
Southern	Ruhango	86%
Average Membership Rate in Southern Province:		86%
Western	Nyamasheke	85%
Western	Rubavu	80%

Western	Rusizi	86%
Western	Rutsiro	82%
Average Membership Rate in Western Province:		87%
Northern	Burera	98%
Northern	Gakenke	84%
Northern	Gicumbi	95%
Northern	Musanze	76%
Northern	Rulindo	98%
Average Membership Rate in Northern Province:		90%
Eastern	Bugesera	91%
Eastern	Gatsibo	94%
Eastern	Kayonza	97%
Eastern	Kirhe	93%
Eastern	Ngoma	69%
Eastern	Rwamagana	87%
Average Membership Rate in Eastern Province:		89%

Source: Rwanda Community Based Health Insurance Policy

3.5 Progress in healthcare system and public health infrastructure

3.5.A Community-based healthcare

According to Rwanda's annual health statistics, the primary healthcare utilization rate increased from 0.81 to 0.94 visits per inhabitant from 2009 to 2013 coinciding with an increase in the number of health posts [6,51]. These health posts allow for community-based intervention, such as family planning and standardization of prenatal care services via community-health workers [52]. In each of Rwanda's 14,837 villages, community-health workers are popularly elected by village members, motivating them to operate in the interest of community-respect [53-55]. Community-health workers are trained in preventive, diagnostic, and therapeutic interventions and serve as access points into the healthcare system, while alleviating the burden on the formal healthcare workforce [56-57]. Data shows that community-health workers promote immunization, facilitate the management of sick children, and improve outcomes for acute respiratory infections and malaria [57].

3.5.B Human resources for health

Human Resources for Health (HRH) was developed to respond to the global shortage of health workers [58-59]. From 2012 to 2019, HRH operated in Rwanda as a system-wide capacity-building program that trained, mentored, and built educational programs through collaboration between Rwandan and American academic institutions [60]. In 2015, HRH consumed 25% of total health spending in Rwanda [60]. Rwanda has made remarkable gains in health, social, and economic development due to HRH [2]. The HRH program provided innovative models for training, data utilization, and financing [9].

3.5.C Success from centrally planned healthcare

Rwanda has centralized healthcare system planning through the Ministry of Health, which has facilitated effective partnerships under a national plan focused on community-based healthcare [53]. Following the genocide, the Rwandan government increased accessibility to mental healthcare for its citizens by bringing care closer to its citizen and administering it through district hospitals [61-62]. Alongside the World Health Organization, Rwanda recruited and trained health workers in family planning and counseling, as well as established health posts which improved maternal outcomes [63-64]. As a result, Rwanda's maternal mortality rate fell from 750 in 2005 to under 300 in 2015

[64]. Rwanda's central planning also facilitated the development of a national cancer program [65]. Rwanda developed a nationwide strategy for cervical cancer prevention, control, and treatment [66]. This program included Human Papillomavirus vaccination and cervical cancer mobile team outreach programs in remote areas [66]. Central planning has allowed Rwanda to implement policy and mobilize resources to respond to its various public health challenges.

3.5.D Public health system: international and public-private partnerships

Multi-sectoral collaboration facilitates the success of Rwanda's public health system [9,23]. Strong governmental support is essential to fostering an environment in which public health interventions are successful. In Rwanda, the government promotes physical activity through initiatives, including a massive sports campaign [23]. Barriers to public health policies include limited stakeholder involvement, misconceptions regarding intervention, inadequate funding, and conflicts between commercial and public health interests [23].

4. DISCUSSION

Rwanda has made immense progress in rebuilding its healthcare system. The remarkable success of this system is grounded in its 96% insurance coverage rate. A feat which has resulted in the average life expectancy significantly increasing and raising beyond the peak prior to the genocide. Through its robust public health program, community-based healthcare system, and international partnerships, Rwanda has sustained its healthcare development over the last two decades.

Despite the incredible success of the system, Rwanda is plagued by issues with human resource, healthcare access, and system infrastructure. Rwanda still has a shortage of healthcare workers due in part to a lack of training and specialization programs. The shortage reflects the struggle of training a workforce with limited educational capacity. Furthermore, Rwanda also has issues with supply chain and drug availability.

The urban-rural divide has come to define the inequities in access in Rwanda. The urban center of Kigali houses the wealthiest Rwandans who take advantage of private healthcare through privatized insurance. These Rwandans have access to care that rural, lower-income Rwandans do not. This division has attempted to be addressed through the provision of health clinics and community-based healthcare workers. These efforts have been successful but increasing the number of hospitals present in the country, especially in provinces where travel times to hospitals can be up to four-hours is necessary to achieve universal health coverage.

5. CONCLUSION

Rwanda's insurance and healthcare system proves the possibility for low-income countries to make serious progress towards universal coverage. Rwanda harnessed the power of private-public partnerships, decentralizing healthcare resources, and community-based healthcare in making this progress. Rwanda has improved insurance coverage and quality of care for patients through community-based healthcare. The public health infrastructure built following the genocide allowed for the management of HIV and malaria, as well as immunization

of children using community health workers and increasing in the number of health posts. Rwanda's success is embodied in its substantial increase in average life expectancy over the past decades. Despite these successes, Rwanda still must focus its efforts on human resource constraints, increasing access to care, and standardization of data. These are areas of growth for Rwanda as it continues its mission to build capacity and ensure universal health coverage.

AUTHORS' CONTRIBUTIONS

The participation of each author corresponds to the criteria of authorship and contributorship emphasized in the [Recommendations for the Conduct, Reporting, Editing, and Publication of Scholarly Work in Medical Journals of the International Committee of Medical Journal Editors](#). Indeed, all the authors have actively participated in the redaction and revision of the manuscript and provided approval for this final revised version.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest in this review.

REFERENCES

- [1] Binagwaho A, Farmer PE, Nsanzimana S, Karema C, Gasana M, de Dieu Ndirabeya J, et al. Rwanda 20 years on: Investing in life. *Lancet*. 2014;384(9940):371–5. doi: [10.1016/S0140-6736\(14\)60574-2](https://doi.org/10.1016/S0140-6736(14)60574-2)
- [2] Mbanjumucyo G, DeVos E, Pulfrey S, et al. State of emergency medicine in Rwanda 2015: an innovative trainee and trainer model. *Int J Emerg Med*. 2015;8:20. doi: [10.1186/s12245-015-0067-2](https://doi.org/10.1186/s12245-015-0067-2)
- [3] Ministry of Health. Health Services Packages for Public Health Facilities. 2017.
- [4] Government of Rwanda, Ministry of Health. (2012). Third Health Sector Strategic Plan 2013- 2018. 2012.
- [5] National Institute of Statistics of Rwanda. Rwanda Vital Statistics Report. 016,2022.
- [6] Partnership for Maternal, Newborn and Child Health. Countdown to 2015 decade report (2000–2010). Geneva: World Health Organization; 2010. Available from: http://www.who.int/pmnch/topics/child/2010countdown_decadereport/en/
- [7] Fadelu T, Nadella P, Iyer HS, Uwikindi F, Shyirambere C, Manirakiza A, et al. Toward equitable access to tertiary cancer care in Rwanda: A geospatial analysis. *JCO Glob Oncol*. 2022;8. doi:10.1200/go.21.00395.
- [8] Rwanda Development Board. Health Services: Overview. 2022 Jun 19. Available from: <https://rdb.rw/investment-opportunities/health-services/>
- [9] World Health Organization. Rwanda's primary health care strategy improves access to essential and life-saving health services. 2022. Available from: <https://extranet.who.int/uhcpartnership/story/rwandas-primary-health-care-strategy-improves-access-essential-and-life-saving-health>
- [10] Karim N, Jing L, Lee JA, Kharel R, Lubetkin D, Clancy CM, et al. Lessons Learned from Rwanda: Innovative Strategies for Prevention and Containment of COVID-19. *Ann Glob Health*. 2021;87(1):23. doi: [10.5334/aogh.3172](https://doi.org/10.5334/aogh.3172)
- [11] World Health Organization. (2022). World Health Organization. <https://extranet.who.int/uhcpartnership/story/rwandas-primary-health-care-strategy-improvesaccess-essential-and-life-saving-health>
- [12] Habarurema G. The Ministry of Health to build new health posts of Excellence. Rwandan Ministry of Health. Available from: <https://www.moh.gov.rw/news-detail/the-ministry-of-health-to-build-new-health-posts-of-excellence>
- [13] Byungura JC, Nyiringango G, Fors U, et al. Online learning for continuous professional development of healthcare workers: an exploratory study on perceptions of healthcare managers in Rwanda. *BMC Med Educ*. 2022;22:851. doi: [10.1186/s12909-022-03938-y](https://doi.org/10.1186/s12909-022-03938-y)
- [14] Aoun N, Matsuda H, Sekiyama M. Geographical accessibility to healthcare and malnutrition in Rwanda. *Soc Sci Med*. 2015;130:135-45. doi: [10.1016/j.socscimed.2015.02.004](https://doi.org/10.1016/j.socscimed.2015.02.004)
- [15] Cubaka VK, Schriver M, Cotton P, Nyirazinoye L, Kallestrup P. Providers' perceptions of communication with patients in primary healthcare in Rwanda. *PLoS One*. 2018;13(4):e0195269. doi: [10.1371/journal.pone.0195269](https://doi.org/10.1371/journal.pone.0195269)
- [16] De L, Urban S, Yambana H. Rwanda: Progress towards Universal Health Coverage. Geneva: International Labor Organization; 2016.
- [17] Government of Rwanda, Ministry of Health. Health Financing Sustainability Policy. Kigali: Ministry of Health; 2015.
- [18] Government of Rwanda, Ministry of Health. Mid term review of the Rwanda Third Health Sector Strategic Plan. Kigali: Ministry of Health; 2015.
- [19] Savchuk K. How Rwanda went from genocide to global health model. The World from PRX. 2014 Apr 8. Available from: <https://theworld.org/dispatches/globalpost-blogs/global-pulse/rwanda-genocide-global-health>
- [20] Cohen MH, d'Adesky AC, Anastos K. Women in Rwanda: another world is possible. *JAMA*. 2005;294(5):613-5. doi: [10.1001/jama.294.5.613](https://doi.org/10.1001/jama.294.5.613)
- [21] UN Inter-Agency Group for Child Mortality Estimation. Under-five mortality rate estimates. Available from: <http://www.childmortality.org/>
- [22] Umubyeyi AN, Vandebriel G, Gasana M, et al. Results of a national survey on drug resistance among pulmonary tuberculosis patients in Rwanda. *Int J Tuberc Lung Dis*. 2007;11(2):189-94.
- [23] Baumann AA, Mutabazi V, Brown AL, et al. Dissemination and Implementation Program in Hypertension in Rwanda: Report on Initial Training and Evaluation. *Glob Heart*. 2019;14(2):135-41. doi: [10.1016/j.ghheart.2019.06.001](https://doi.org/10.1016/j.ghheart.2019.06.001)
- [24] Notrica MR, Evans FM, Knowlton LM, et al. Rwandan Surgical and Anesthesia Infrastructure: A Survey of District Hospitals. *World J Surg*. 2011;35:1770-80. doi: [10.1007/s00268-011-1125-4](https://doi.org/10.1007/s00268-011-1125-4)
- [25] Rwandan Research and Implementation Writing Group. Building Health Research Infrastructure in Rwanda. *Lancet Glob Health*. 2014;2(1). doi: [10.1016/s2214-109x\(13\)70144-x](https://doi.org/10.1016/s2214-109x(13)70144-x)
- [26] Jayaraman S, Ntiringanya F, Nkeshimana M, et al. Building Trauma and EMS Systems Capacity in Rwanda: Lessons and Recommendations. *Ann Glob Health*. 2021;87(1):104. doi: [10.5334/aogh.3324](https://doi.org/10.5334/aogh.3324)
- [27] Subedi N, et al. Building Capacity and Infrastructure at Hospitals Implementing Minimally Invasive Tissue Sampling: Experience and Lessons Learned From Nepal, Rwanda, and Tanzania. *Clin Infect Dis*. 2021;73(Suppl 5):S396-S400. doi: [10.1093/cid/ciab780](https://doi.org/10.1093/cid/ciab780)
- [28] Kim WC, Byiringiro JC, Ntakiyiruta G, et al. Vital Statistics: Estimating Injury Mortality in Kigali, Rwanda. *World J Surg*. 2016;40:6-13. doi: [10.1007/s00268-015-3258-3](https://doi.org/10.1007/s00268-015-3258-3)
- [29] Morgan JP, Isyagi M, Ntaganira J, et al. Building oral health research infrastructure: the first national oral health survey of Rwanda. *Glob Health Action*. 2018;11(1):1477249. doi: [10.1080/16549716.2018.1477249](https://doi.org/10.1080/16549716.2018.1477249)
- [30] Karim N, Mumporeze L, Nsengimana VJ, et al. Epidemiology of Patients with Head Injury at a Tertiary Hospital in Rwanda. *West J Emerg Med*. 2021;22(6):1374-8. doi: [10.5811/westjem.2021.4.50961](https://doi.org/10.5811/westjem.2021.4.50961)
- [31] Iyer HS, Hirschhorn LR, Nisingizwe MP, et al. Impact of a district-wide health center strengthening intervention on healthcare utilization in rural Rwanda: Use of interrupted time series analysis. *PLoS One*. 2017;12(8):e0182418. doi: [10.1371/journal.pone.0182418](https://doi.org/10.1371/journal.pone.0182418)
- [32] Uwishema O. Rwanda's health-care transformation: A case study for war. *Lancet*. 2023. doi: [10.1016/S0140-6736\(23\)00452-X](https://doi.org/10.1016/S0140-6736(23)00452-X)
- [33] Dworkin M, Cyuzuzo T, Hategekimana J, et al. Barriers to surgical care at a tertiary hospital in Kigali, Rwanda. *J Surg Res*. 2020;250:148-55. doi: [10.1016/j.jss.2019.12.045](https://doi.org/10.1016/j.jss.2019.12.045)

- [34] Iliza A. Rwanda Health Care Bleeds as workers quit over poor pay and lack of benefits. *Rwanda Today*. 2023 May 26. Available from: <https://rwandatoday.africa/rwanda/news/rwanda-health-care-bleeds-as-workers-quit-over-poor-pay-and-lack-of-benefits-4241354>.
- [35] Karim N, Mumporeze L, Nsengimana VJP, Gray A, Kearney A, Aluisio AR, et al. Epidemiology of patients with head injury at a tertiary hospital in Rwanda. *West J Emerg Med*. 2021;22(6):1374-8. doi: [10.5811/westjem.2021.4.50961](https://doi.org/10.5811/westjem.2021.4.50961)
- [36] Mbituyumuremyi A, Van Nuil JI, Umuhire J, et al. Controlling hepatitis C in Rwanda: a framework for a national response. *Bull World Health Organ*. 2018;96(1):51-8. doi: [10.2471/BLT.16.183772](https://doi.org/10.2471/BLT.16.183772)
- [37] Uwizeyimana T, Hashim HT, Kabakambira JD, et al. Drug supply situation in Rwanda during COVID-19: issues, efforts and challenges. *J Pharm Policy Pract*. 2021. doi: [10.1186/s40545-021-00301-2](https://doi.org/10.1186/s40545-021-00301-2)
- [38] Chandani Y, Noel M, Pomeroy A, et al. Factors affecting availability of essential medicines among community health workers in Ethiopia, Malawi, and Rwanda: solving the last mile puzzle. *Am J Trop Med Hyg*. 2012;87(5 Suppl):120-6. doi: [10.4269/ajtmh.2012.11-0781](https://doi.org/10.4269/ajtmh.2012.11-0781)
- [39] Kim WC, Byiringiro JC, Ntakiyiruta G, et al. Vital statistics: estimating injury mortality in Kigali, Rwanda. *World J Surg*. 2016;40(1):6-13. doi: [10.1007/s00268-015-3258-3](https://doi.org/10.1007/s00268-015-3258-3)
- [40] Smith V, Changoor A, McDonald C, et al. A Comprehensive Approach to Medical Oxygen Ecosystem Building: An Implementation Case Study in Kenya, Rwanda, and Ethiopia. *Glob Health Sci Pract*. 2022;10(6):e2100781. doi: [10.9745/GHSP-D-21-00781](https://doi.org/10.9745/GHSP-D-21-00781)
- [41] Bizimana T, Kayumba PC, Heide L. Prices, availability and affordability of medicines in Rwanda. *PLoS One*. 2020;15(8):e0236411. doi: [10.1371/journal.pone.0236411](https://doi.org/10.1371/journal.pone.0236411)
- [42] World Health Organization. Key country indicators. Geneva: WHO; 2016. Available from: <http://apps.who.int/gho/data/node.cco>.
- [43] Umuhiza SM, Musange SF, Nyandwi A, et al. Strengths and Weaknesses of Strategic Health Purchasing for Universal Health Coverage in Rwanda. *Health Syst Reform*. 2022;8(2):e2061891. doi: [10.1080/23288604.2022.2061891](https://doi.org/10.1080/23288604.2022.2061891)
- [44] Nyandekwe M, Nzayirambaho M, Kakoma JB. Universal health coverage in Rwanda: dream or reality. *Pan Afr Med J*. 2014;17:232. doi: [10.11604/pamj.2014.17.232.3471](https://doi.org/10.11604/pamj.2014.17.232.3471)
- [45] Sserwanja Q, Gatasi G, Musaba MW. Evaluating continuum of maternal and newborn healthcare in Rwanda: evidence from the 2019–2020 Rwanda demographic health survey. *BMC Pregnancy Childbirth*. 2022;22:781. doi: [10.1186/s12884-022-05109-9](https://doi.org/10.1186/s12884-022-05109-9)
- [46] Umuhiza C, Karambizi AC, Tuyisenge L, Cartledge P. Caregiver delay in seeking healthcare during the acute phase of pediatric illness, Kigali, Rwanda. *Pan Afr Med J*. 2018;30:160. doi: [10.11604/pamj.2018.30.160.15286](https://doi.org/10.11604/pamj.2018.30.160.15286)
- [47] Nshimiyiryo A, Barnhart DA, Cubaka VK, et al. Barriers and coping mechanisms to accessing healthcare during the COVID-19 lockdown: a cross-sectional survey among patients with chronic diseases in rural Rwanda. *BMC Public Health*. 2021;21:704. doi: [10.1186/s12889-021-10783-z](https://doi.org/10.1186/s12889-021-10783-z)
- [48] Chirwa GC, et al. Socioeconomic inequality in premiums for a community-based health insurance scheme in Rwanda. *Health Policy Plan*. 2021;36(1):14-25. doi: [10.1093/heapol/czaa135](https://doi.org/10.1093/heapol/czaa135)
- [49] World Bank. Rural population (% of total population). Available from: <https://data.worldbank.org/indicator/SP.RUR.TOTL.ZS>.
- [50] Ministry of Health. Rwanda Community Based Health Insurance Policy. Kigali: Ministry of Health; 2010. Available from: http://rbc.gov.rw/IMG/pdf/mutual_policy_document_final1.pdf.
- [51] Victora CG, Requejo JH, Barros AJD, et al. Countdown to 2015: a decade of tracking progress for maternal, newborn, and child survival. *Lancet*. 2016;387(10032):2049-59.
- [52] Asiimwe A, Rwiyereka AK, Kaufman JA, Shepard DS. AIDS funds: Rwanda. *Science*. 2010;330(6001):176-8. doi: [10.1126/science.330.6001.176-a](https://doi.org/10.1126/science.330.6001.176-a)
- [53] Binagwaho A, Kyamanywa P, Farmer PE, et al. The Human Resources for Health Program in Rwanda — a new partnership. *N Engl J Med*. 2013;369(21):2054-9. doi: [10.1056/nejmsr1302176](https://doi.org/10.1056/nejmsr1302176)
- [54] Tuyisenge G, Crooks VA, Berry NS. Using an ethics of care lens to understand the place of community health workers in Rwanda's maternal healthcare system. *Soc Sci Med*. 2020;264:113297. doi: [10.1016/j.socscimed.2020.113297](https://doi.org/10.1016/j.socscimed.2020.113297)
- [55] Condo J, Kateera B, Mutimura E, et al. Building clinical trial priorities at the University of Rwanda. *Trials*. 2014;15:467. doi: [10.1186/1745-6215-15-467](https://doi.org/10.1186/1745-6215-15-467)
- [56] Binagwaho A, Scott K, Rosewall T, et al. Improving eye care in Rwanda. *Bull World Health Organ*. 2015;93(6):429-34. doi: [10.2471/BLT.14.143149](https://doi.org/10.2471/BLT.14.143149)
- [57] Niyigena A, Girukubonye I, Barnhart DA, et al. Rwanda's community health workers at the front line: a mixed-method study on perceived needs and challenges for community-based healthcare delivery during COVID-19 pandemic. *BMJ Open*. 2022;12(4):e055119. doi: [10.1136/bmjopen-2021-055119](https://doi.org/10.1136/bmjopen-2021-055119)
- [58] Morgan JP, Isyagi M, Ntaganira J, Gatarayaha A, Pagni SE, Roomian TC, et al. Building oral health research infrastructure: the first national oral health survey of Rwanda. *Glob Health Action*. 2018;11(1):1477249. doi: [10.1080/16549716.2018.1477249](https://doi.org/10.1080/16549716.2018.1477249)
- [59] Garber SC, Martin KD, Gonzalez-Marques C, et al. Building and Sustaining Partnerships in Health Workforce and Research Capacity in Rwanda. *R I Med J*. 2019;102(7):32-5.
- [60] Government of Rwanda. Data validation and verification procedure manual. Kigali: Government of Rwanda; 2011.
- [61] Ndenga E, Uwizeye G, Thomson DR, et al. Assessing the twinning model in the Rwandan Human Resources for Health Program: goal setting, satisfaction and perceived skill transfer. *Glob Health*. 2016;12:4. doi: [10.1186/s12992-016-0141-4](https://doi.org/10.1186/s12992-016-0141-4)
- [62] Palmer I, Firmin N. Mental health in post-genocide Rwanda. *Int Psychiatry*. 2011;8(4):86-7.
- [63] Patrick M, Zaman MSU, Afzal G, et al. Factors That Affect Maternal Mortality in Rwanda: A Comparative Study with India and Bangladesh. *Comput Math Methods Med*. 2022;2022:1940188. doi: [10.1155/2022/1940188](https://doi.org/10.1155/2022/1940188)
- [64] Williams P, Santos N, Azman-Firdaus H, et al. Predictors of postpartum family planning in Rwanda: the influence of male involvement and healthcare experience. *BMC Womens Health*. 2021;21:112. doi: [10.1186/s12905-021-01253-0](https://doi.org/10.1186/s12905-021-01253-0)
- [65] Stulac S, Binagwaho A, Tapela NM, et al. Capacity building for oncology programmes in sub-Saharan Africa: the Rwanda experience. *Lancet Oncol*. 2015;16(8):e405-13. doi: [10.1016/S1470-2045\(15\)00161-8](https://doi.org/10.1016/S1470-2045(15)00161-8)
- [66] Bangura MS, Zhao Y, Gonzalez Mendez MJ, et al. Case study of cervical cancer prevention in two sub-saharan African countries: Rwanda and Sierra Leone. *Front Med*. 2022;9. doi: [10.3389/fmed.2022.928685](https://doi.org/10.3389/fmed.2022.928685)