INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH AND INNOVATIVE STUDIES
ISSN: 2820-7157
www.ijsrisjournal.com

June 2026 Volume 5 Number 3 551-563

Received Date: 21 April 2026 Accepted Date: 12 May 2026 Published Date: 1 June 2026

Epidemics throughout the history of Morocco: Epidemiological dynamics, socio-economic and political impacts

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Abstract

Introduction — A crossroads between Africa, the Mediterranean and the Atlantic, Morocco has been exposed to repeated waves of plague, smallpox, cholera, typhus, influenza, measles and, more recently, COVID-19 and emerging vector-borne diseases. These crises produced not only health effects but also demographic, economic, social and political disruptions.

Objective — To analyse, over the long term, the major epidemics that have affected Morocco, their determinants, their socio-economic and political consequences, and the evolution of public health responses.

Methods — A narrative synthesis based on a systematised literature search, updated to 19 August 2026. The main biomedical corpus relied on seven PubMed queries, supplemented by three queries targeting socio-economic and political impacts in Morocco and four comparative queries on social conflict, taxation, trade, labour, inequality, institutions and the Islamic world/Maghreb. PMC, WHO/IRIS, OpenEdition, IMIST-Toubkal and reference chaining served as complementary sources. The strongly overlapping result counts across queries were not summed; 50 sources were ultimately cited in the final reference list.

Results — Morocco's major crises reveal recurrent determinants: mobility, trade, ports, pilgrimage, poverty, famine, war, and territorial and environmental vulnerabilities. They disrupted production, exchange, supply, mobility and institutional functioning, while progressively stimulating quarantine, vaccination, sanitation, surveillance and, more recently, genomics. The comparative literature shows that epidemics should be regarded as amplifiers of vulnerabilities and catalysts of institutional transformation rather than as sole causes of political collapse.

Conclusion — Morocco's epidemic history highlights the enduring interdependence between health, the economy, social cohesion and state capacity. Future preparedness must combine integrated surveillance, continuity of essential services, territorial equity, institutional trust and a One Health approach.

Keywords: Morocco; history; epidemics; plague; cholera; influenza; COVID-19; socio-economic impact; governance; political instability; public health; One Health.

1. Introduction

The history of Morocco cannot be separated from that of communicable diseases. Situated at the interface of sub-Saharan Africa, the Maghreb, the Mediterranean, the Atlantic and Europe, the country has long been a space of circulation for people, goods and infectious agents. Caravan routes, Atlantic and Mediterranean ports, exchanges with the Iberian Peninsula and the rest of the Maghreb, military movements, and pilgrimage-related travel all contributed, at various periods, to the introduction and spread of epidemic diseases. This geographic exposure combined with internal determinants — droughts, famines, conflicts, urban densification, poverty, overcrowding and inadequate health infrastructure — which shaped the intensity of these crises and their demographic and social consequences. As early as the pre-colonial era, famine relief policies also constituted a form of public action on the survival and health of populations, with documented social and political functions under the early Alaouite sovereigns [1].

The historical interpretation of these episodes nevertheless remains complex. In early sources, the terms “plague,” “ta’oun” or “wabâ’” do not necessarily denote nosological entities in the contemporary sense. Similarly, mortality estimates reported by chroniclers, travellers or diplomats are not based on record-keeping systems comparable to modern epidemiological surveillance. Reconstructing early epidemics therefore requires cross-referencing historical sources with available microbiological, epidemiological and institutional data, without retrospectively projecting present-day diagnostic categories onto historical descriptions [2 and 3].

Major epidemics also extended beyond their purely biological dimension. In Morocco, they affected demographic structures, agricultural and commercial activity, supply chains, mobility and administrative capacity. When combined with drought, famine, dynastic conflict or international tensions, they could amplify pre-existing fragilities. Relief and protection policies simultaneously served as instruments of government: Meyers's [1] analysis thus shows that, under the early Alaouite sovereigns, famine management had social and political functions. The comparative historical literature nevertheless cautions against any deterministic reading: epidemics can accelerate or reveal a crisis of the state and alter the distribution of resources and political trust, but they rarely constitute, by themselves, the cause of the fall of an empire or dynasty.

This trajectory is, however, not linear. The disappearance or control of a disease does not mean the disappearance of infectious risk. Improvements in drinking water and sanitation have sharply reduced cholera, vaccination has transformed the epidemiology of smallpox and measles, and antibiotics have changed the prognosis of several bacterial infections. At the same time, the intensification of international mobility, urbanisation, environmental change, climate change and interactions between humans, animals and vectors have favoured new forms of emergence and re-emergence.

Recent Moroccan publications particularly illustrate this transformation. The COVID-19 pandemic led to the development of spatio-temporal surveillance, digital responses, a large-scale vaccination campaign and genomic surveillance allowing the tracking of successive viral lineages. At the same time, the persistence of leishmaniasis foci, the documented circulation of West Nile virus, and the risk of emergence of other arboviruses show that the historical approach to epidemics must now integrate an environmental and “One Health” perspective. This continuity between history, institutions and contemporary innovations forms the guiding thread of the present synthesis.

1.1. Rationale

Despite the existence of scattered historical, epidemiological, microbiological and socio-economic studies, there are few longitudinal syntheses linking, over several centuries, Morocco's major epidemics to their determinants, their demographic and economic consequences, the reconfiguration of public trust and authority, and the transformation of health instruments. The literature is, moreover, strongly asymmetrical: contemporary periods are abundantly documented, whereas the relationships between infectious crises, famine, trade, taxation, social conflict and political power in pre-modern Morocco are mainly accessible through historical sources outside the biomedical databases.

The central research question is therefore as follows: how does the succession of epidemics in Morocco, from the Middle Ages to the contemporary period, help us understand the transformation of vulnerabilities, modes of transmission, socio-economic and political consequences, and public health responses, and what lessons can be drawn for future preparedness against infectious risks?

1.2. Objectives

The general objective of this synthesis is to analyse the historical evolution of the major epidemics that have affected Morocco and the progressive transformation of health responses.

The specific objectives are to:

- Identify and chronologically order the major epidemics documented in Morocco;
- Describe their main geographic, social, environmental and political determinants;
- Analyse their health, demographic, economic, social, fiscal and institutional consequences, as well as their possible interaction with political crises;
- Trace the evolution of responses, from community strategies, quarantines and lazarets to vaccination, sanitation, epidemiological surveillance, molecular biology and genomic surveillance;
- Situate Morocco's trajectory within the Maghreb, Mediterranean and international contexts, notably to compare the effects of epidemics on social cohesion, institutional trust and state transformation;
- Integrate vector-borne and emerging diseases in order to assess the contemporary relevance of a One Health approach;
- Identify the main documentary gaps and priorities for research and health preparedness.

2. Methodology

2.1. Study design and research question

A structured narrative synthesis with a systematised literature search was conducted. This methodological choice was made because of the heterogeneity of the available material: historical chronicles, historians' works, university theses, epidemiological and microbiological articles, surveillance reports and institutional documents. This is not a systematic review aiming at a combined quantitative estimate, nor an exhaustive PRISMA review, but a historical and analytical synthesis aiming to reconstruct the major epidemic sequences, characterise their determinants and analyse the evolution of health responses. The method was nevertheless made reproducible by recording the databases searched, the successive queries, the number of results obtained and the selection rules.

The guiding question was: which epidemics have marked Moroccan territory, what factors conditioned their spread, how have their consequences been described, and how have health responses evolved?

2.2. Documentary sources

Searches were updated to 19 August 2026. The biomedical update relied mainly on PubMed, with verification of open access in PubMed Central (PMC) where relevant. For historical periods and socio-economic and political dimensions, this database was supplemented by full-text PMC, WHO/IRIS, OpenEdition, IMIST-Toubkal, institutional documents, and bibliography chaining. This diversification was necessary because the political, fiscal, commercial and social consequences of epidemics are imperfectly indexed in biomedical databases.

2.3. PubMed search strategy

The PubMed strategy was conducted in successive blocks. Queries Q1–Q7 documented the main biomedical corpus: general search, recent literature, plague/cholera/smallpox/typhus, influenza, measles, COVID-19 and vector-borne diseases. Three additional queries (Q8–Q10) targeted the socio-economic and political consequences of epidemics in Morocco, the links between historical epidemics, famine, power and institutions, and then famine, drought, public health and governance. Finally, four comparative queries (Q11–Q14) successively explored epidemics and social conflict; taxation/trade/labour/state capacity; the Black Death and transformations in labour/inequality; and the Maghreb–Islamic world and governance. The queries were deliberately broad. Query Q12 (n = 886) generated particularly substantial documentary noise and was treated as a high-sensitivity exploratory search intended mainly to identify structuring references rather than to build a quantitative corpus.

Title/Abstract fields and, where relevant, MeSH terms were combined with Morocco, Moroccan, Maghreb or North Africa. Socio-economic concepts included economic, socioeconomic, famine, poverty, inequality, trade, taxation, labor/labour, wages and state capacity; political concepts included political, governance, institution, political instability, revolt, rebellion, social unrest and social conflict. No chronological restriction was applied to historical searches. Because results from the different queries strongly overlapped, their counts were reported separately and were never summed to produce an artificial number of unique references.

Table 1. Summary of PubMed queries used for the update of 19 August 2026.

Query	Main subject	Results
1	Morocco/Moroccan + epidemic/outbreak/pandemic	562
2	Same strategy, 2020–2026 period	366
3	Plague, cholera, smallpox, typhus	17
4	Influenza, H1N1, influenza surveillance	95
5	Measles, vaccination, outbreaks	13
6	COVID-19: epidemiology, transmission, response, genomics	164
7	Malaria, leishmaniasis, West Nile, arboviruses	82
8	Socio-economic and political impacts of epidemics in Morocco	129
9	Historical epidemics, famine, power and institutions	52
10	Famine, drought, public health and governance in Morocco	42
11	Epidemics, revolts, social conflict, stigmatisation	40
12	Taxation, trade, labour, state capacity (exploratory)	886
13	Black Death, labour, wages, mobility, inequality	38
14	Maghreb/Islamic world: epidemics, power, governance	168

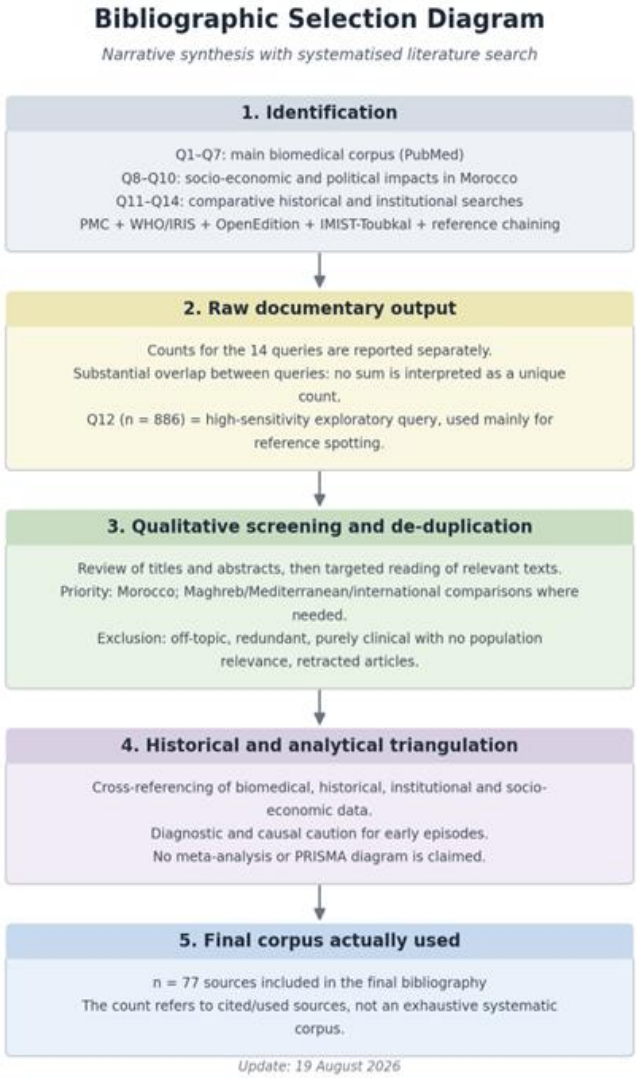

Figure 1. Bibliographic selection flow diagram of the narrative synthesis, including the socio-economic and political extension.

The diagram distinguishes identification, qualitative screening, source triangulation, and the final corpus actually used (n = 77). Query counts are raw, strongly overlapping outputs; they are not summed. Intermediate counts that were not prospectively recorded were not reconstructed retrospectively.

2.4. Eligibility criteria

Priority was given to studies focusing directly on Morocco, as well as Maghreb, Mediterranean or regional publications essential for interpreting the Moroccan context. Priority was given to epidemiological, historical, microbiological or public health articles describing outbreaks, temporal trends, surveillance systems, control measures, vaccination policies or institutional transformations. Texts in French or English were included, with priority given to documents with accessible full text. For earlier periods, historical sources

outside PubMed were retained when they documented major episodes absent from biomedical databases.

Excluded from the main corpus were purely clinical publications with no relevance to epidemic dynamics, highly specialised case series without a population-level dimension, studies without a direct or relevant comparative link to the research question, and redundant documents. Retracted articles identified during screening were excluded. For the political component, publications were retained only if they documented a plausible and explicitly discussed mechanism (trust, social conflict, institutions, taxation, trade, labour, redistribution or state capacity), in order to avoid speculative historical parallels.

2.5. Selection, extraction and synthesis

References were successively screened by title and abstract, then assessed for their contribution to the historical and public health question. Duplicates across queries were removed qualitatively. Because intermediate screening steps were not recorded in the form of a PRISMA log, no retrospective intermediate count was artificially reconstructed. The final corpus actually used corresponds to the 77 sources included in the final bibliography. For each source retained, the following were extracted: period, disease, geographic area, spread factors, health and demographic consequences, economic and social effects when documented, institutional or political transformations, control measures, and main contribution to the historical narrative. The overall process is presented in Figure 1. No meta-analytic calculation was performed given the heterogeneity of the material.

2.6. Particularities of historical sources

The PubMed search confirmed a strong under-representation of early episodes specifically concerning Morocco. Queries targeting plague, cholera, smallpox and typhus retrieved few directly usable publications, in contrast to searches on influenza, COVID-19 or leishmaniasis. Historical diagnoses and historical mortality estimates were therefore interpreted with caution and were not artificially rendered comparable to contemporary data. This documentary asymmetry justifies triangulation between PubMed, archives, theses, OpenEdition, IMIST-Toubkal and institutional sources.

2.7. Methodological limitations

This approach carries the limitations inherent to a narrative synthesis: absence of independent double selection, heterogeneity of sources, uneven indexing of historical documents, absence of a formal risk-of-bias assessment for the entire corpus, and substantial overlap between queries. The socio-economic and political searches were deliberately broad and sometimes produced considerable documentary noise. They were therefore used to identify conceptually structuring references rather than to establish a quantitative frequency. Associations between epidemics and political transformations are interpreted with caution: historical concomitance does not constitute proof of causality.

3. Results

3.1. Chronological overview of the main episodes

Table 2. Chronological Overview of Major Epidemics in Morocco, Their Dominant Factors and Public Health Responses.

Period	Episode	Dominant factors	Documented response
14th c.	Black Death	Mediterranean circulation, ports, mobility	Flight, isolation, religious practices
1597–1599	Great Saadian plague	Famine, urban density, political crisis	Withdrawal from cities, local responses
17th–19th c.	Recurrent plagues	Maritime and caravan trade	Quarantines and cordons, formalised
19th c.	Cholera, notably 1878 and 1895	Contaminated water, pilgrimage, trade routes	Lazarets, port control, sanitation
Early 20th c.	Plague, smallpox, typhus	Urbanisation, war, poverty	Laboratories, vaccination, disinfection
1918–1919	Pandemic influenza	Troops, ports, railways	Isolation, limited NPI measures
1940s	Typhus, famine-related infections	Malnutrition, lice, displacement	Disinfection, vector control, care
1980–1997	Last 20th-c. cholera epidemics	Unequal water and sanitation	Rehydration, surveillance, infrastructure
1990–2026	Persistent/re-emerging leishmaniasis	Vectors, environment, climate, urbanisation	Surveillance, vector control, diagnosis
2003 onward	West Nile virus / arboviral risk	Vectors, animal reservoirs, climate	Entomological surveillance, One Health
2009–2010	Influenza A(H1N1)pdm09	International respiratory spread	Virological surveillance, vaccination

Since 2020	COVID-19: pandemic then post-emergency	Mobility, respiratory transmission	Lockdown, testing, vaccination, genomic surveillance
Since 2023	Measles resurgence	Susceptibility pockets, vaccination delays	Catch-up vaccination and surveillance

3.2. Plague: recurrence, political crises and early health measures

The Black Death reached the Maghreb in the 14th century in the context of the second plague pandemic. Available Moroccan sources are less quantitative than those from several European countries, but they describe substantial mortality, population displacement, and major disruption of urban and rural activities. Later recurrences show that plague remained a component of the Moroccan health landscape for several centuries [2 and 4].

Secondary historical sources place a severe plague sequence in 1597–1599, at the end of the reign of Ahmad al-Mansur. The episode occurred in a context already marked by political tensions, subsistence difficulties and successional reconfiguration. Available documentation does not, however, allow isolation of a specific causal effect of the epidemic on the fate of the Saadian dynasty; it is therefore interpreted here as an aggravating factor within a multifactorial crisis. Figures reported by early sources should be regarded as orders of magnitude rather than modern epidemiological estimates [2].

The 1818–1820 wave, notably documented around Tangier, illustrates the coexistence of protective strategies based on isolation, withdrawal from cities and the limitation of contact. In the early 20th century, plague management increasingly followed an institutional logic combining laboratories, quarantines and health policies. The review by Malek et al. [4] confirms the persistence of Maghreb foci until the 20th century and their progressive decline with surveillance, rodent and flea control, improved housing, and antibiotic therapy.

3.3. Smallpox: from endemicity to vaccination

Smallpox was long endemic in Morocco, with periodic outbreaks particularly affecting children. Practices of inoculation or variolation are mentioned in certain historical sources, but their extent and effectiveness are difficult to quantify.

The progressive introduction of smallpox vaccination profoundly transformed this situation. The decline of the disease in the 20th century was part of the international movement that led to certified global eradication in 1980. The history of smallpox thus marks an important turning point: for the first time, a historical epidemic disease could be controlled not only through isolation and travel restrictions, but through a specific preventive intervention applied on a large scale [5 and 6].

3.4. Cholera: ports, pilgrimage, water and sanitation

In the 19th century, cholera gradually took the place of plague as the major international epidemic threat. Its spread followed maritime routes, trade exchanges and population movements, notably those linked to pilgrimage. In Morocco, historical sources report notably major epidemics in 1878 and 1895. Responses combined travel restrictions, port control, lazarets and quarantine measures [3, 7 and 8].

With the recognition of waterborne transmission, health action gradually shifted toward improving water supply, sanitation, food hygiene and case management. Episodes occurring in the 20th century nevertheless highlight the gradual and unequal nature of this transition. In an official statement dated 27 August 2018, Morocco's Ministry of Health indicated that no cholera epidemic had been recorded in the country since 1997. This historical institutional information should not be extrapolated as proof of the absolute absence of cases up to 2026; the persistence of epidemics in several regions of the world and international mobility justify maintaining surveillance and preparedness measures [9 and 10].

At the North African scale, recent literature notes that cholera remains a potentially re-emerging threat when disasters, infrastructure degradation and social vulnerabilities combine [11].

3.5. Typhus: a marker of social vulnerability

Epidemic typhus particularly illustrates the interaction between infectious disease and social conditions. Transmitted by body lice, it is favoured by overcrowding, poor hygiene, poverty, cold, war and malnutrition. In Morocco, the first half of the 20th century, particularly periods of food shortage, combined displacement, undernutrition and the spread of several infections. In this context, typhus was as much an indicator of social vulnerability as an infectious disease.

Clothing disinfection, delousing, improved hygiene and the introduction of antibiotics progressively transformed its control [2 and 12]. The updated PubMed search nevertheless confirms the persistent scarcity of biomedical literature directly devoted to historical Moroccan typhus episodes, which calls for caution regarding early quantitative estimates.

3.6. The 1918 influenza and the construction of modern influenza surveillance

The 1918–1919 pandemic also reached North Africa in a context of military movement, maritime traffic and the development of railway networks. Moroccan-specific documentation nevertheless remains limited in PubMed; the updated search did not identify any biomedical publication allowing a robust quantitative reconstruction of the Moroccan episode. International historical references therefore remain necessary to contextualise this pandemic [13].

Contemporary literature is, by contrast, much more robust. In Morocco, influenza surveillance among outpatients and inpatients was already documented for the period 1996–2009 by Barakat et al. [14]. The emergence of the A(H1N1) pdm09 pandemic in 2009–2010 led to a specific characterisation of its epidemiology, transmissibility and factors associated with death [15]. Surveillance was subsequently consolidated through the establishment of seasonal and alert thresholds [16], the characterisation of severe acute respiratory infections [17], and the study of their viral aetiology [18].

Vaccination and its safety surveillance have also taken on a growing role. Mantel et al. [19] analysed seasonal vaccination practices in Morocco in a comparison of middle-income countries, while Tebaa et al. [20] documented the pharmacovigilance of pandemic A/H1N1 and seasonal vaccines. This trajectory marks the shift from a mainly reactive response to surveillance based on sentinel networks, virology, epidemic thresholds and structured vaccination policies.

3.7. Measles: vaccine progress and resurgence

The generalisation of vaccination sharply reduced the burden of measles in Morocco, but did not eliminate the risk of outbreaks when coverage becomes insufficient. The development of laboratory capacity progressively strengthened surveillance. Benamar et al. [21] notably showed the value of real-time PCR in detecting the virus in specimens with negative IgM serology.

The resurgence observed since 2023 is a major reminder of the need to maintain high vaccination coverage. Abassi et al. [22] described the experience of the Rabat Children's Hospital during the 2024–2025 outbreak, providing recent clinical documentation of this resurgence.

The COVID-19 pandemic constitutes an important part of the context. A survey of 103 Moroccan paediatricians documented disruptions to childhood vaccination during the pandemic [23]. Subsequent observations made in Guelmim also suggest that delays, missed doses, access difficulties, lack of information and vaccine hesitancy may contribute to the accumulation of susceptible populations [24]. The measles resurgence thus illustrates that a prior vaccination success can be rapidly undermined if the continuity of vaccination and catch-up campaigns is not maintained.

3.8. Vector-borne diseases: persistence and emergence

Recent literature confirms the persistence of vector-borne risk in Morocco, mainly illustrated by leishmaniasis, whose distribution is strongly heterogeneous and associated with environmental and socio-demographic determinants [25-27]. Recent work also suggests a role for climatic factors in certain areas [28].

The circulation of West Nile virus has been documented in Morocco, and the presence of competent vectors sustains a risk of emergence of other arboviruses [29 and 30]. Contemporary malaria is mainly represented by imported cases, as illustrated by a recent series from the Ibn Sina Hospital in Rabat [31]. These elements justify an integrated approach linking human, vector and environmental surveillance, without making vector-borne diseases a dominant axis of this historical synthesis.

3.9. COVID-19: from a national crisis to genomic surveillance

COVID-19 is the best-documented episode in Morocco's recent epidemic history. In early 2020, the response combined distancing measures, mobility restrictions, lockdown, the development of diagnostic capacity, and the reorganisation of health services. Hadrya et al. [32] documented the spatio-temporal dynamics of the epidemic in Morocco at an early stage, while Barkia et al. [33] analysed the national response and its public health lessons.

Vaccination subsequently became a central element of the national response. Moroccan evaluations showed the effectiveness of the inactivated BBIBP-CorV vaccine against severe and critical hospitalisations, and later the value of a booster dose during the Omicron wave in reducing severe and critical forms and deaths [34]. Seroepidemiological studies conducted in Casablanca-Settat, Rabat and other Moroccan populations also contributed to documenting the collective immune response, without being developed further here in order to maintain a historical public health framing.

One of the most important transformations concerns genomic surveillance. The first Moroccan studies documented the genetic diversity of the virus as early as 2020–2021 [35]. Subsequent work tracked the diversification of Omicron and the succession of lineages, up to a longitudinal analysis of genomes collected between 2020 and 2024 [36-38]. This scaling-up of sequencing forms part of a broader African and North African dynamic of genomic data sharing.

The pandemic also had indirect consequences. It disrupted the continuity of certain health services, notably childhood vaccination programmes, potentially creating conditions favourable to the reappearance of vaccine-preventable diseases. COVID-19 thus represents less a total break with history than an acceleration of already observed trends: the role of mobility, the importance of information, tensions between health control and social activity, but also the shift toward high-resolution digital and genomic surveillance.

3.10. Socio-economic and political impacts: from vulnerability to institutional transformation

Historical and contemporary literature converges on one observation: epidemic crises produce effects that go beyond mortality and morbidity. In Morocco, early episodes must be placed within sequences in which epidemics, droughts, famines, displacement, market disruption and weakened administrative capacity interact. Meyers [1] notably shows that famine relief policies under the early Alaouite sovereigns already constituted a form of public action on population survival while simultaneously contributing to the political legitimation of power.

The 1597–1599 plague, the subsistence crises of the 17th–18th centuries and the epidemics of the 19th century do not allow the establishment of a simple causal relationship between disease and dynastic change. They instead show how an infectious crisis can amplify pre-existing tensions by reducing the active population, disrupting trade and supply, and increasing relief needs. Comparative work on major plagues supports this multifactorial reading: political effects depend on the demographic, fiscal, military and institutional context, and recent reconstructions call for caution regarding narratives of “collapse” attributed to a single epidemic.

The same mechanisms can, however, produce institutional innovation. European experiences with quarantine and lazarets show how the protection of trade and populations favoured the territorialisation of health arrangements [39 and 40]. Trade routes, while facilitating the spread of plague, thus also contributed to the emergence of instruments for controlling mobility [41]. This tension between economic openness and health protection is a particularly relevant historical thread for a port-based Mediterranean country like Morocco.

In the contemporary era, COVID-19 makes these interactions directly observable. Moroccan macroeconomic scenarios showed the cost of lockdown measures and the trade-offs between transmission control and the continuity of activity [42]. Other work documented effects on food insecurity, mobility and migration governance [43 and 44]. The pandemic also brought institutional trust and public information back to the forefront. Comparative analyses indicate that infectious outbreaks can erode political trust and, in certain contexts, intensify stigmatisation, social conflict and scapegoating [45 and 46].

4. Discussion

4.1. A Moroccan history marked by recurrent determinants

Analysis over several centuries shows that infectious agents change more than the fundamental determinants of their spread. Morocco's major epidemics are consistently associated with human mobility, trade, ports, pilgrimage, war and displacement, poverty, urban density, inadequate water and sanitation, disruptions in access to care, and environmental vulnerabilities.

Plague travelled along commercial and maritime networks; cholera exposed inadequacies in water and sanitation; typhus developed in conditions of poverty and overcrowding; pandemic influenza and COVID-19 benefited from the acceleration of international mobility. Historical continuity therefore lies less in the agents themselves than in the repetition of the conditions favouring their spread.

4.2. From isolation to genomic surveillance: transformation of the health state

One of the major findings of this synthesis is the progressive transformation of public health instruments. Early responses relied mainly on flight, isolation, community practices and, later, quarantines and sanitary cordons. This history of public action does not, however, begin with modern health administrations: Meyers's [1] analysis shows that, in the Morocco of the early Alaouite sovereigns, famine relief policies already contributed to a form of governance over the survival and vulnerability of populations. In the 19th century, the organisation of lazarets, port regulation and the first health administrations subsequently reflected more explicit institutionalisation.

In the 20th century, instruments diversified with sanitation, vaccination, microbiology, antibiotics, vector control and epidemiological surveillance. The recent period marks a new stage, with syndromic surveillance, sentinel networks, PCR, information systems, digital tools and genomic sequencing. This transition is particularly visible for influenza and COVID-19: structured influenza surveillance established before 2009, complemented by seasonal vaccination policies [19], preceded a scaling-up of virological capacity, while COVID-19 accelerated the use of sequencing and molecular surveillance.

4.3. The vaccine paradox: historical success and vulnerability to resurgence

Smallpox and measles demonstrate the major benefits of vaccination, but also a particular fragility: the rarer a disease becomes, the more the perception of its risk can decline. The recent measles resurgence illustrates this paradox. Interruptions or delays in vaccination during COVID-19 may have created pockets of susceptibility, allowing the return of a disease that had previously been strongly controlled.

The pandemic thus revealed that a resilient health system must be able to manage an emerging emergency while simultaneously maintaining essential programmes. The COVID-19 vaccination experience likewise shows the value of having national real-world effectiveness data, including during the Omicron wave [34]. This lesson extends beyond measles and COVID-19: any pandemic preparedness strategy should include specific plans to maintain vaccination, screening, chronic disease follow-up, and maternal and child care.

4.4. Morocco in its Arab, Maghreb and Mediterranean context

Morocco's historical profile belongs to a broader Arab and Islamic history, structured by trade routes, pilgrimage to Mecca and circulation between ports. Like other countries in the region, Morocco experienced the gradual shift from plague to cholera as the dominant threat in the 19th century. Pilgrimages served both as a route of transmission and as a driver of international health cooperation, with the development of quarantines, certificates, lazarets and sanitary conferences [7 and 47].

Morocco's trajectory also shares several features with Algeria and Tunisia: the historical persistence of plague, the importance of ports, colonial and postcolonial health transformations, and the progressive development of vaccination and surveillance. Geographic proximity does not, however, mean epidemiological uniformity. The distribution of foci depends on ecological factors, urban structure, housing conditions and local surveillance capacity [4].

The COVID-19 pandemic reinforced the relevance of this regional scale. North African genomic surveillance highlighted the importance of sequence and data sharing [48]. The Mediterranean should thus be regarded not only as a political border, but as a shared epidemiological space.

4.5. Environmental change, vector-borne diseases and the transition toward One Health

Vector-borne diseases complete the narrative of major epidemics by showing that part of infectious risk now explicitly depends on interactions between climate, environment, vectors, animal reservoirs and human populations. Variations in temperature, rainfall, land use and urbanisation can alter the distribution of sand flies and mosquitoes; recent Moroccan work on leishmaniasis, West Nile virus and arboviruses reinforce the need for territorial vigilance [27, 28 and 30].

In this perspective, One Health is less a new stand-alone theme than an operational evolution of surveillance: the integration of human, veterinary, vector, climatic and environmental data, supported by microbiology and genomics. This approach must remain proportionate to the historical scope of the manuscript, but it sheds light on the transition of contemporary infectious risks.

4.6. Social and territorial inequalities

Epidemics never strike populations uniformly. In early episodes, famine, poverty and war strongly increased vulnerability. In the contemporary period, the determinants differ in form but are comparable in function: difficulties in accessing care, geographic remoteness, housing conditions, precarity, mobility and unequal access to information.

Leishmaniasis illustrates a territorial geography of risk; measles highlights the consequences of under-vaccinated pockets; COVID-19 showed the differential effects of care interruptions. Health policies must therefore be evaluated not only in terms of average national coverage, but also in terms of territorial equity.

4.7. Epidemics as amplifiers of vulnerability and catalysts of political change

The Moroccan case first invites us to consider health crises as a component of a broader system of vulnerabilities. Meyers's [1] analysis shows that, under the early Alaouite sovereigns, famine relief policies simultaneously served a protective function for populations and carried political significance. This observation is important: it suggests that the relationship between health crisis and power cannot be reduced to state weakening; the capacity to organise relief, supply and protection can also contribute to political legitimacy.

Over the long term, episodes of plague, famine and trade disruption should therefore be interpreted as factors capable of amplifying pre-existing demographic, economic, fiscal or successional tensions. Work in economic and social history shows, in other contexts, that major health crises can alter

growth trajectories, inequality, mobility and labour relations, while infectious outbreaks can affect social cohesion and political trust [45, 46, 49 and 50]. These comparisons are not mechanically transposed to Morocco; they serve to illuminate plausible mechanisms where Moroccan sources are incomplete.

Crises can, finally, stimulate institutional innovation. Historical experiences of quarantine, lazarets and territorial organisation show how the repetition of infectious threats contributed to formalising mobility-control and trade-protection arrangements [39-41]. In contemporary Morocco, COVID-19 illustrates this ambivalence: a major economic and social shock, but also an accelerator of health digitalisation, epidemiological and genomic surveillance, and new forms of public coordination. The epidemic should thus be understood as an amplifier or catalyst within a multifactorial causal chain, not as an autonomous cause of dynastic collapse or political transformation.

4.8. Quality and limitations of the evidence

This synthesis reveals a strong documentary asymmetry. For COVID-19, influenza and leishmaniasis, PubMed provides abundant literature including epidemiology, molecular surveillance, vaccination and spatial analyses. Conversely, early plagues, smallpox, historical cholera, typhus, and above all their fiscal and political consequences, are poorly represented in biomedical databases. Comparative socio-economic searches generated considerable documentary noise, confirming the need to cross-reference biomedical literature, economic history and historical sources. What is historically important is not necessarily well indexed in PubMed or PMC.

The main limitations are the heterogeneity of sources, the absence of reliable denominators for early periods, difficulties in retrospective diagnostic identification, contradictions between certain early data, insufficient indexing of Moroccan sources, incomplete access to archives, and the overrepresentation of contemporary diseases. Selection was not carried out in duplicate, and no formal risk-of-bias assessment was applied to the entire body of documents. Furthermore, because intermediate screening counts were not prospectively recorded under a PRISMA protocol, they are not reconstructed retrospectively; only the final corpus actually used and included in the bibliography is quantified (n = 77).

4.9. Implications for health preparedness

Morocco's epidemic history suggests several priorities. The first is to preserve structural achievements: vaccination, drinking water, sanitation, laboratories and surveillance. The second is to ensure the continuity of essential services during crises, so that the response to an emerging disease does not indirectly favour the re-emergence of other diseases. The third is to maintain and expand the genomic surveillance developed during COVID-19. A fourth priority now explicitly concerns socio-economic resilience: preparedness plans should integrate protection of vulnerable populations, food security, continuity of supply chains, maintenance of essential activities, and communication strategies capable of preserving public trust.

The fifth priority is to strengthen the territorial dimension of surveillance in order to identify under-vaccinated pockets or vector foci at an early stage. Finally, climatic and environmental transformations make a One Health surveillance approach necessary, integrating human, animal, vector and environmental data. Preparedness should therefore no longer be conceived disease by disease; it should be designed as a cross-cutting capacity for detection, anticipation and response, combining public health, social protection, governance, crisis communication and economic continuity.

5. Conclusions

From the 14th century to contemporary health crises, epidemics have accompanied Morocco's transformations. Plague interacted with subsistence crises and dynastic tensions; cholera reinforced the need for port control, quarantine and sanitation; smallpox demonstrated the power of vaccination; typhus revealed the weight of poverty and overcrowding; influenza and later COVID-19 accelerated virological, digital and genomic surveillance. Socio-economic and political analysis nevertheless shows that an epidemic never by itself explains a dynastic collapse or a state transformation: it mainly acts as an amplifier of pre-existing demographic, economic, fiscal and social vulnerabilities, but can also stimulate institutional innovation. The recent measles resurgence and the persistence of vector-borne risks are a final reminder that health resilience must be built over the long term. Morocco's epidemic history thus argues for integrated preparedness combining surveillance, vaccination, territorial equity, social protection, economic continuity, public trust and a One Health approach.

References

[1] A. R. Meyers, "Famine relief and imperial policy in early modern Morocco: the political functions of public health", American Journal of Public Health, 71(11), 1266-1273, 1981.

[2] D. Gharbaoui, "Histoire des épidémies au Maroc à partir du XVIIe siècle : de la peste au COVID-19 [Thèse de médecine, Université Mohammed V de Rabat]", IMIST-

Toubkal, 2022, https://toubkal.imist.ma/items/ded77d85-c97f-4f9f-b45f-3016b70f55ca.

[3] B. Pouget, "La Méditerranée et les grandes épidémies : retour sur un demi-siècle de travaux historiques", Cahiers de la Méditerranée, 103, 2021, https://journals.openedition.org/cdlm/15133.

[4] M. A. Malek, et al., "Plague in Arab Maghreb, 1940–2015: a review", Frontiers in Public Health, 4, 112, 2016, https://pmc.ncbi.nlm.nih.gov/articles/PMC4891326/.

[5] World Health Organization, "History of smallpox vaccination", n.d., https://www.who.int/news-room/spotlight/history-of-vaccination/history-of-smallpox-vaccination.

[6] Centers for Disease Control and Prevention, "History of smallpox", 2024, https://www.cdc.gov/smallpox/about/history.html.

[7] L. Chantre, "Entre pandémie et panislamisme : l'imaginaire colonial de la contagion à l'épreuve du pèlerinage à La Mecque", Archives de sciences sociales des religions, 2013, https://journals.openedition.org/assr/25258.

[8] H. Ez-zouaki, "Il était une fois le choléra au Maroc", Cahiers de Narratologie, 2023, https://journals.openedition.org/narratologie/14651.

[9] Ministry of Health of Morocco, "No cholera case has been recorded in Morocco: anticipatory and preventive measures", Press release of 27 August 2018, 2018, https://www.sante.gov.ma/Pages/Communiques.aspx?IDCom=291.

[10] World Health Organization, "Cholera and acute watery diarrhoea: global situation", Weekly Epidemiological Record, 101(31), 2026, https://www.who.int/publications/journals/weekly-epidemiological-record/wer101-31.

[11] M. Martini, C. Minet, D. Orsini, "The specter of cholera in Libya and North Africa: natural disasters and anthropization threaten human health during recent years", Journal of Preventive Medicine and Hygiene, 64(3), E340-E344, 2023.

[12] D. Raoult, V. Roux, "The body louse as a vector of reemerging human diseases", Clinical Infectious Diseases, 29(4), 888–911, 1999.

[13] J. K. Taubenberger, D. M. Morens, "1918 influenza: the mother of all pandemics", Emerging Infectious Diseases, 12(1), 15–22, 2006, https://wwwnc.cdc.gov/eid/article/12/1/05-0979_article.

[14] A. Barakat, H. Ihazmad, S. Benkaroum, I. Cherkaoui, A. Benmamoun, M. Youbi, R. El Aouad, "Influenza surveillance among outpatients and inpatients in Morocco, 1996-2009", PLoS One, 6(9), e24579, 2011.

[15] A. Barakat, et al., "2009 pandemic influenza A virus subtype H1N1 in Morocco, 2009–2010", Emerging Infectious Diseases, 18(4), 2012, https://pmc.ncbi.nlm.nih.gov/articles/PMC3572880/.

[16] A. Rguig, et al., "Establishing seasonal and alert influenza thresholds in Morocco", BMC Public Health, 20, 2020, https://pmc.ncbi.nlm.nih.gov/articles/PMC7323370/.

[17] H. Ezzine, I. Cherkaoui, A. Rguig, et al., "Influenza epidemiology and risk factors for severe acute respiratory infection in Morocco during the 2016/2017 and 2017/2018 seasons", Pan African Medical Journal, 36, 159, 2020.

[18] A. Bimouhen, Z. Regragui, F. El Falaki, H. Ihazmade, S. Benkerroum, I. Cherkaoui, A. Rguig, H. Ezzine, T. Benamar, S. Triki, Y. Bakri, H. Oumzil, "Viral aetiology of influenza-like illnesses and severe acute respiratory illnesses in Morocco, September 2014 to December 2016", Journal of Global Health, 12, 04062, 2022.

[19] C. Mantel, S. Y. Chu, T. B. Hyde, P. Lambach, "Seasonal influenza vaccination in middle-income countries: assessment of immunization practices in Belarus, Morocco, and Thailand", Vaccine, 38(2), 212-219, 2020.

[20] A. Tebaa, et al., "Monitoring the safety of influenza A/H1N1 pandemic and seasonal influenza vaccines in Morocco", 2022, https://pmc.ncbi.nlm.nih.gov/articles/PMC8968976/.

[21] T. Benamar, et al., "Real-time PCR for measles virus detection on clinical specimens with molecular characterization of strains circulating in Morocco", 2016, https://pmc.ncbi.nlm.nih.gov/articles/PMC4727926/.

[22] K. B. Abassi, et al., "Experience of the Children's Hospital of Rabat (2024–2025): measles resurgence in Morocco", PubMed Central, 2026, https://pmc.ncbi.nlm.nih.gov/articles/PMC12964329/.

[23] N. Chekhlabi, R. Arrab, S. Ettair, N. Dini, "Impact de la pandémie COVID-19 sur la vaccination des enfants au Maroc : enquête électronique auprès de 103 pédiatres", Pan African Medical Journal, 38, 134, 2021.

[24] A. Asraoui, A. Soulaymani, "COVID-19-related disruptions and measles vaccination uptake among children attending urban health centers in Guelmim, Morocco: a cross-sectional study", BMC Public Health, 2026.

[25] M. Sadeq, "Spatial patterns and secular trends in human leishmaniasis incidence in Morocco between 2003 and 2013", Infectious Diseases of Poverty, 5, 48, 2016.

[26] A. El Hamouchi, O. Daoui, M. Ait Kbaich, I. Mhaidi, S. El Kacem, I. Guizani, M. Sarih, M. Lemrani, "Epidemiological features of a recent zoonotic cutaneous leishmaniasis outbreak in Zagora province, southern Morocco", PLoS Neglected Tropical Diseases, 13(4), e0007321, 2019.

[27] C. Harkat, D. Sereno, O. Rida, H. Hafiane, S. Bouhout, L. Hoummadi, K. Kahime, "Spatiotemporal patterns of zoonotic cutaneous leishmaniasis in the high-burden provinces of Morocco, 1995-2022: an exploratory analysis of environmental and socio-demographic correlates", Parasite, 33, 44, 2026.

[28] S. Benkhira, N. Boudebouch, B. Benazzouz, "Impact of climatic factors on the incidence of cutaneous leishmaniasis in Essaouira, Morocco: a decadal analysis (2014-2023)", Epidemiologia, 7(1), 28, 2026.

[29] I. Schuffenecker, C. N. Peyrefitte, M. El Harrak, S. Murri, A. Leblond, H. G. Zeller, "West Nile virus in Morocco, 2003", Emerging Infectious Diseases, 11(2), 306-309, 2005.

[30] S. Jdiaa, H. Hazyoun, M. A. Louah, O. Himmi, "Risque d'émergence de maladies arbovirales transmises par les moustiques au Maroc : revue bibliographique", Médecine Tropicale et Santé Internationale, 5(4), 2025.

[31] A. Hanafi, I. Zouaoui, H. Abjabja, Y. Abercha, S. Aoufi, "Imported malaria at the Ibn Sina University Hospital in Rabat: a retrospective study of 81 cases", Cureus, 16(5), e60253, 2024.

[32] F. Hadrya, A. Soulaymani, F. El Hattimy, "Space-time COVID-19 monitoring in Morocco", Pan African Medical Journal, 35(Suppl. 2), 41, 2020.

[33] A. Barkia, et al., "Morocco's national response to the COVID-19 pandemic: public health challenges and lessons learned", JMIR Public Health and Surveillance, 2021, https://pmc.ncbi.nlm.nih.gov/articles/PMC8451960/.

[34] J. Belayachi, A. Mhayi, H. Majidi, E. El Fahime, R. Abouqal, "Effectiveness of Sinopharm's BBIBP-CorV booster vaccination against COVID-19-related severe and critical cases and deaths in Morocco during the Omicron wave", Vaccines, 12(3), 244, 2024.

[35] B. Badaoui, et al., "Genetic diversity and genomic epidemiology of SARS-CoV-2 in Morocco", Biosafety and Health, 2021, https://pmc.ncbi.nlm.nih.gov/articles/PMC7857134/.

[36] S. El Mazouri, A. Essabbar, T. Aanniz, R. Eljaoudi, L. Belyamani, A. Ibrahimi, M. Ouadghiri, "Genetic diversity and evolutionary dynamics of the Omicron variant of SARS-CoV-2 in Morocco", Pathogens and Global Health, 118(3), 241-252, 2024.

[37] H. Ghammaz, M. Melloul, A. Mbarki, M. Hemlali, T. Chouati, H. E. Annaz, N. Touil, M. Elouennass, K. Ennibi, E. E. Fahime, "Genomic evolution of SARS-CoV-2 in Morocco: insights from whole genome sequences collected from 2020 to 2024", Virus Research, 353, 199530, 2025.

[38] O. Bouddahab, S. Aqillouch, H. Charoute, et al., "Genomic surveillance in Morocco tracks SARS-CoV-2 variant shift from Alpha to Omicron sublineage JN1", npj Viruses, 3, 63, 2025.

[39] M. Martini, P. Calcagno, F. Brigo, F. Ferrando, "The story of the plague in the Maritime Republic of Genoa (Italy) (1656-1657): An innovative public health system and an efficacious method of territorial health organization", Journal of Preventive Medicine and Hygiene, 63(4), E625-E629, 2022.

[40] C. B. Vicentini, O. Simonetti, M. Martini, C. Contini, "The Italian lazarets of the Adriatic Sea: from their institution to the fight against the economic and demographic collapse caused by epidemics", Infezioni in Medicina, 31(1), 116-126, 2023.

[41] R. P. H. Yue, H. F. Lee, C. Y. H. Wu, "Trade routes and plague transmission in pre-industrial Europe", Scientific Reports, 7, 12973, 2017.

[42] Z. Firano, F. A. Fatine, "The COVID-19: macroeconomics scenarii and role of containment in Morocco", One Health, 10, 100152, 2020.

[43] A. Murzakulova, M. Dessalegn, N. Phalkey, "Examining migration governance: evidence of rising insecurities due to COVID-19 in China, Ethiopia, Kyrgyzstan, Moldova, Morocco, Nepal and Thailand", Comparative Migration Studies, 9, 44, 2021.

[44] R. Belahsen, M. Cherkaoui, A. I. Mora Urda, F. J. Martín Almena, M. D. P. Montero López, "Consequences of COVID-19 lockdown on food insecurity and food quality in two Mediterranean countries (Spain and Morocco)", Foods, 14(15), 2604, 2025.

[45] R. Jedwab, A. M. Khan, J. Russ, E. D. Zaveri, "Epidemics, pandemics, and social conflict: Lessons from the past and possible scenarios for COVID-19", World Development, 147, 105629, 2021.

[46] O. Koren, N. B. Weidmann, "Infectious disease outbreaks drive political mistrust", Proceedings of the National Academy of Sciences of the United States of America, 122(29), e2506093122, 2025.

[47] B. Grams, "The historical significance of epidemics in the Middle East", Georgetown University, Center for Contemporary Arab Studies, 2022, https://ccas.georgetown.edu/ccas-newsmagazine/the-historical-significance-of-epidemics-in-the-middle-east/.

[48] Z. Hamzaoui, S. Ferjani, I. Medini, et al., "Genomic surveillance of SARS-CoV-2 in North Africa: 4 years of GISAID data sharing", IJID Regions, 11, 100356, 2024.

[49] G. Alfani, F. Ammannati, "Long-term trends in economic inequality: the case of the Florentine state, c. 1300-1800", Economic History Review, 70(4), 1072-1102, 2017.

[50] V. Arthi, J. Parman, "Disease, downturns, and wellbeing: Economic history and the long-run impacts of COVID-19", Explorations in Economic History, 79, 101381, 2021.