

The effects of inflation on access to healthcare in Algeria: An ARDL model analysis over the period 1990–2023

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Abstract:

This study explores the impact of inflation on access to healthcare in Algeria over the period 1990-2023. The econometric approach adopted is based on the Autoregressive Distributed Lag (ARDL) model, which allows for the identification of both short-term and long-term effects. The empirical results highlight the existence of a long-term relationship between inflation and access to health services. The long-term estimation results from the ARDL model confirm the existence of a cointegrating relationship between inflation and healthcare access. The inflation coefficient is negative, indicating a restrictive effect of rising prices on access to health services. Conversely, GDP per capita and social protection exert positive and statistically significant effects, reflecting their structural contribution to improving health accessibility.

Keywords: Inflation, Access to health care, ARDL model, Algeria

Jel Classification Codes : E31; I11; C22.

Résumé:

Cette étude explore l'influence de l'inflation sur l'accès aux soins de santé en Algérie sur la période 1990-2023. L'approche économétrique adoptée repose sur le modèle ARDL, permettant d'identifier les effets à court et long terme. Les résultats empiriques mettent en évidence l'existence d'une relation de long terme entre l'inflation et l'accès aux services de santé. Les résultats de l'estimation de long terme issus du modèle ARDL confirment l'existence d'une relation de cointégration entre l'inflation et l'accès aux soins. Le coefficient de l'inflation est négatif, indiquant un effet restrictif de la hausse des prix sur l'accès aux services de santé. À l'inverse, le PIB par habitant et la protection sociale exercent des effets positifs et statistiquement significatifs, traduisant leur contribution structurelle à l'amélioration de l'accessibilité sanitaire.

Mots clés: Inflation, Accès aux soins, ARDL, Algérie

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I. Introduction

Access to healthcare constitutes a pivotal challenge for socio-economic development and population well-being. It is not limited to the physical availability of medical infrastructure but also intrinsically depends on the financial and social capacity of individuals to utilize health services(El Fathaoui &*al.*, 2023).

In Algeria, despite sustained state efforts to expand health coverage and strengthen the care network, persistent obstacles remain, notably regional disparities, limited access to specialized services, and an insufficient availability of healthcare professionals in specific areas (Guechar & Djouad, 2025).These constraints amplify social health inequalities and hinder the capacity for effective access to care for a significant portion of the population (Bouledroua, 2025).

Among the economic determinants influencing healthcare access, inflation occupies a central position. Inflation, understood as a general rise in prices and the subsequent erosion of purchasing power, can severely reduce households' ability to finance essential care, increase the real costs of medical services, and create formidable financial barriers to access(OECD, 2023).Furthermore, inflation tends to drive up the costs of health inputs—including pharmaceuticals, medical supplies, equipment, and wages—which inflates overall health system expenditures and may reduce the affordability of care for the most vulnerable populations. Understanding these effects is essential for guiding public policies capable of guaranteeing equitable access to care, even during periods of macroeconomic pressure.

However, the scientific literature regarding the direct impact of inflation on healthcare access in Algeria remains highly limited. In most existing research, the macroeconomic determinants of health expenditure are studied in a general manner without isolating the specific effect of inflation (Diğer & Uyar, 2025). On a global scale, several reviews highlight that inflation can have adverse effects on health outcomes, while also noting significant gaps in methodological and contextual approaches. This lack of empirical work focused on the Algerian context fully justifies the present study and underscores its scientific and practical significance.

To address this empirical gap, this research adopts the Autoregressive Distributed Lag (ARDL) model, which allows for the simultaneous analysis of the short- and long-term effects of inflation on per capita health expenditure. Consequently, the central research question is formulated as follows: **To what extent does inflation influence access to healthcare in Algeria, and what are its short- and long-term effects on health expenditure per capita?**

By integrating these components within the ARDL framework, the analysis aims to deliver robust empirical insights to inform public policymakers regarding the transmission mechanisms through which inflation impacts healthcare access. Ultimately, these findings are intended to contribute to formulating targeted policy recommendations designed to enhance the equity and efficiency of the Algerian healthcare system, while carefully accounting for prevailing macroeconomic constraints.

II. Literature Review

On an empirical level, several studies have examined the relationship between inflation and access to healthcare by utilizing both microeconomic and macroeconomic data. This body of research primarily focuses on the effects of rising prices on the utilization of health services, household medical expenditures, and the foregoing of care, yielding contrasted results depending on institutional contexts and income levels. Within this macroeconomic context, (Zhou, et al., 2020) analyze the relationship between GDP per capita and health expenditure across several emerging economies over the 2000–2018 period, highlighting that an increase in per capita income leads to a proportional, or even greater, rise in health spending; this suggests that economic growth indirectly improves access to health services.

In contrast to the positive implications of income growth, macroeconomic pressures such as inflation can severely constrain these dynamics. For instance, (Shah, Khan, & Ali, 2023) demonstrate that in Pakistan, inflation constitutes a direct financial barrier by reducing recourse to consultations, pharmacological treatments, and hospitalizations, particularly among middle-income households. In developing countries, where health systems rely heavily on out-of-pocket payments, the impact is often more severe. In this regard, (Shovo, 2025) observes in Bangladesh that the rising cost of care and medicine leads low- and middle-income households to delay consultations, reduce medication consumption, or resort to informal care. Similarly, (Isbal & Khan, 2025) emphasize that inflation reduces the share of the household budget allocated to healthcare in favor of food and energy expenditures, contributing to the deterioration of general health status and the widening of health inequalities.

Furthermore, access to medicine constitutes a central channel through which inflation affects health in developing nations. (Ademola & Osagie, 2024) show that in Nigeria, the increase in drug prices in both public and private pharmacies limits the accessibility of essential treatments for rural and low-income populations. These localized findings are corroborated by macroeconomic panel analyses, such as that of (Khan, Zahir, & Saleem, 2026),

who study 20 Asia-Pacific countries and highlight that inflation significantly influences health expenditure and access to care—an effect amplified in countries with low institutional quality and limited social protection systems.

Moving beyond regional panel analyses, global and institutional assessments reinforce these empirical patterns. A systematic review conducted by (Kent & al, 2024) covering 69 empirical studies confirms that inflation is associated with a deterioration in healthcare access, notably through an increase in foregone care for financial reasons, even in countries with developed social protection systems. Complementarily, the (OECD, 2023) underscores that following the COVID-19 pandemic, the increase in health budgets in several European countries did not offset the rise in real costs, leading to reduced hospital capacity, longer waiting times, and increased financial pressure on patients.

Finally, specific field studies confirm the direct, measurable effect of inflation on healthcare utilization. (Kazmi & al, 2025), in a cross-sectional study in Pakistan involving 386 middle-class individuals, report that 48.4% of participants reduced their number of medical visits, 40.9% shortened their prescriptions, and 57.8% delayed hospitalization due to high costs. These observations clearly illustrate how medical cost inflation acts as a critical financial barrier, particularly affecting middle- or low-income households.

III. Research Methodology

III. 1Methodological Approach and Justification

To investigate the empirical relationship between inflation and healthcare access in Algeria, this study adopts the Autoregressive Distributed Lag (ARDL) cointegration framework. The selection of this econometric methodology is robustly justified based on several technical and practical considerations. First, the ARDL model possesses the unique capability to accommodate time series integrated of different orders, specifically $I(0)$ and $I(1)$, provided that no variable exhibits an $I(2)$ order of integration (Pesaran, Shin, & Smith, 2001). Second, this framework allows for the simultaneous estimation of both short- and long-run dynamic relationships, which is methodologically essential for capturing the immediate and protracted effects of inflationary pressures on healthcare access. Third, the ARDL approach demonstrates superior statistical power and robustness when dealing with relatively small sample sizes, making it highly appropriate for the current study which utilizes 34 annual observations spanning the period from 1990 to 2023. Consequently, given these econometric advantages, this model has been widely implemented in empirical economic and social

research to scrutinize the dynamic impacts of macroeconomic volatility on social outcomes.

III. 2 Data and Variable Operationalization

The empirical analysis utilizes annual time series data spanning the period from 1990 to 2023, sourced from recognized institutional repositories. Specifically, healthcare indicators were obtained from the World Health Organization (WHO) database, while macroeconomic data were retrieved from the World Bank Development Indicators. This comprehensive temporal scope is well-suited to capturing structural economic fluctuations—most notably inflationary pressures—and tracing their subsequent impacts on healthcare access while accounting for shifts in national public policies. The specific variables, their operational metrics, abbreviations, and theoretically hypothesized signs are systematically outlined in Table 1.

Table (01): Presentation of Variables and Expected Signs

Variables	Measure / Indicator	Abbreviation	Expected Sign
Inflation	Annual inflation rate (%)	INF	(-)
GDP per Capita	Real GDP per capita	GDPC	(+)
Physicians per 1,000 inhabitants	Medical density (physicians / 1,000 inhabitants)	DOC	(+)
School Enrollment Level	Secondary school gross enrollment rate (%)	SSE	(+)
Social Security Share in Total Health Expenditure	% of total health expenditure financed by social security	SSS	(+)

Source: by the author.

III.3 Definition and Justification of Variables

III.3.1 Dependent Variable

The dependent variable in this empirical framework is health expenditure per capita, expressed in constant dollars. This metric serves as a reliable quantitative proxy for healthcare access, as elevated expenditure levels typically reflect enhanced availability and institutional utilization of medical services. This operational choice is robustly supported by the established literature, which widely regards per capita health expenditure as a resilient, albeit indirect, indicator of healthcare accessibility (Mills & al, 2012).

III.3.2 Explanatory Variables

The explanatory framework incorporates a set of macroeconomic, demographic, and institutional determinants. Specifically, Inflation (INF), quantified via the Consumer Price Index (CPI), is hypothesized to constrain healthcare access by diminishing household purchasing power. Conversely, GDP

per capita (GDPC) encapsulates the aggregate income level, whereby higher economic prosperity systematically facilitates greater access to health services (Bloom, Canning, & Sevilla, 2004).

The supply-side capacity of the healthcare sector is captured by the number of physicians per 1,000 inhabitants (DOC), representing medical density where an expansion in medical personnel is expected to improve healthcare delivery. Furthermore, the school enrollment rate (SSE) is utilized to capture broader social and administrative development, under the premise that higher human capital and educational attainment facilitate institutional navigation and access to healthcare services. Finally, the share of social security in total health expenditure (SSS) measures the depth of public financing mechanisms; a more robust institutional contribution is hypothesized to alleviate the financial burden on households, thereby mitigating the adverse impacts of inflationary shocks on healthcare access. Structurally, all variables were selected based on their profound theoretical relevance and empirical validity, as extensively documented in modern macroeconomic literature (Mills & al, 2012).

III.4 Empirical Procedure

The econometric estimation proceeds systematically through several sequential stages to ensure analytical rigorousness. In the first stage, stationarity properties are verified using the Augmented Dickey-Fuller (ADF) unit root test applied to each individual time series to ascertain their respective integration orders, wherein a series is deemed stationary if the test statistic is statistically significant at the 5% level. Upon establishing that no variable is integrated of order I(2), the second stage implements the (Pesaran, Shin, & Smith, 2001). bounds testing approach to cointegration to assess the existence of a stable, long-run equilibrium relationship among the variables. Cointegration is formally confirmed if the computed F-statistic exceeds the upper critical bound. Following the validation of a long-run cointegrating relationship, the third stage involves the estimation of the Autoregressive Distributed Lag (ARDL) model to extract the long-run coefficients, simultaneously estimating the Error Correction Model (ECM) to evaluate short-run dynamic adjustments and the speed of convergence. Finally, the structural validity and econometric reliability of the estimated model are rigorously evaluated using a comprehensive suite of diagnostic and robustness checks. These include the Breusch-Godfrey test for serial correlation, the White test for heteroskedasticity, the Jarque-Bera test for residual normality, and the Cumulative Sum (CUSUM) and Cumulative Sum of Squares (CUSUMSQ) tests to verify parameter stability over time. This sequential

methodology collectively guarantees the robustness and reliability of the final empirical findings.

IV. Results and Discussion

This section is dedicated to the presentation and analysis of the empirical results derived from the estimation of the ARDL model applied to the study of the effects of inflation on healthcare access in Algeria. It aims to examine the short- and long-term relationships between the selected variables while assessing the robustness and validity of the estimated model.

IV.1 Stationarity Test

Variable stationarity is rigorously examined using the Augmented Dickey-Fuller (ADF) unit root test, which allows for the detection of a unit root within the time series. This evaluation constitutes an indispensable preliminary step in advanced econometric modeling. The empirical results of the ADF test indicate that all investigated variables are non-stationary in their levels but become stationary in first differences, with associated probability values falling well below the 5% statistical significance threshold. Consequently, the series are integrated of order one, denoted as I(1). Crucially, the confirmed absence of variables integrated of order two, I(2), robustly justifies the application of the Autoregressive Distributed Lag (ARDL) model and the bounds testing approach to cointegration as highly appropriate frameworks for this study.

Table (02): ADF Unit Root Test for Stationarity

	AtLevel		First difference		Order of Integration
	T-Statistic	Prob	T-Statistic	Prob	
LHEPC	-1.410497	0.8391	-5.282087	0.0000	I(1)
LSSE	-3.155558	0.1113	-3.903226	0.0236	I(1)
LINF	-2.528407	0.3134	-7.867619	0.0000	I(1)
LDOC	-1.696481	0.7295	-12.58824	0.0000	I(1)
LGDPC	-1.602805	0.7701	-3.475759	0.0011	I(1)
LSSS	-2.802675	0.2063	-6.717078	0.0000	I(1)

Source: Authors' estimations via EViews 9.

IV.2 Cointegration Testing and ARDL Model Estimation

To examine the existence of a long-term equilibrium relationship between inflation and healthcare access, a formal cointegration analysis was conducted. This pivotal step determines whether the investigated macroeconomic variables move together toward a stable, long-run equilibrium before proceeding with the structural ARDL model estimation.

IV.2.1. Cointegration Test

The analysis of the long-run and short-run dynamics between inflation and healthcare access in Algeria is grounded in the ARDL bounds testing approach. This framework allows for the simultaneous estimation of short- and long-term effects, even when the underlying variables exhibit different mixed orders of integration, specifically $I(0)$ and $I(1)$. Prior to performing any model estimation, it is methodologically essential to verify the existence of a long-term cointegrating relationship among the variables, which is formally tested using the bounds testing approach to cointegration.

Table (03): Bounds Test for Cointegration

Signification	I0 Bound	I1 Bound
10%	2.26	3.35
5%	2.62	3.79
2.5%	2.96	4.18
1%	3.41	4.68
F-Statistique	4.850405	

Source: Authors' estimations via EViews 9.

The empirical results of the ARDL bounds test indicate that the computed F-statistic ($F = 4.85$) exceeds the upper critical bound $I(1)$ at both the 5% (3.79) and 2.5% (4.18) significance levels, and strictly equals the critical value at the 1% significance level (4.85). Consequently, the null hypothesis of no long-run relationship is robustly rejected. These findings confirm the existence of a stable, long-term cointegrating relationship among the model variables, thereby justifying the subsequent estimation of both the long- and short-term ARDL frameworks.

IV.2.2. ARDL Model Estimation

Once the cointegrating relationship is formally established, the analytical procedure shifts to estimating the empirical ARDL model. The selection of the optimal lag structure and model specification is fundamentally based on the Akaike Information Criterion (AIC), which determines the appropriate number of lags for each variable to systematically balance goodness-of-fit with parametric parsimony.

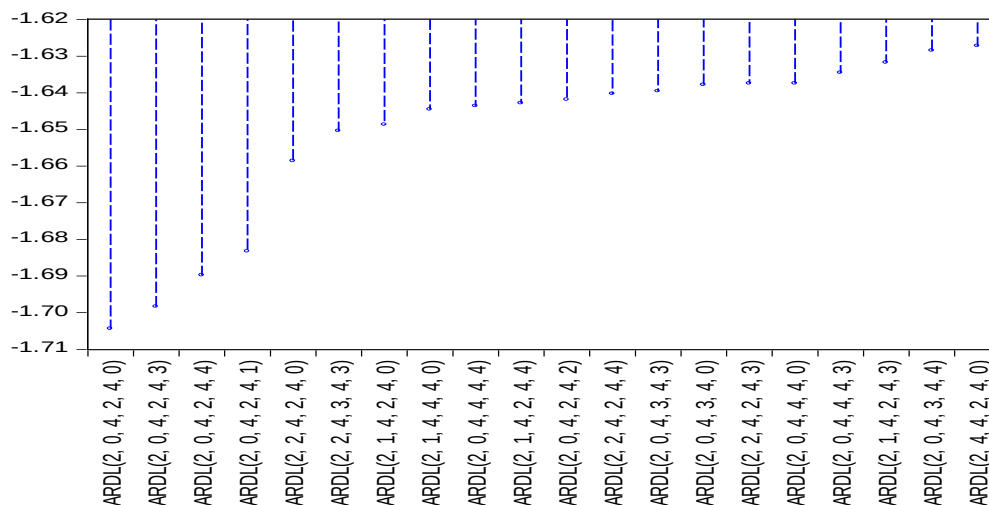
Table (04): Estimation and Selection of the Optimal Parameter ARDL Model (2, 0, 4, 2, 4, 0)

Variables	Coefficients	Std.Error	T-Statistic	Prob
LHEPC(-1)	0.071730	0.255799	0.280417	0.7839
LHEPC(-2)	-0.403698	0.184163	-2.192071	0.0488
LINF	-0.052900	0.027856	-1.900000	0.0578
LDOC	0.488594	0.264904	1.844414	0.0899
LDOC(-1)	0.943182	0.337869	2.791564	0.0163
LDOC(-2)	0.963537	0.336886	2.860126	0.0144
LDOC(-3)	1.982626	0.482633	4.107935	0.0015
LDOC(-4)	1.726808	0.691464	2.497321	0.0281
LGDPC	1.120435	1.822598	0.614746	0.5502
LGDPC(-1)	1.974390	2.280251	0.865865	0.4035
LGDPC(-2)	3.778347	1.370777	2.756355	0.0174
LSSS	0.463281	0.171626	2.699374	0.0193
LSSS(-1)	-0.475272	0.281188	-1.690225	0.1168
LSSS(-2)	-1.186235	0.370621	-3.200663	0.0076
LSSS(-3)	-0.289198	0.317035	-0.912195	0.3796
LSSS(-4)	-0.833656	0.268920	-3.100009	0.0092
LSSE	2.231950	0.515899	4.326334	0.1010
C	-32.98110	12.89195	-2.558272	0.0251
R ² = 0.99=):(FStatistic=89.30335;Prob=0.000001;DW=2.37				

Source: Authors' estimations via EViews 9.

The results of the ARDL model estimation demonstrate an excellent fit ($R^2 = 0.99$, adjusted $R^2 = 0.98$), indicating that the explanatory variables account for a vast majority of the variance in health expenditure per capita. This reflects a high goodness-of-fit for the estimated model.

Fig.(01): Akaike Information Criterion (AIC)
Akaike Information Criteria (top 20 models)



Source: Authors' estimations via EViews 9.

The evaluation of the various ARDL specifications using the Akaike Information Criterion leads to the selection of the ARDL (2, 0, 4, 2, 4, 0) model, as it presents the lowest AIC value. This selection reflects a superior statistical fit compared to alternative candidate models while systematically avoiding excessive parametric complexity. Consequently, this optimal configuration is deemed the most appropriate framework for examining the short- and long-term dynamic relationships among the model variables.

IV.3 Short- and Long-Term Dynamics of Inflation on Healthcare Access

In the following section, we analyze the short- and long-term relationships between inflation and healthcare access using the ARDL econometric framework. This modeling approach allows for the simultaneous identification of the transitory effects of inflation on access to health services as well as its structural, long-term impact, by explicitly highlighting the dynamic adjustments toward the long-run economic equilibrium.

IV.3.1. Long-Term Dynamics of the Impact of Inflation on Healthcare Access

In this subsection, we present the analysis of the long-term relationship between inflation and healthcare access, highlighting the lasting impact of inflation on the population's capacity to access health services.

Table (05): The Long-Run Relationship

Variables	Coefficients	Std.Error	T-Statistic	Prob
LINF	-0.042594	0.017400	-2.45373	0.0144
LDOC	4.583253	0.374293	12.245091	0.0000
LGDP	5.160163	0.819176	6.299208	0.0000
LSSS	2.438228	0.499046	4.885779	0.0004
LSSE	0.260001	0.182175	1.440001	0.1500
C	-24.761183	7.750650	-3.194723	0.0077

Cointeq=LHEPC- (-0.042594*LINF+4.5833*LDOC+5.1602*LGDP-2.4382*LSSS-1.6757*LSSE-24.7612)

Source: Authors' estimations via EViews 9.

The empirical estimation of the long-run relationship highlights the existence of a structural link between inflation and healthcare access, while underscores the decisive role played by broader economic and social determinants. Specifically, the long-run coefficient associated with inflation (INF) is negative and statistically relevant, indicating that a 1% increase in the general price level tends to reduce healthcare access by 0.04% in the long run. These findings are highly consistent with localized empirical studies conducted in developing countries, notably those of (Shah, Khan, & Ali, 2023),(Shovo,

2025), and (Isbal & Khan, 2025), which collectively demonstrate that rising prices force households to make critical budgetary trade-offs to the detriment of health expenditures. Furthermore, they align with the macroeconomic panel analyses of (Khan, Zahir, & Saleem, 2026), which reveal a significant and persistent adverse effect of inflation on both health spending and healthcare accessibility. This crucial observation highlights that the inflationary pressures observed in recent years are partly linked to a heavy structural reliance on imports, particularly for pharmaceutical products and medical equipment. This dependency directly exposes the national healthcare sector to fluctuations in international prices and substantially contributes to the erosion of household purchasing power.

Regarding structural variables, these play a determining role in healthcare access. The number of physicians per 1,000 inhabitants constitutes a key factor: a 1% increase in the number of physicians significantly improves long-run healthcare access by 4.58%. This result emphasizes that the medical supply is a major structural determinant of health accessibility. This situation reflects a well-known reality of the Algerian healthcare system: the unequal distribution of physicians between urban and rural areas. While major cities benefit from a relatively abundant medical supply, the inland and Southern regions suffer from a significant deficit in healthcare personnel. Thus, improving access to care requires not only increasing the number of doctors but also ensuring a better territorial distribution and implementing incentive policies for practitioners to settle in underserved areas.

Similarly, Gross Domestic Product (GDPC) per capita shows a positive and statistically significant coefficient, confirming that economic growth promotes improved access to care through rising household incomes and the strengthening of public financing capacities. A 1% increase in GDP per capita translates into a 5.16% increase in household health expenditures, reflecting high income elasticity. This result is consistent with the work of Zhou et al. (2020), which shows that economic growth improves health spending and, indirectly, the accessibility of medical services. This analysis shows that healthcare expenditures in Algeria are highly dependent on the economic climate: they increase during periods of hydrocarbon-led growth and decrease during slowdowns, which affects the quality of and access to care.

Social protection (SSS) also emerges as a significant factor. The estimation indicates that a 1% increase in social coverage improves long-run access to care by 2.43%. These findings confirm the central role of social protection systems in reducing financial barriers and advancing toward universal health coverage. This finding is consistent with the structure of the healthcare system in Algeria,

characterized by relatively broad coverage through social security and free care within the public sector. However, despite this coverage, inequalities persist due to variable service quality, long waiting times, and the increasing recourse to the private sector. This suggests that social coverage, while essential, must be accompanied by improvements in the efficiency and quality of the healthcare system.

Finally, the level of education (SSE) presents a positive coefficient of 1.67, suggesting that a higher level of education favors healthcare access. However, its p-value (0.1500) shows that this relationship is not statistically significant at the 5% threshold. It is possible that education exerts an indirect effect on healthcare access, or that its influence is captured by other variables within the model. The absence of a direct effect can be explained by the fact that access to basic care in Algeria is relatively independent of educational attainment, thanks to public policies. However, education could play an important indirect role, notably through better prevention, more effective utilization of health services, and greater awareness of health behaviors. Its effect might therefore be captured by other variables such as income or social coverage.

IV.3.2. Short-run dynamics of the impact of inflation on healthcare access

Once the long-run relationships have been established, attention now turns to the examination of short-run effects.

Table (06): The Short-Run Relationship

Variables	Coefficients	Std.Error	T-Statistic	Prob
D(LGDPC(-1))	0.403698	0.184163	2.192071	0.0488
D(LINF)	-0.052900	0.027856	-1.900000	0.0578
D(LDOC)	0.488594	0.264904	1.844414	0.0899
D(LDOC(-1))	-0.963537	0.336886	-2.860126	0.0144
D(LDOC(-2))	-1.982626	0.482633	-4.107935	0.0015
D(LDOC(-3))	-1.726808	0.691464	-2.497321	0.0281
D(LGDPC)	1.120435	1.822598	0.614746	0.5502
D(LGDPC(-1))	-3.778347	1.370777	-2.756355	0.0174
D(LSSS)	0.463281	0.171626	2.699374	0.0193
D(LSSS(-1))	-1.186235	0.370621	-3.200663	0.0076
D(LSSSS(-2))	-0.289198	0.317035	-0.912195	0.3796
D(LSS(-3))	-0.833656	0.268920	-3.100009	0.0092
D(LSSE)	2.231950	0.515899	4.326334	0.0010
CointEq(-1)	-1.331968	0.282391	-4.716748	0.0005

Source: Authors' estimations via EViews 9.

The short-run results confirm the existence of an adjustment mechanism toward the long-run equilibrium. The coefficient of the error correction term (CointEq(-1)) is negative and highly significant (-1.331968; $p = 0.0005$), indicating a rapid speed of adjustment following a cyclical shock.

In the short run, the variation in inflation (INF) exerts a negative effect on healthcare access, but this effect is not statistically significant. Thus, inflationary fluctuations do not significantly affect healthcare accessibility in the immediate term. Conversely, certain variables present significant effects. This lack of effect is explained notably by the cushioning role of public policies in Algeria. Indeed, state funding for a large share of healthcare expenditures, the regulation of prices for medical services and medications, and social coverage mechanisms limit the immediate transmission of price increases to households. Consequently, the impact of inflation on healthcare accessibility tends to manifest more in the long term through the progressive erosion of real income and the constraints weighing on the healthcare system.

Social protection (SSS) positively influences healthcare access in the short run, although certain lags indicate corrective effects. The level of education shows a positive and highly significant impact, underscoring its decisive role in the immediate improvement of access to health services.

Overall, the results demonstrate that structural factors, particularly education and social protection, play a more significant role than inflation in the short-run dynamics of healthcare access.

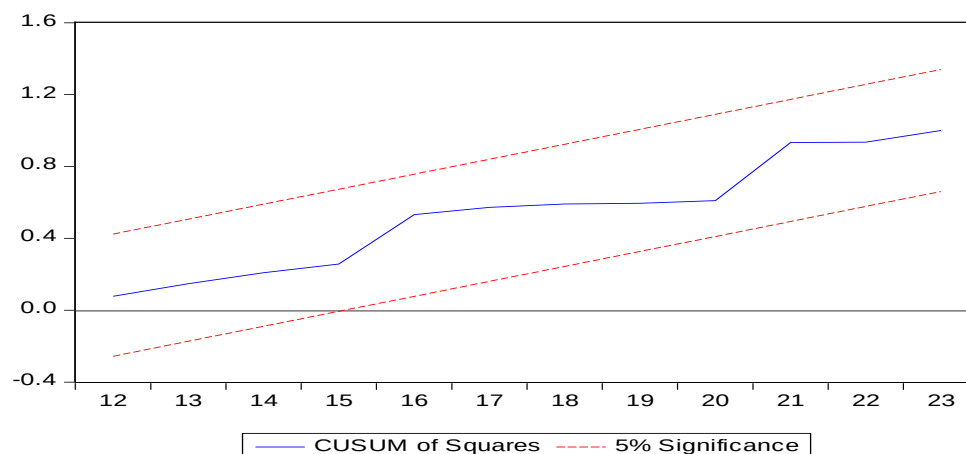
V.Stability and Robustness of the ARDL Model

This section examines the stability and robustness of the ARDL model to verify the reliability of the estimations and the consistency of the long-run relationships.

V.1 Stability of the ARDL Model

Prior to verifying the stability of the ARDL model, we apply the CUSUM and CUSUMSQ tests to examine the stability of the model parameters.

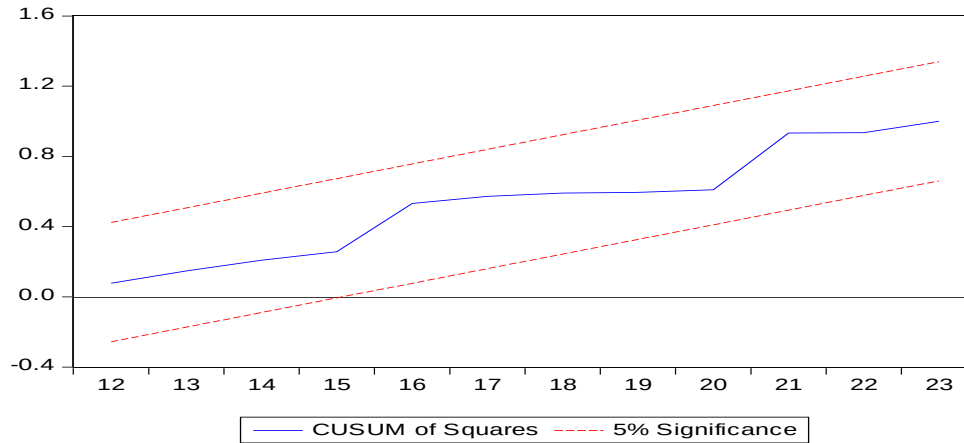
Fig. (02): Cumulative Sum of Recursive Residuals



Source: Authors' estimations via EViews 9.

The CUSUM and CUSUMSQ tests show that the curves remain within the 5% critical boundaries, indicating that the ARDL model is structurally stable over the study period and that no parameter instability is detected.

Fig.(03): Cumulative Sum of Squares of Recursive Residuals



Source: Authors' estimations via EViews 9.

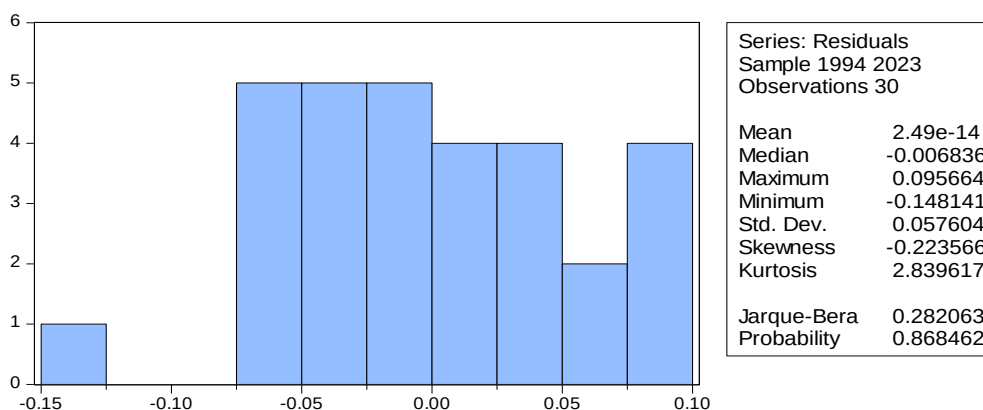
V.2 Robustness of the ARDL Model

The robustness of the model is verified through standard diagnostic tests. The tests for serial correlation (Breusch-Godfrey), heteroskedasticity (White), and the normality of residuals (Jarque-Bera) confirm that the classical assumptions of the model are met. These results attest to the econometric solidity of the ARDL model and the reliability of the conclusions regarding the impact of inflation on healthcare access in Algeria.

V.2.1. Normality Test of Residuals

The residual normality test is used to verify whether the model's errors follow a normal distribution. This condition is important to ensure the validity of the statistical tests.

Fig.(04): Normality Test of Residuals



Source: Authors' estimations via EViews 9.

The histogram and statistics show that the residuals are symmetrical and closely follow a normal distribution. The Jarque-Bera test ($p = 0.87$) confirms that the null hypothesis of normality is not rejected, indicating that the model's assumptions are satisfied.

V.2.2. Serial Correlation Test of the Errors

The error serial correlation test aims to verify the independence of the residuals in the estimated model. The absence of serial correlation ensures the validity of the estimations and the reliability of the statistical tests.

Table (07): Serial Correlation Test of the Errors

F-statistic	2.161733	Prob. F(4,8)	0.1642
Obs*R-squared	15.58293	Prob. Chi-Square(4)	0.0636

Source: Authors' estimations via EViews 9.

The serial correlation test (Breusch-Godfrey) reveals no evidence of serial correlation in the residuals at the 5% threshold. Indeed, the probabilities associated with the F-statistic (0.1642) and the Obs*R² statistic (0.0636) are greater than 0.05. Thus, the null hypothesis of no serial correlation is not rejected. The model, therefore, appears to be correctly specified regarding the independence of the errors.

V.2.3. Breusch-Pagan-Godfrey Test

To check for the presence of heteroscedasticity, the Breusch-Pagan-Godfrey test is employed. It ensures that the variance of the errors remains constant.

Table (08): Breusch-Pagan-Godfrey Test

F-statistic	0.901619	Prob. F(17,12)	0.5880
Obs*R-squared	16.82647	Prob. Chi-Square(17)	0.4662
Scaled explained SS	2.476341	Prob. Chi-Square(17)	1.0000

Source: Authors' estimations via EViews 9.

The Breusch-Pagan-Godfrey test, conducted to detect the presence of heteroscedasticity in the model, indicates non-significant statistics (p -values of 0.5880 and 0.4662). Consequently, the null hypothesis of homoscedasticity is not rejected, confirming the constancy of error variance.

VI. Conclusion

The objective of this article was to study the effects of inflation on healthcare access in Algeria by employing an ARDL (Autoregressive Distributed Lag) econometric approach, which allows for the simultaneous analysis of short- and long-term dynamics between macroeconomic variables and healthcare access indicators. This methodology proved particularly suitable for the context under study, given the differing stationarity properties of the time series and the necessity of identifying a long-run equilibrium relationship.

The empirical results obtained clearly demonstrate the existence of a statistically significant relationship between inflation and access to care. In the short term, the findings do not reveal a statistically significant relationship between inflation and access to care. This lack of significance suggests that cyclical price fluctuations do not immediately affect the accessibility of healthcare services. However, in the long term, the results confirm that persistent inflationary pressures exert a negative and lasting effect on the financial accessibility of care. This deterioration is primarily explained by the erosion of household purchasing power, the increase in out-of-pocket health expenditures, and the rise in indirect costs associated with accessing health services, such as transportation, the unavailability of certain medications, or the forced recourse to the private sector.

These results highlight the structural nature of the relationship between inflation and access to care within the Algerian context. Despite the existence of a healthcare system with a strong public component, intended to guarantee a certain equity of access, several constraints limit its actual effectiveness. The saturation of public infrastructure, deficiencies in service quality, and the unequal availability of medicines lead a growing portion of the population to turn toward the private sector, which is generally more costly. In this context, inflation acts as an aggravating factor, accentuating inequalities in access to care, particularly for low- and middle-income households, who are more exposed to budgetary trade-offs unfavorable to healthcare consumption.

Thus, inflation cannot be understood solely as a macroeconomic phenomenon; it must also be considered a major determinant of public health. Price stability therefore appears to be an essential condition for guaranteeing equitable and sustainable access to health services. It constitutes a fundamental lever for preserving household purchasing power and limiting financial barriers to accessing care.

Consequently, price stability should not be viewed only as a macroeconomic objective, but must also be considered a fundamental pillar of public health policy. In this regard, several recommendations can be formulated:

- First, it is necessary to strengthen macroeconomic stabilization through better coordination with the Bank of Algeria, as well as the implementation of specific monitoring of inflation within the healthcare sector.
- Second, the financial protection of households must be improved, notably by strengthening the coverage mechanisms provided by the National Social Insurance Fund, reducing out-of-pocket expenses, and facilitating access to reimbursements.
- Third, stricter regulation of the pharmaceutical market is indispensable, including price controls, support for national production (notably through Soidal), and the fight against shortages.

Ultimately, this study highlights the structural nature of the relationship between inflation and access to care in Algeria. It emphasizes the need for an integrated approach, articulating macroeconomic and health policies, in order to guarantee equitable, sustainable, and resilient access to health services in a context of persistent inflationary pressures.

VII. References:

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