

A Prospective Study to Estimate the Health Needs of the Population of the Wilaya of Setif Between 2019 and 2054 Based on Spectrum Demographic Software

Dr.Rajâa KHECHEKHOUCHE^{*1}

Department of Sociology and Demography, University of Setif 2, Setif, Algeria.

E-mail: Khechekhouche.radja@gmail.com

Karima FOUDAD²

Department of Sociology and Demography, Class A Lecturer, University of Setif 2, Setif, Algeria.

E-mail: K.foudad@univ-setif2.dz

Received: 25/04/2025,

Accepted: 17/01/2026,

Published: 05 /06/ 2026

ABSTRACT

Objectives: This study seeks to conduct future projections for the population of the wilaya of Setif in order to estimate their expected health requirements in terms of the number of doctors, nurses, health centers, hospitals, hospital beds and annual health expenditure. In this respect, determining the wilaya's population size is essential, therefore, three scenarios have been elaborated to review the demographic phenomena that govern future population growth using Spectrum demographic software, from the base-year 2019 to the projection year 2054.

Methods: This study adopted a quantitative foresight approach by employing a future foresight model to estimate anticipated health needs. Relevant demographic and health data were input into Spectrum demographic software, followed by the development of three foresight scenarios. The software enabled future projections of the population size in the Wilaya of Setif and the estimation of health needs through the horizon of the year 2054.

Results: The findings of the study, based on the three scenarios revealed an upward trend in the population size of the Wilaya of Setif by the year 2054. In parallel, the future projections indicated an increase in health care needs. Although the general trend was upward across all scenarios, the highest rates were recorded under the optimistic scenario, followed by the reference, and then the pessimistic scenario.

Conclusions: The quantitative estimates contribute to supporting future population and health planning, thereby enabling decision-makers to benefit from them effectively.

Keywords: Estimation; Needs; Health needs; Demographic Projection; Spectrum Demographic Software.

1- Introduction:

1-1- Background of the Study:

Development is a comprehensive process that seeks to bring prosperity and progress to a society by addressing all social, health, educational, economic and political sectors, based on clearly defined, time-bound interim targets. The health sector is a key pillar for any development process, given its

pivotal role in creating a healthy population that is capable of contributing effectively to driving progress in various realms, as advanced by the World Bank and the International Monetary Fund, which both underscore the importance of investing in human capital through health and education, the two prerequisites for achieving a balanced and sustainable development.

For any country to build a strong and efficient health sector, it should implement clear strategies and well-structured plans aimed at continuously improving this sector. In this vein, one of the contributing mechanisms is the accurate scientific estimation of future human and material health needs that allow for advance planning, which is the focus of this study.

1-2- Research problem:

Many scholars and academics are increasingly interested in scientific prospective studies, especially in light of rapid technological advancements that we are witnessing in various fields. In Algeria, similarly to other countries around the world, specialists and scientists are taking a considerable interest in this type of studies and directing their efforts towards the prospection of the future, particularly in critical sectors such as the health sector.

The objective of projecting future health needs is to raise the awareness of policymakers and officials of the importance of advance planning and avoid stochastic decision-making by adopting clear, accurate and science-based health policies in addition to well-structured plans based on probable scenarios. This approach can contribute to improving public health indexes and elevating the health system to meet international standards. In light of the above, this study seeks to conduct demographic projections to estimate the health needs of the population of the wilaya of Setif from the base-year 2019 to the projection year 2054 and therefore, the research question of this study is the following:

“What are the future health needs of the population of the wilaya of Setif by 2054?”

From the above-mentioned research question, the following sub-questions are formulated:

- What is the projection of the population of the wilaya of Setif in the period between 2019 and 2054?
- What is the projection of the number of doctors and nurses in the wilaya of Setif in the period between 2019 and 2054?
- What is the projection of the number of health centers, hospitals, hospital beds and the annual health expenditure (in DZD) in the wilaya of Setif in the period between 2019 and 2054?

1-3- Study aims:

This study has a set of objectives, including:

- Projecting the population of the wilaya of Setif in the period between 2019 and 2054 using the DemProj module of Spectrum demographic software to provide accurate data that contributes to the planning and determination of the future health needs of the wilaya of Setif;
- Projecting the health needs of the wilaya of Setif in the period between 2019 and 2054, including the number of doctors, nurses, hospitals, hospital beds and the required annual health expenditure, using the RAPID module of Spectrum demographic software, in order to achieve overall health coverage for the inhabitants of the wilaya of Setif in the future;
- Highlighting the vital and effective role of demographic data, particularly those disaggregated by age and gender in preparing projections;

- Contributing to support policymakers and high authorities in Algeria in general and Setif in particular in establishing plans and strategies to upgrade the population's health to a level that enables them to contribute effectively to achieving health development and by extension, achieve development in all sectors.

1-4- Importance of the study:

It is vitally relevant to adopt an accurate and scientific approach to address the projection of the health needs of the population of the wilaya of Setif in the period between 2019 and 2054, based on the shifting demographic phenomena using Spectrum demographic software. The study findings provide an important basis that can be referred to by the government in the process of structured, science-based policy making and advance planning, which reinforces its ability to efficiently meet the future health needs of the wilaya of Setif.

1-5- Study Terminology:

In order to avoid any confusion or ambiguity related to the subject of study, the key concepts must be elucidated to ensure comprehensive coverage of the various aspects of the study. Some of the key concepts of the study are the following:

- **Needs:**

It refers to what is required by something to address a deficiency or to compensate for a shortcoming. (Mario, 1983, p. 637)

According to Michael Mann, needs refer to a condition or an incident that puts the individual in a difficult situation or distress which makes him feel in desperate need or desire for basic necessities (Al-Hayis, 2015, p. 12), such as food, drink, clothing, education and health which ensures one's survival.

Whereas for Robert L. Barker, as mentioned in The Social Work Dictionary, needs are the social, cultural, economic, psychological and material needs, necessary for survival, well-being and achievement (Al-Hayis, 2015, p. 12). In this definition, Robert L. Barker advances that after fulfillment of basic needs, the individual gradually shifts towards luxuries to achieve a level of well-being that transcends living in survival mode.

- **Health needs:**

Before reviewing the concept of health needs, it is elementary to first address the concept of health:

Health is defined in the Larousse Medical dictionary as "a state of proper functioning of the organism". (Larousse Medicales, 2000, p. 917)

As defined by the sociologist Newman, health is a state of relative balance of the body functions; this state of balance is the aftermath of the body's adaptation to the harmful elements to which it is exposed. (Bawaneh, 2004, p. 27)

According to the World Health Organization (WHO), health is a vital and integral aspect of daily life and a core dimension of the quality of life. Accordingly, health is a resource that enables individuals to manage and change the course of their lives. (Oscarson, 2006, p. 5)

Health needs:

Health needs refer to the collection of supplies and services that are necessary for different social

groups to maintain good health and prevent, diagnose as well as treat diseases. This guarantees a decent quality of life to individuals in accordance with recognized national and international health standards. The latter consist of both human needs, such as doctors and nurses and material needs, such as hospitals and health centers.

- **Needs assessment:**

Assessing needs is a systematic process used to assess human needs in a certain area and explore community-related issues, with the aim of using its findings in improving the processes of policy and decision-making for community planning. (Al-Hayis, 2015, p. 19)

- **Population projections:**

Population projections refer to future population census, that is to say projecting the future population according to a set of scenarios, based on predicted future shifts in fertility, death and migration rates. We count a number of statistical methods to conduct population projections. (Al-Kharif, 2010, p. 26)

These projections are used to calculate future needs and ensure their fulfillment as it is highly unlikely to meet the population needs in terms of food, goods and services as well as implement the various development programs without knowing the population's future number and distribution. (Atal, 2019, p. 73)

2- Methodology and Research Tools:

2-1- Temporal and Spatial Scope:

The temporal scope of the study extends between 2019 and 2054. The spatial scope of the study is limited to the wilaya of Setif. The study area lies between longitudes 5.04 and 6.26 east of the Greenwich meridian and Latitudes 34.76 and 36.26 north of the Equator. Geographically, Setif is located 330 km southeast of the capital Algiers; it is spread out over 6549.64 km², equivalent to 1.7% of the Eastern Plateaus and 0.27% of the overall surface area of the country. The administrative borders of the wilaya are defined by Law No 84-09 of February 1984 related to the territorial reorganization of Algeria. To the north, the study area is bordered by the wilayas of Jijel and Bejaia, to the east by Mila, to the west by the wilaya of Bordj Bou Arreridj and to the south, by the wilayas of Batna and M'sila. The aforementioned law also names the sixty (60) municipalities and twenty (20) administrative divisions of the wilaya as shown in the map below: (Directorate of Programming and Budget Monitoring, 2019, pp. 12-13)

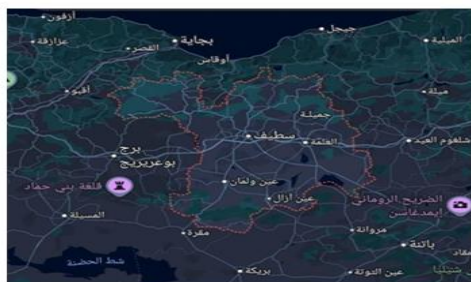


Figure (01): The Administrative Map of the Wilaya of Setif
Source: prepared by us using Google Maps

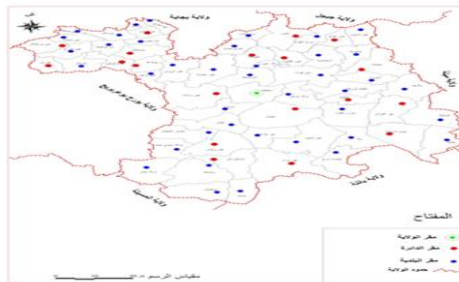


Figure (02): Map of the Administrative Division of the Wilaya of Setif

Source: Directorate of Programming and Budget
Monitoring of the wilaya of Setif

2-2- Data Sources:

Given the importance of using reliable sources in scientific research, this study refers to the annual statistical reports on the period between 2001 and 2019, issued by the Directorate of Programming and Budget Monitoring of the wilaya of Setif.

The reports include data related to the distribution of the population of Setif by age group and sex, in addition to the distribution of both material and human resources in the public and private sectors.

The data related to the human resources include the number of general and specialized physicians, dentists and nurses.

Whereas the data related to the material resources include the number of health facilities, including hospitals, health centers, therapy halls and maternity homes.

2-3- Study Method:

We adopted the quantitative foresight approach in this research, as it is the most suitable for the nature of the topic. This approach is defined as a set of quantitative methods and techniques used by specialists to analyze current data and explore future trends in order to anticipate potential transformations based on multiple future scenarios. These methods are characterized by their accuracy and clarity, particularly when employing mathematical models or specialized software. However, their primary objective is not to test hypotheses in the traditional sense, but rather to provide well-considered options that support decision-making and future planning. (Chabaki, 2020, p. 31)

2-4- Research tool:

This study uses Spectrum demographic software as a indirect estimation method to conduct projections with the aim of estimating the future health needs of the population of the wilaya of Setif and working on their fulfillment. This objective can only be attained through population projection according to science-bound scenarios that are based on a sequence of past and future events which are highly likely to occur. These projections can be used by officials in the process of planning for the improvement and development of the health sector so as to avoid problems and crises that may occur in the future.

2-4-1 Description of the Spectrum demographic software:

Spectrum is a desktop software, developed to conduct population projections on countries and regions, which consists of the following modules: (Avenir Health, s.d).

- DemProj: projects the population for an entire country or region by age and sex, based on assumptions about fertility, mortality and migration. A full set of demographic indicators can be displayed for up to 50 years in the future. It can also be used in preparing urban and rural projections
- The Companion model EasyProj provides the data needed to conduct a population projection based on the estimates issued by the United Nations Population Division.
- RAPID: projects the social and economic consequences of high fertility and rapid population growth for such sectors as labor, education, health, urbanization and agriculture. This program is used to raise the awareness of policy makers of the importance of fertility and population growth as factors in social and economic development.

- FamPlan: projects family planning requirements needed to achieve national goals for addressing unmet needs or achieving desired fertility. It can be used to set realistic goals, to plan for the service expansion required to meet program objectives and to evaluate alternative methods of achieving goals. The program uses assumptions about the approximate determinants of fertility and the characteristics of the family planning program to evaluate the cost and number of users.
- Lives Saved Tool: indicates change in child survival rate, according to the changes in the coverage of various child health interventions.
- AIM: projects the consequences of the HIV epidemic, including the number of people living with HIV, new infections, HIV deaths by age and sex, as well as new cases of tuberculosis. It is used by UNAIDS to prepare national and regional estimates that are issued every two years.
- GOALS: it helps efforts to respond to the HIV/AIDS epidemic by showing how the amount and allocation of funding are related to the achievement of national goals, such as reduction of HIV prevalence and expansion of care and support.
- TIME: is a set of tuberculosis-specific analytical tools used for the epidemiological, impact and cost-effectiveness analysis and other rational steps of strategic tuberculosis policy and program design.
- NCD: estimates non-communicable diseases and the potential impact of interventions on non-communicable diseases such as cardiovascular disease, diabetes and cancer, in addition to mental health, substance abuse and neurological disorders.

2-4-2 Timeframe of the Demographic Projection:

In this study, the demographic projection was conducted covering a time period of 35 years, starting from the base year 2019 to the projection year 2054, using Spectrum demographic software.

2-4-3 Data required in Spectrum demographic software:

2-4-3-1/ demographic indicators: these indicators must be related to the base year 2019 and include: Age and gender structure of the population of the wilaya of Setif.

Life expectancy at birth for both sexes.

The Overall fertility index (OFI).

2-4-3-2 health indicators, which include:

Population per doctor;

Population per nurse;

Population per health center;

Population per hospital;

Population per hospital bed;

Annual health expenditure per capita (DZD).

2-4-4 Scenarios (hypotheses):

This study is based on three scenarios (hypotheses) for the variability of demographic phenomena, namely fertility, mortality and migration, starting from the base year 2019 to the projection year 2054. The study is also based on one hypothesis concerning data related to health indicators in all scenarios. The hypotheses are as follows:

2-4-4-1 Hypotheses related to demographic phenomena:

Fertility:

In dealing with fertility, Spectrum demographic software used the overall fertility index (OFI). Three cases are hypothesized as follows:

- Increase in fertility rate in the optimistic scenario: this increase is based on the fact that the overall fertility index increased from 2.5 children born per woman in 2001 to 3 children born per woman in 2019, an increase rate of 0.5 children over the span of 18 years. Since the projection timeframe covers a period of 35 years, we doubled the increase rate; therefore, the overall increase rate projected for the year 2054 is 4 children born per woman.
- Stability in fertility rate in the reference scenario, that is to say that the overall fertility index of the projection year is the same as in the base year, 3 children born per woman.
- Decline in fertility rate in the pessimistic scenario: the decline is due to the fact that the overall fertility index is at the replacement rate, 2.10 children born per woman, as shown in the table below:

Table (01): Hypotheses Related to Fertility in Setif 2019-2054

Fertility	2019	2024	2029	2034	2039	2044	2049	2054
High fertility	3*	3,14	3,29	3,43	3,57	3,71	3,86	4
Stable fertility	3*	3	3	3	3	3	3	3
Low fertility	3*	2,87	2,74	2,61	2,49	2,36	2,23	2,1

Source: prepared by us based on the Spectrum demographic software
(National Office of Statistics, 2020, pp. 6-7-8)*

Mortality:

In dealing with mortality, Spectrum demographic software uses the life expectancy at birth index for both sexes. Based on the latter, we notice an increase for both sexes in the period between 2001 and 2019, although it is higher for females than for males. Therefore, the increase rate is unlikely to witness a stability or decline. For males, it increased from 71.9 years in 2001 to 76.6 years in 2019, with a difference of 4.7 years in 18 years. For females, it increased from 73.6 years in 2001 to 78.6 years in 2019, with a gap of 5 years in 18 years. Accordingly, we hypothesized an increase in the life expectancy at birth index; given the fact that the projection period extends over a period of 35 years, we doubled the lower difference for both sexes, therefore, the life expectancy at birth index of 2054 is 86 years for males and 88 years for females, as shown in the table below:

Table (02): Hypothesis Related to Mortality in Setif 2019-2054

Life expectancy at birth	2019	2024	2029	2034	2039	2044	2049	2054
Male	76,6*	77,9	79,3	80,6	82	83,3	84,7	86
Female	78,6*	79,9	81,3	82,6	84	85,3	86,7	88

Source: prepared by us based on the Spectrum demographic software

* DPBM

Migration:

Given the fact that no data was located in all scenarios loaded into the Spectrum demographic

software, we hypothesized that it is non-existent.

2-4-4-2: Hypothesis related to health indicators:

We elaborated one hypothesis related to health indicators with the aim of improving it in the future, starting from the base-year 2019 to the projection year 2054. We hypothesized that the compound annual growth rate (CAGR) for the improvement of these indicators is 1%, which is the objective of this study. Nonetheless, it should be taken into consideration that the annual growth rate is negative -1% for the following indicators: population per doctor, population per nurse, population per health center, population per hospital and population per hospital bed because lower growth rate for these indicators indicate fewer people per doctor, which translates into higher demand. Conversely, the annual growth rate is positive 1% for the annual health expenditure per capita because a higher health expenditure indicates greater investment in improving health needs, as shown in the table below:

Table (03): Hypothesis Related to Health Indicators in Setif 2019-2054

Health indicators	2019	2024	2029	2034	2039	2044	2049	2054
Population per doctor	1046*	1002	957	913	869	825	780	736*
Population per nurse	463*	443	424	404	385	365	346	326*
Population per health center	6193*	5931	5668	5406	5143	4881	4618	4356*
Population per hospital	176215 *	16875 0	16128 4	15381 9	14635 4	13888 9	13142 3	123958 *
Population per bed	722*	691	661	630	600	569	539	508*
Annual health expenditure per capita (DZD)	9180**	9726	10273	10819	11365	11911	12458	13004* *

Source: prepared by us based on the Spectrum demographic software

*Calculations done by us based on DPBM data

**Calculations done by us based on data retrieved from (General Secretariat of the Government, 2018, p. 29)

The overall scenarios are as follows:

- Optimistic scenario: hypothesis of high fertility + hypothesis of mortality + hypothesis of health indicators.
- Reference scenario: hypothesis of stable fertility + hypothesis of mortality + hypothesis of health indicators.
- Pessimistic scenario: hypothesis of low fertility + hypothesis of mortality + hypothesis of health indicators.

3- Findings and Discussion:

After loading the data into the Spectrum demographic software, we came to the following findings:

3-1- Population Projections:

3-1-1 Based on the optimistic scenario:

Table (04): Population Projection of the wilaya of Setif by age and sex for the year 2054 based on the optimistic scenario

Age groups sex	Males	Females
0-4 years	220 798	210 813
5-9 years	194 451	185 714
10-14 years	169 726	162 142
15-19 years	149 460	142 850
20-24 years	135 731	129 847
25-29 years	126 779	121 514
30-34 years	118 545	113 873
35-39 years	112 013	106 624
40-44 years	96 836	92 697
45-49 years	82 753	79 828
50-54 years	76 055	73 822
55-59 years	76 733	74 835
60-64 years	78 219	76 519
65-69 years	73 807	72 730
70-74 years	61 945	62 216
75-79 years	46 032	47 860
80+ years	53 621	58 692

Source: prepared by us based on the Spectrum demographic software

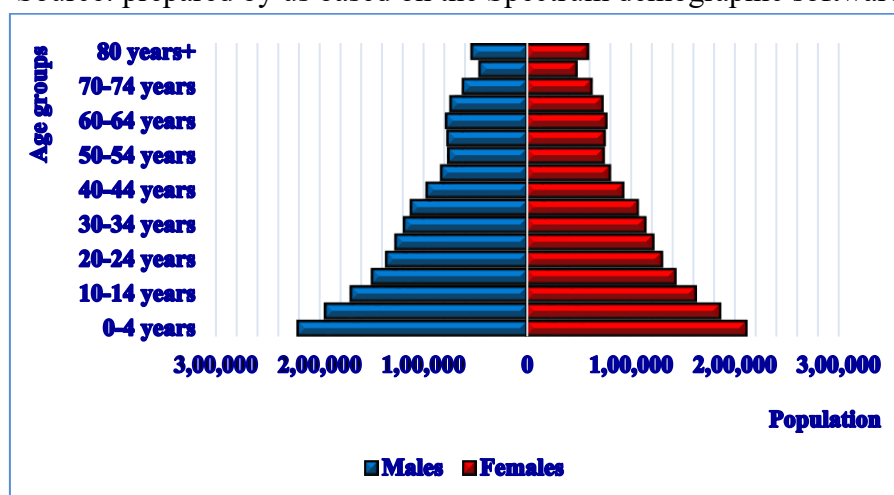


Figure (03): The Projected Population Pyramid for the wilaya of Setif in the year 2054 Based on the Optimistic Scenario

Source: Prepared by us using Excel Software

Figure (03) which illustrates the projected population pyramid for the wilaya of Setif for the year 2054 under the optimistic scenario, shows a broadening of the pyramid's base, indicating high fertility rates and continued population growth. This reflects a youthful society with a large labor force; however, it requires substantial investments in education, healthcare, and job creation to ensure the effective utilization of the growing human potential.

3-1-2 Based on the reference scenario:

Table (05): Population Projection for the wilaya of Setif by age and sex for the year 2054 based on the reference scenario.

Age groups sex	Males	Females
0-4 years	161 868	154 549
5-9 years	151 201	144 407
10-14 years	138 680	132 483
15-19 years	127 510	121 871
20-24 years	120 762	115 528
25-29 years	117 797	112 906
30-34 years	115 238	110 698
35-39 years	112 013	106 624
40-44 years	96 836	92 697
45-49 years	82 753	79 828
50-54 years	76 055	73 822
55-59 years	76 733	74 835
60-64 years	78 219	76 519
65-69 years	73 807	72 730
70-74 years	61 945	62 216
75-79 years	46 032	47 860
80+ years	53 621	58 692

Source: prepared by us based on the Spectrum demographic software

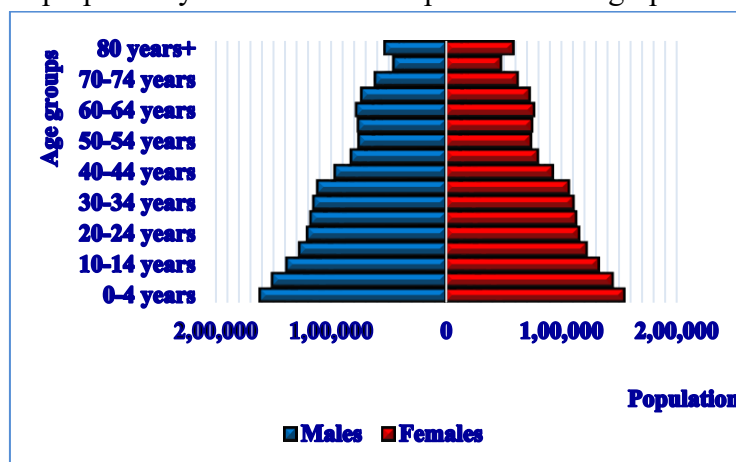


Figure (04): The Projected Population Pyramid for the wilaya of Setif in the year 2054 Based on the Reference Scenario

Source: Prepared by us using Excel Software

Figure (04) which presents the projected population pyramid for the wilaya of Setif for the year 2054 under the reference scenario, shows a relative balance among age groups, as fertility rates begin to decline moderately alongside an improvement in life expectancy. This indicates that the wilaya is entering a demographic transition phase that requires balanced policies to ensure social and economic sustainability.

3-1-3 Based on the pessimistic scenario:

Table (06): Population Projection for the Wilaya of Setif by Age and Sex for the Year 2054 Based on the Pessimistic Scenario.

Age groups sex	Males	Females
0-4 years	112 137	107 066
5-9 years	113 327	108 236
10-14 years	110 934	105 977
15-19 years	107 770	103 004
20-24 years	107 290	102 641
25-29 years	109 713	105 158
30-34 years	112 262	107 840
35-39 years	112 013	106 624
40-44 years	96 836	92 697
45-49 years	82 753	79 828
50-54 years	76 055	73 822
55-59 years	76 733	74 835
60-64 years	78 219	76 519
65-69 years	73 807	72 730
70-74 years	61 945	62 216
75-79 years	46 032	47 860
80+ years	53 621	58 692

Source: prepared by us based on the Spectrum demographic software

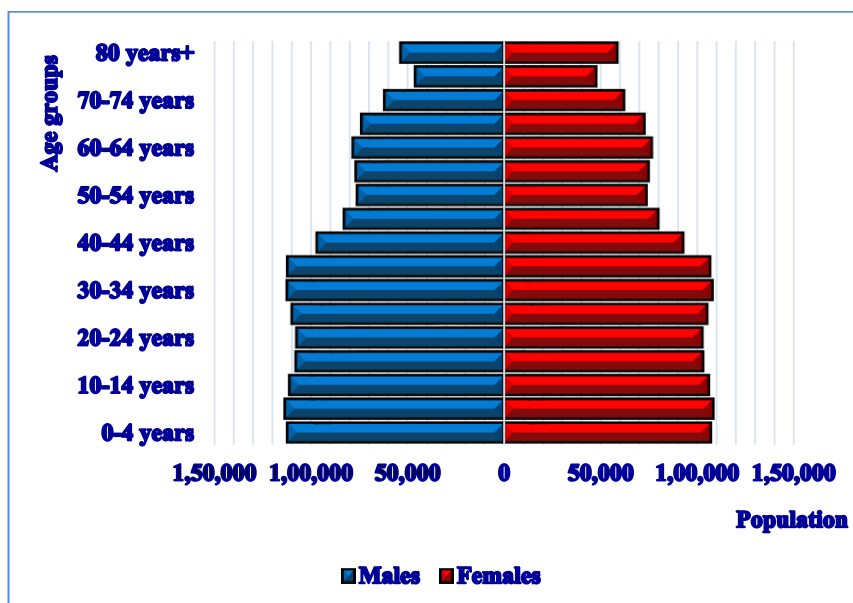


Figure (05): The Projected Population Pyramid for the wilaya of Setif in the year 2054 Based on the Pessimistic Scenario

Source: Prepared by us using Excel Software

Figure (05) which illustrates the projected population pyramid for the wilaya of Setif for the year 2054 under the pessimistic scenario, reveals a significant decline in the younger age groups and a gradual expansion in the elderly population. This reflects a sharp decrease in fertility rates and the onset of population aging. Such situation may lead to a shrinking labor market and increased pressure on healthcare and pension systems.

Based on these demographic projections, population and strategic planning must take into account the three scenarios in order to ensure the long-term sustainability of development in the wilaya of Setif.

3-2- Projection of the number of doctors:

Table (07): The Projected Number of Doctors Required in the Wilaya of Setif 2019-2054

Year	Optimistic scenario		Reference scenario		Pessimistic scenario	
	Population	Doctors required	Population	Doctors required	Population	Doctors required
2019	1 938 363	1 853	1 938 363	1 853	1 938 363	1 853
2024	2 136 823	2 133	2 130 269	2 127	2 124 370	2 121
2029	2 347 075	2 451	2 322 807	2 426	2 300 965	2 403
2034	2 569 085	2 813	2 515 404	2 755	2 467 091	2 702
2039	2 803 057	3 226	2 706 358	3 115	2 619 357	3 015
2044	3 060 336	3 711	2 902 907	3 521	2 761 633	3 349
2049	3 354 622	4 299	3 112 722	3 989	2 897 486	3 713
2054	3 686 082	5 008	3 329 336	4 524	3 017 193	4 099

Source: prepared by us based on the Spectrum demographic software

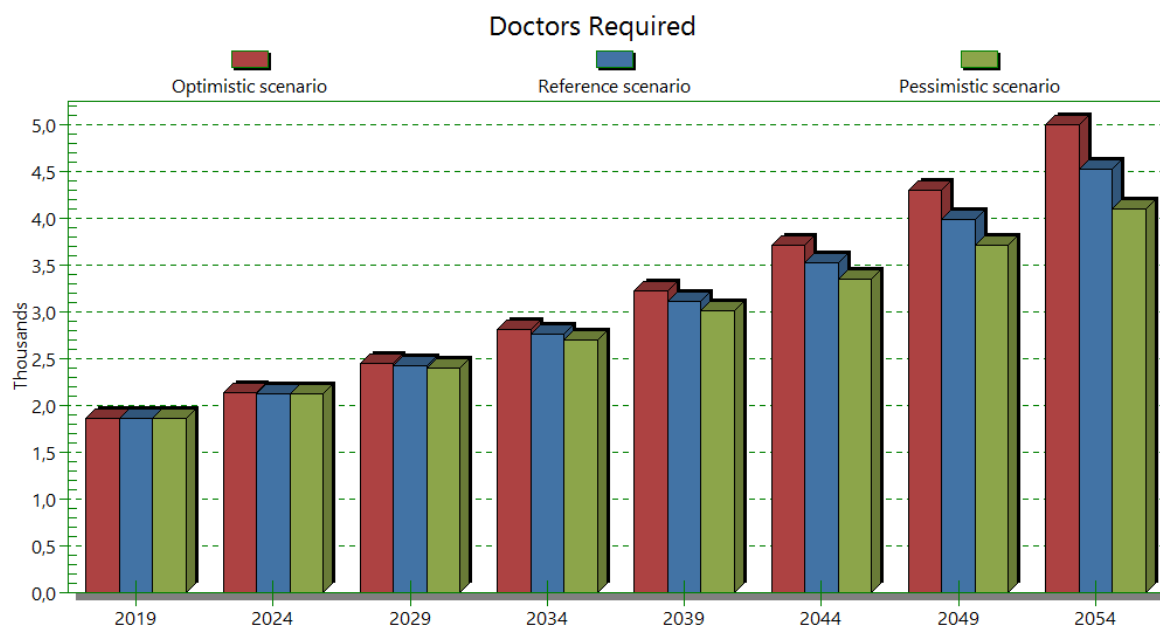


Figure (06): Projection of the Number of Doctors Required in the Wilaya of Setif Between 2019-2054 using Spectrum Demographic Software

Source: prepared by us based on the Spectrum demographic software

Table (07) and figure (06) project the number of doctors required in the wilaya of Setif in the period between 2019 and 2054. We note that in the first year of the projection period (2019), the number of doctors is 1853; this number increased in the projection year of 2054 in all three scenarios, but at different rates: 5008 in the optimistic scenario, 4524 doctors in the reference scenario and 4099 doctors in the pessimistic scenario, with a difference of 3155 doctors in the optimistic scenario, 2671 doctors in the reference scenario and 2246 doctors in the pessimistic scenario, over the span of 35 years. This variation in the increase rate is attributed to the fertility factor; the increase rate rose at a similar rate in all scenarios in 2024. In the same year, the number of doctors required is 280 doctors in the optimistic scenario, 274 doctors in the reference scenario and 268 in the pessimistic scenario. Subsequently, due to the diverging influence of the fertility factor in the three scenarios, the increase rate varied. In the optimistic scenario, the increase rate rose significantly to reach 709 doctors between 2049 and 2054, compared to 535 doctors in the reference scenario and 386 doctors in the pessimistic scenario. The slower increase in the number of doctors required in the reference and pessimistic scenarios can be attributed to the higher life expectancy factor.

3-3- Projection of the number of nurses:

Table (08): The Projected Number of Nurses Required in the Wilaya of Setif 2019-2054

Year	Optimistic scenario		Reference scenario		Pessimistic scenario	
	Population	Nurses required	Population	Nurses required	Population	Nurses required
2019	1 938 363	4 187	1 938 363	4 187	1 938 363	4 187
2024	2 136 823	4 819	2 130 269	4 804	2 124 370	4 791

2029	2 347 075	5 537	2 322 807	5 480	2 300 965	5 429
2034	2 569 085	6 355	2 515 404	6 222	2 467 091	6 102
2039	2 803 057	7 286	2 706 358	7 035	2 619 357	6 809
2044	3 060 336	8 381	2 902 907	7 950	2 761 633	7 563
2049	3 354 622	9 707	3 112 722	9 007	2 897 486	8 385
2054	3 686 082	11 307	3 329 336	10 213	3 017 193	9 255

Source: prepared by us based on the Spectrum demographic software

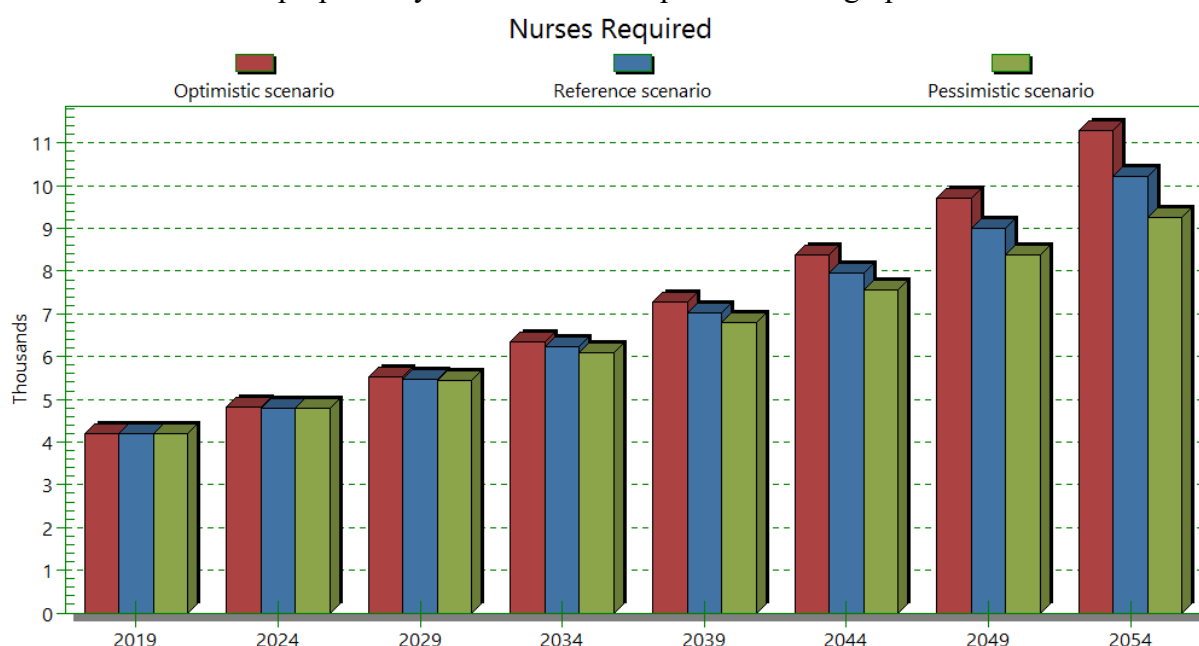


Figure (07): Projection of the Number of Nurses Required in the Wilaya of Setif Between 2019-2054 using Spectrum Demographic Software

Source: prepared by us based on the Spectrum demographic software

Table (08) and figure (07) project the number of nurses required in the wilaya of Setif in the period between 2019 and 2054. We note that the number of nurses required in the first year of the projection period is 4187; the number increased by the projection year of 2054 in all scenarios to reach 11307 nurses in the optimistic scenario with an increase of 7120 nurses, 10213 nurses with an increase of 6026 nurses in the reference scenario, 9255 nurses in the pessimistic scenario with an increase of 5068 nurses, over the projection period. Based on the above, we notice that the increase rate is at different rates in the three scenarios due to the influence of the fertility factor. Between 2019 and 2024, the increase in the number of the nurses required was at a slow and close rate in the three scenarios with 632 in the optimistic scenario, 617 in the reference scenario and 604 in the pessimistic scenario. Eventually, the influence of the fertility factor became more apparent; the number of nurses required rose significantly in the optimistic scenario to reach 1600 nurses between 2049 and 2054, compared to 1206 nurses and 870 nurses in the reference and pessimistic scenarios, respectively. This indicates that the increase in the number of nurses required in the optimistic scenario is a result of the rise of the young and elderly communities which also reflects high fertility and high life

expectancy, whereas the increase in the nurses required in the pessimistic scenario is only attributed to the increase in the elderly population.

3-4- Projection of the number of health centers:

Table (09): Projection of the Number of Health Centers Required in the Wilaya of Setif between 2019 and 2054

Year	Optimistic scenario		Reference scenario		Pessimistic scenario	
	Population	Health centers required	Population	Health centers required	Population	Health centers required
2019	1 938 363	313	1 938 363	313	1 938 363	313
2024	2 136 823	360	2 130 269	359	2 124 370	358
2029	2 347 075	414	2 322 807	410	2 300 965	406
2034	2 569 085	475	2 515 404	465	2 467 091	456
2039	2 803 057	545	2 706 358	526	2 619 357	509
2044	3 060 336	627	2 902 907	595	2 761 633	566
2049	3 354 622	726	3 112 722	674	2 897 486	627
2054	3 686 082	846	3 329 336	764	3 017 193	693

Source: prepared by us based on the Spectrum demographic software

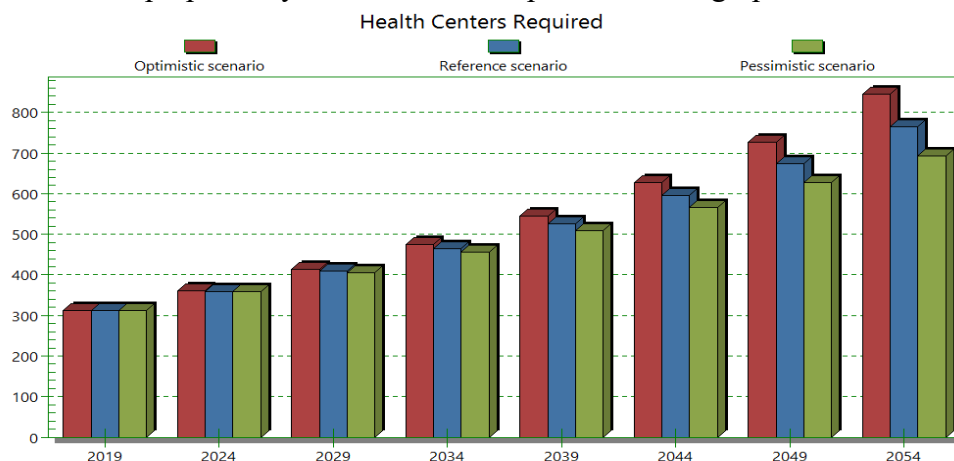


Figure (08): Projection of the Number of Health Centers Required in the Wilaya of Setif Using Spectrum Demographic Software

Source: prepared by us based on the Spectrum demographic software

Table (09) and figure (08) project the number of health centers required in the wilaya of Setif in the period between 2019 and 2054. The number of health centers required in the first year of the projection period (2019) is 313 health centers; this number increased by the projection year of 2054 to reach 846 health centers in the optimistic scenario, 764 health centers in the reference scenario and 693 health centers in the pessimistic scenario with an increase rate of 533 health centers, 451 health centers and 380 health centers in the optimistic, reference and pessimistic scenario, respectively, over the span of 35 years. This increase rate variation is attributed to the influence of

the fertility factor which got clearer with time. Between 2019 and 2024, the number of health centers increased by 47 health centers in the optimistic scenario, 46 health centers in the reference scenario and 45 health centers in the pessimistic scenario. Accordingly, we notice that the increase rate is close in the three scenarios because the influence of the fertility factor was minor. However, between 2034 and 2039, the number of health centers required increased by 70 in the optimistic scenario, 61 health centers in the reference scenario and 53 health centers in the pessimistic scenario. In this period, the influence of the fertility factor is more noticeable which indicates a higher influence of fertility on the rate of increase. Furthermore, in the period between 2049 and 2054, the number of health centers required increased by 120 health centers in the optimistic scenario, compared to 90 health centers and 66 health centers in the reference and pessimistic scenarios, respectively. This variation in increase rates reflects the rise in young and elderly populations in the optimistic scenario, as opposed to the pessimistic scenario in which the increase rate of the number of health centers required is slower as it is only a result of the increase in the elderly population.

3-5- Projection of the number of hospitals:

Table (10): Projection of the Number of Hospitals Required in the Wilaya of Setif between 2019 and 2054

Year	Optimistic scenario		Reference scenario		Pessimistic scenario	
	Population	Hospitals required	Population	Hospitals required	Population	Hospitals required
2019	1 938 363	11	1 938 363	11	1 938 363	11
2024	2 136 823	13	2 130 269	13	2 124 370	13
2029	2 347 075	15	2 322 807	14	2 300 965	14
2034	2 569 085	17	2 515 404	16	2 467 091	16
2039	2 803 057	19	2 706 358	18	2 619 357	18
2044	3 060 336	22	2 902 907	21	2 761 633	20
2049	3 354 622	26	3 112 722	24	2 897 486	22
2054	3 686 082	30	3 329 336	27	3 017 193	24

Source: prepared by us based on the Spectrum demographic software

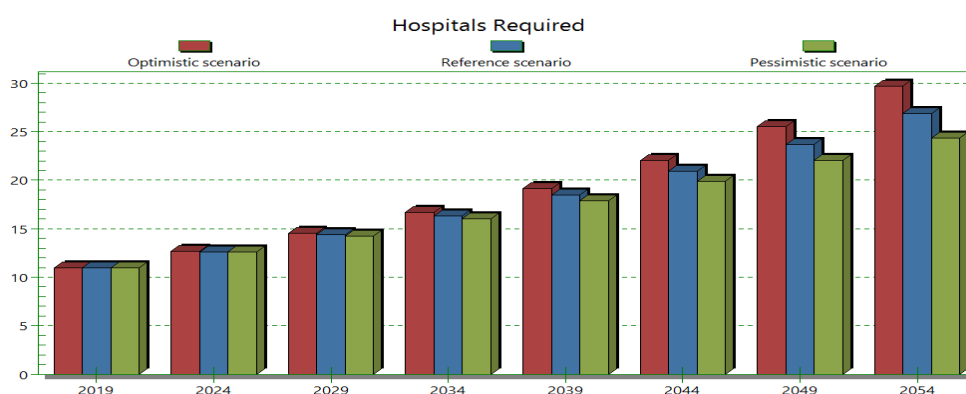


Figure (09): Projection of the Number of Hospitals Required in the Wilaya of Setif Using Spectrum Demographic Software

Source: prepared by us based on the Spectrum demographic software

Table (10) and figure (09) project the number of hospitals required in the wilaya of Setif in the period between 2019 and 2054. The number of hospitals required in the first year of the projection period (2019) is 11 hospitals; this number increased by 2054 to reach 30 hospitals in the optimistic scenario, 27 hospitals in the reference scenario and 24 hospitals in the pessimistic scenario with a difference rate of 19 hospitals, 16 hospitals and 13 hospitals in the optimistic, reference and pessimistic scenarios, respectively, over the span of 35 years. In the year 2024, we notice that the increase rate was the same in all three scenarios because of the minor influence of the fertility factor. From 2029, variations in the increase rate difference started to be more significant. The number of the hospitals required in the optimistic scenario increased by two hospitals, compared to one hospital in the reference and pessimistic scenarios. The increase maintained a faster rate in the optimistic scenario, compared to the reference and pessimistic scenarios which shared a slower increase rate. Since 2049, variations in increase rates between the three scenarios became more pronounced with an increase of 4 hospitals in the optimistic scenario, 3 hospitals in the reference scenario and 2 hospitals in the pessimistic scenario, in the period between 2049 and 2054. These variations also reflect high fertility and high life expectancy in the optimistic scenario which translates into greater demand on hospitals, compared to the pessimistic scenario which recorded lower demand that is only a result of an increase in the elderly population.

3-6- Projection of the number of hospital beds:

Table (11): Projection of the Number of Hospital Beds Required in the Wilaya of Setif between 2019 and 2054

Year	Optimistic scenario		Reference scenario		Pessimistic scenario	
	Population	Hospital beds required	Population	Hospital beds required	Population	Hospital beds required
2019	1 938 363	2 685	1 938 363	2 685	1 938 363	2 685
2024	2 136 823	3 090	2 130 269	3 081	2 124 370	3 072
2029	2 347 075	3 552	2 322 807	3 515	2 300 965	3 482
2034	2 569 085	4 076	2 515 404	3 991	2 467 091	3 914
2039	2 803 057	4 674	2 706 358	4 513	2 619 357	4 368
2044	3 060 336	5 377	2 902 907	5 100	2 761 633	4 852
2049	3 354 622	6 229	3 112 722	5 780	2 897 486	5 380
2054	3 686 082	7 256	3 329 336	6 554	3 017 193	5 939

Source: prepared by us based on the Spectrum demographic software

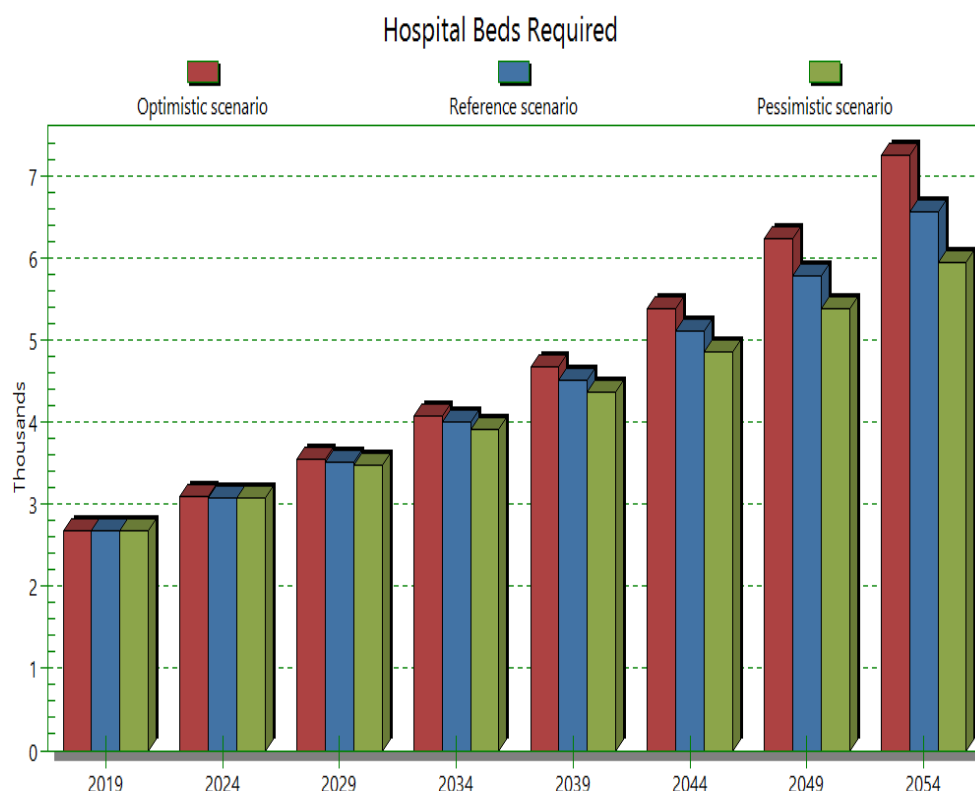


Figure (10): Projection of the Number of Hospital Beds Required in the Wilaya of Setif Using Spectrum Demographic Software

Source: prepared by us based on the Spectrum demographic software

Table (11) and figure (10) project the number of beds required in the hospitals of the wilaya of Setif in the period between 2019 and 2054. In the first year of the projection period (2019), the number of beds is 2685; this number increased by the year 2054 to 7256 in the optimistic scenario, 6554 in the reference scenario and 5939 in the pessimistic scenario with an increase rate of 4571 hospital beds, 3869 hospital beds and 3254 hospital beds in the optimistic, reference and pessimistic scenarios, respectively, over the span of 35 years. This increase in the number of hospital beds required in the wilaya of Setif is attributed to the population increase which jumped from 1938363 in the base-year to 3686082 in the optimistic scenario, 3329336 in the reference scenario, 3017193 in the pessimistic scenario in the projection year of 2054 with an increase rate of 90.16% in the optimistic scenario, 71.76% in the reference scenario and 55.66% in the pessimistic scenario. Furthermore, we notice that the increase in the number of hospital beds required was at a similar rate at the beginning of the projection period. In 2024, the number of hospital beds required increased by 405 hospital beds, 396 hospital beds and 387 hospital beds in the optimistic, reference and pessimistic scenarios, respectively. However, we note that the increase rate in the optimistic scenario is higher in comparison with the reference and the pessimistic scenarios. In the period between 2049 and 2054, the variation in the increase rate between the three scenarios is clear; we notice that the number of hospital beds required increased by 1027 hospital beds, 774 hospital beds and 559 hospital beds in the optimistic, reference and pessimistic scenarios, respectively, which is due to the eventual

appearance of the influence of the fertility factor.

3-7- Projection of the annual health expenditure:

Table (12): Projection of the Required Annual Health Expenditure in the Wilaya of Setif Between 2019 and 2054

Year	Optimistic scenario	Reference scenario	Pessimistic scenario
	Required annual health expenditure	Required annual health expenditure	Required annual health expenditure
2019	17 794 172 340,00	17 794 172 340,00	17 794 172 340,00
2024	20 783 354 344,75	20 719 600 970,72	20 662 225 608,82
2029	24 110 495 258,28	23 861 197 930,09	23 636 826 996,14
2034	27 794 567 024,39	27 213 794 529,70	26 691 100 366,36
2039	31 857 136 777,04	30 758 138 854,88	29 769 365 768,01
2044	36 452 971 117,66	34 577 766 807,12	32 894 997 583,13
2049	41 790 917 894,14	38 777 403 138,53	36 096 048 407,75
2054	47 933 810 328,00	43 294 682 093,00	39 235 581 023,00

Source: prepared by us based on the Spectrum demographic software

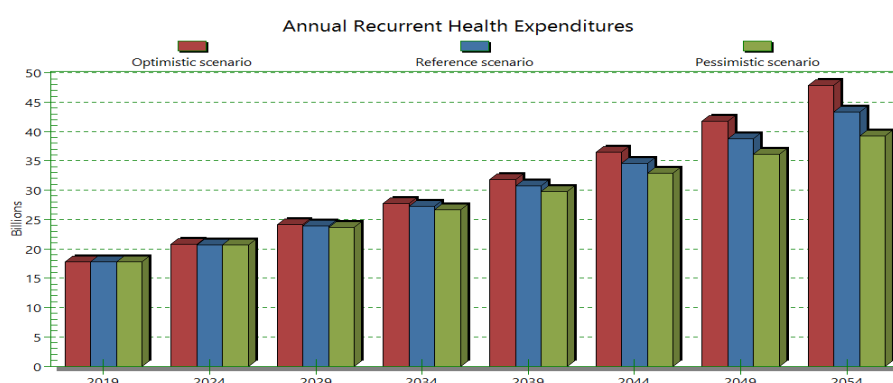


Figure (11): Projection of the Required Annual Health Expenditure in the Wilaya of Setif Between 2019 and 2054

Source: prepared by us based on the Spectrum demographic software

Table (12) and figure (11) project the required annual health expenditure in the wilaya of Setif in the period between 2019 and 2054. In the first year of the projection period (2019), the annual health expenditure amounts to 17794172340,00 DZD; by the projection year of 2054, this amount increased to 47933810328 DZD in the optimistic scenario, 43294682093 DZD in the reference scenario and 39235581023 DZD in the pessimistic scenario, recording an increase rate of 169.38% in the optimistic scenario, 143.31% in the reference scenario and 120.50% in the pessimistic scenario, over the span of 35 years. We notice that, at the beginning of the projection period, the variations in the required annual health expenditure rate were similar. In this vein, the increase rate between 2019 and 2024 amounted to 2989182994.75 DZD in the optimistic scenario, 2925428630.72 DZD in the reference scenario and 2868053268.82 DZD in the pessimistic scenario. Eventually, the influence of

the fertility factor became more apparent which reflected clear disparities between the three scenarios in terms of the required annual health expenditure. In the period between 2049 and 2054, the amount increased to 6142892433.86 DZD in the optimistic scenario, 4517278954.47 DZD in the reference scenario and finally 3139532615.25 in the pessimistic scenario.

4- Conclusion:

In this study, we aim to underscore the pivotal role of demographic data in building a genuine, accurate and science-based development project that is based on probable scenarios through past and present data analysis.

In this vein, we projected the population of the wilaya of Setif before proceeding to the projection of the health needs of the inhabitants of the wilaya by 2054, in terms of the number of doctors, nurses, health centers, hospitals, hospital beds, in addition to the annual health expenditure. Accordingly, it is imperative for concerned government bodies to set clear plans and efficient policies so as to meet the various demands related to the health sector, which is the key vector of any sustainable development process. This is particularly important because the findings of the demographic projection in the three scenarios indicate an increase in the population of Setif and by extension, their health needs, as illustrated below:

- The population projection of the wilaya of Setif by 2054 is 3686082 people in the optimistic scenario, 3329336 people in the reference scenario and 3017193 in the pessimistic scenario;
- The projection of the number of doctors required in the wilaya of Setif by 2054 is 5008 doctors in the optimistic scenario, 4524 doctors in the reference scenario and 4099 doctors in the pessimistic scenario;
- The projection of the number of nurses required in the wilaya of Setif by 2054 is 11307 doctors in the optimistic scenario, 10213 doctors in the reference scenario and 9255 doctors in the pessimistic scenario;
- The projection of the number of health centers required in the wilaya of Setif by 2054 is 846 health centers in the optimistic scenario, 764 health centers in the reference scenario and 693 health centers in the pessimistic scenario;
- The projection of the number of hospitals required in the wilaya of Setif by 2054 is 30 hospitals in the optimistic scenario, 27 hospitals in the reference scenario and 24 hospitals in the pessimistic scenario;
- The projection of the number of hospital beds required in the wilaya of Setif by 2054 is 7256 hospital beds in the optimistic scenario, 6554 hospital beds in the reference scenario and 5939 hospital beds in the pessimistic scenario;
- The projection of the required annual health expenditure amounts to 47933810328 DZD in the optimistic scenario, 43294682093 DZD in the reference scenario and 39235581023 DZD in the pessimistic scenario.

In light of the above, we suggest conducting similar studies to project health needs in other wilayas. The findings of these studies can be used by the government bodies to elaborate science-based development programs that take into account comprehensive and equitable distribution across the various wilayas of the country.

References

- Al-Hayis, A. (2015). Estimating the Basic Needs of Local Populations as an Entry Point to Comprehensive Development. *Journal of Studies in Development and Society*, 2(2).
- Al-Kharif, R. (2010). *Dictionary of Population and Development Terms*. (1st ed). Riyadh: King Khalid Foundation.
- Atal, D. (2019). Estimating Mortality in Algeria during the period 1987- 2008 Using Indirect Estimation Techniques. 73. Algeria: University of Batna 01.
- Avenir Health*. (s.d). Retrieved from <http://www.futuresinstitute.org/spectrum2.aspx#rapid>
- Bawaneh, A.-M. (2004). *Management of Health Services and Institution: Concepts, Theories, and Fundamentals in Health Administration*. (1st ed). Jordan: Dar Al-Hamed for Publishing and Distribution.
- Chabaki, H. (2020). Presentation of the Most Commonly Used Foresight Methods in Future Studies. *Maarif Journal of Legal and Economic Sciences*, 1(1).
- Directorate of Programming and Budget Monitoring. (2019). Statistical Bulletin. Setif, Algeria: Statistics Department.
- General Secretariat of the Government. (2018, December 30). Official Gazette of the People's Democratic Republic of Algeria. 29. Algeria.
- Larousse Medicale* (11th ed). (2000). Paris, France: Editions Larousse.
- Mario, P. (1983). *The Lexicon Webster Dictionary*. (Vol. 11).
- National Office of Statistics. (2020). Algerian Demographics 2019. (N°890/Bis). Algiers, Algeria.
- Oscarson, N. (2006). Health Economic Evaluation: Method for Decision- Marking in Preventive Dentistry. 5. UNEA University Medical Dissertations.