



www.econix.net

HEART FAILURE WITH REDUCED EJECTION FRACTION
COST IN TURKEY WITH REAL WORLD DATA

2022

Heart Failure with Reduced Ejection Fraction Cost in Turkey with Real World Data

ECONiX Research

This report was prepared by ECONiX which provides tailor made research, analysis and consultancy services, including, but not limited to, market access, health economics, medical and business development, for public and academic institutions, pharmaceutical, medical equipment and healthcare providers with offices in Turkey Estonia, and Tunisia and in Eastern Europe, West Asia, the Middle East and North Africa



This work has been prepared with the unconditional sponsorship of Boehringer Ingelheim

Researchers

Prof. Dr. Muzaffer Murat Değertekin, Yeditepe University, İstanbul

Prof. Dr. Bülent Özın, Başkent University, Ankara

Assoc. Prof. Dr. Kerem Can Yılmaz, Aritmi Health Group, Bursa

Assoc. Prof. Dr. İrem Kara üzümlü, Kocaeli University, Kocaeli

Assoc. Prof. Dr. Ali Bağcı, Süleyman Demirel University, Isparta

Assoc. Prof. Dr. Selçuk Şen, İstanbul University, İstanbul

Assoc. Prof. Dr. Gülpembe Oğuzhan, Tarsus University, Mersin

Phar. Büşra Benkli Yeditepe University Hospital, İstanbul

Dr. Güvenç Koçkaya, ECONiX, İstanbul

Spc. Mustafa Kurnaz, ECONiX, Samsun

Spc. Selin Ökçün, ECONiX, Samsun

Arif Erdoğan, ECONiX, İstanbul

Design and Composition: Yasemin Simit

ECONiX Research Analysis and Consulting Inc. Aksu Mah. OMU C. Samsun Teknopark Sit.
Teknokent Apt. Kapı No: 1 D: 165 Atakum / Samsun

heor@econix.net

+90 850 255 19 34

www.econix.net / www.econalix.net

All rights reserved. It cannot be reproduced, distributed or used for any other purpose without permission.
ECONiX Research Analysis and Consulting Inc. Inc., Turkey ECONiX Consultancy OÜ, Estonya 2022

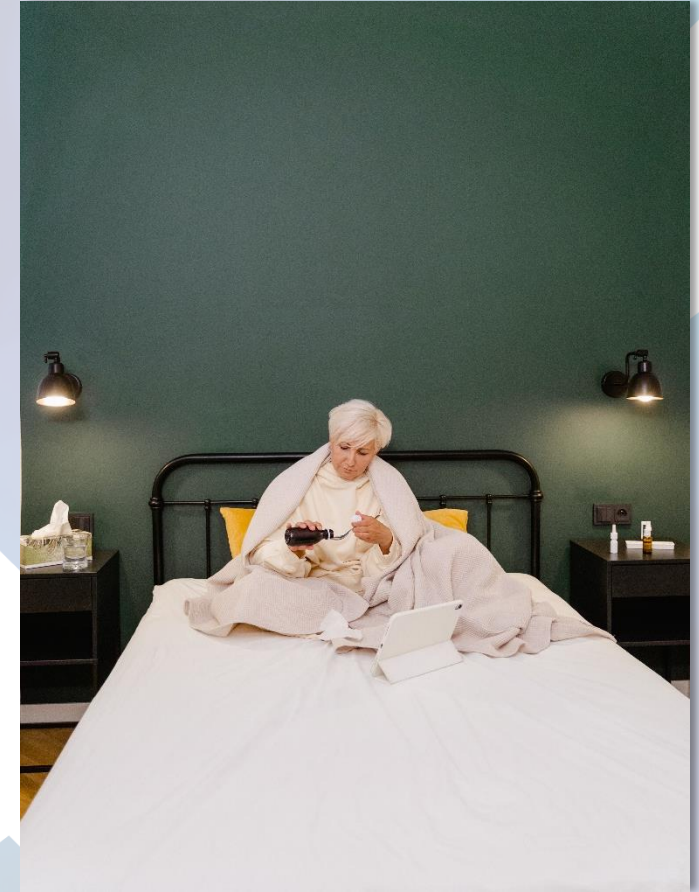
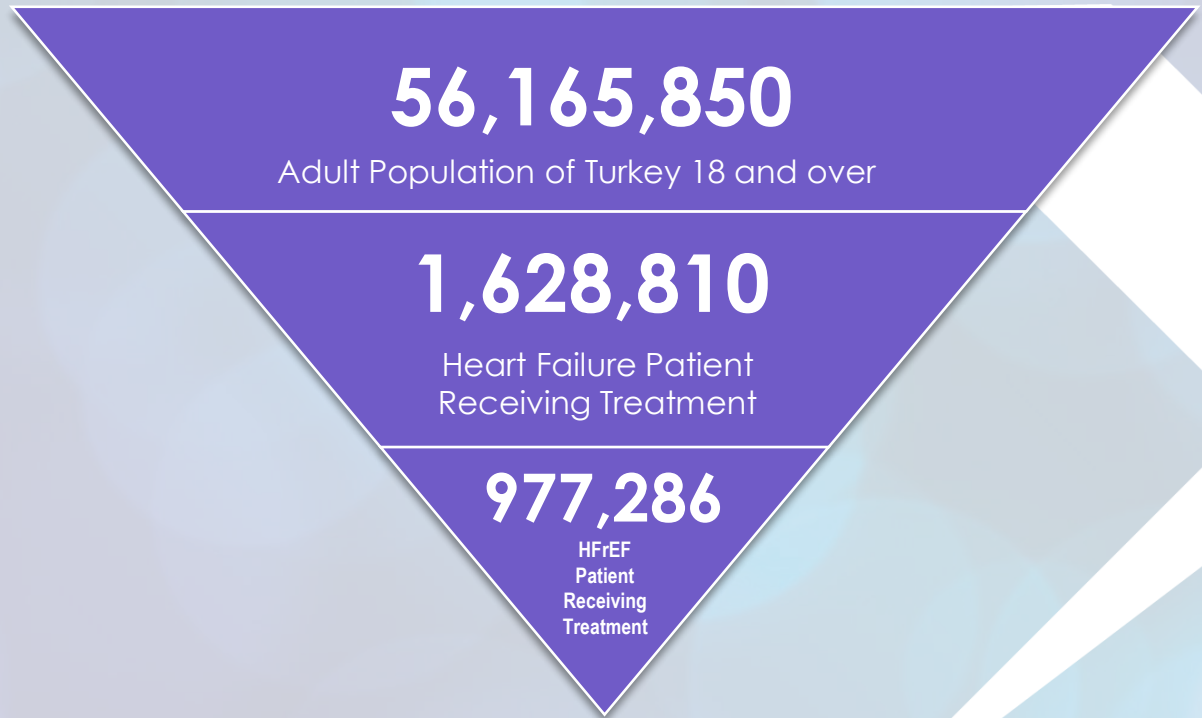
Tag: ECONiX Research Reports, Heart Failure with Reduced Ejection Fraction
Cost in Turkey with Real World Data, July 2022 , İstanbul , Türkiye



EXECUTIVE SUMMARY

Heart Failure with Reduced Ejection Fraction Cost in Turkey with Real World Data

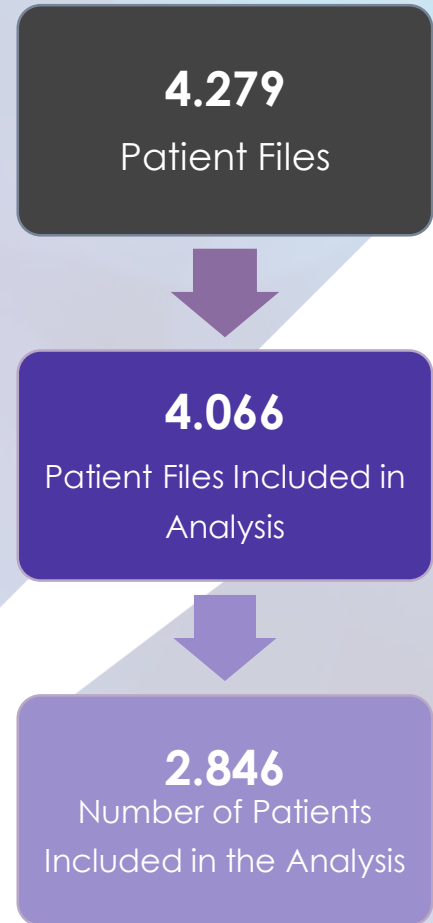
There are 1.6 million heart failure patients under treatment in Turkey. 977,286 of these patients need advanced and innovative treatments due to Heart Failure with reduced Ejection Fraction. If these patients are not treated, the consequences can be fatal. The 1-year mortality rate of heart failure patients with reduced ejection fraction is 8.8%



Heart Failure with Reduced Ejection Fraction Cost in Turkey with Real World Data

- A total of 4,279 patient files from 4 centers included in the study from different provinces of Turkey.
- After extracting erroneous and incomplete data from these files, 4,066 of them were included in the analysis.

After removing erroneous and incomplete data from anonymous patient data, 2,846 anonymous individual patient data were included in the further analysis.



Heart Failure with Reduced Ejection Fraction Cost in Turkey with Real World Data

- The total direct and indirect cost per patient with HFrEF is 7,831.00 TL.
- 6,935.52 TL of this cost is direct health expenditure by Social Security Institution.
- 895.49 TL is the labor cost of the patients due to their work loss under treatment.



Annual per patient
HFrEF cost of Direct and Indirect Costs

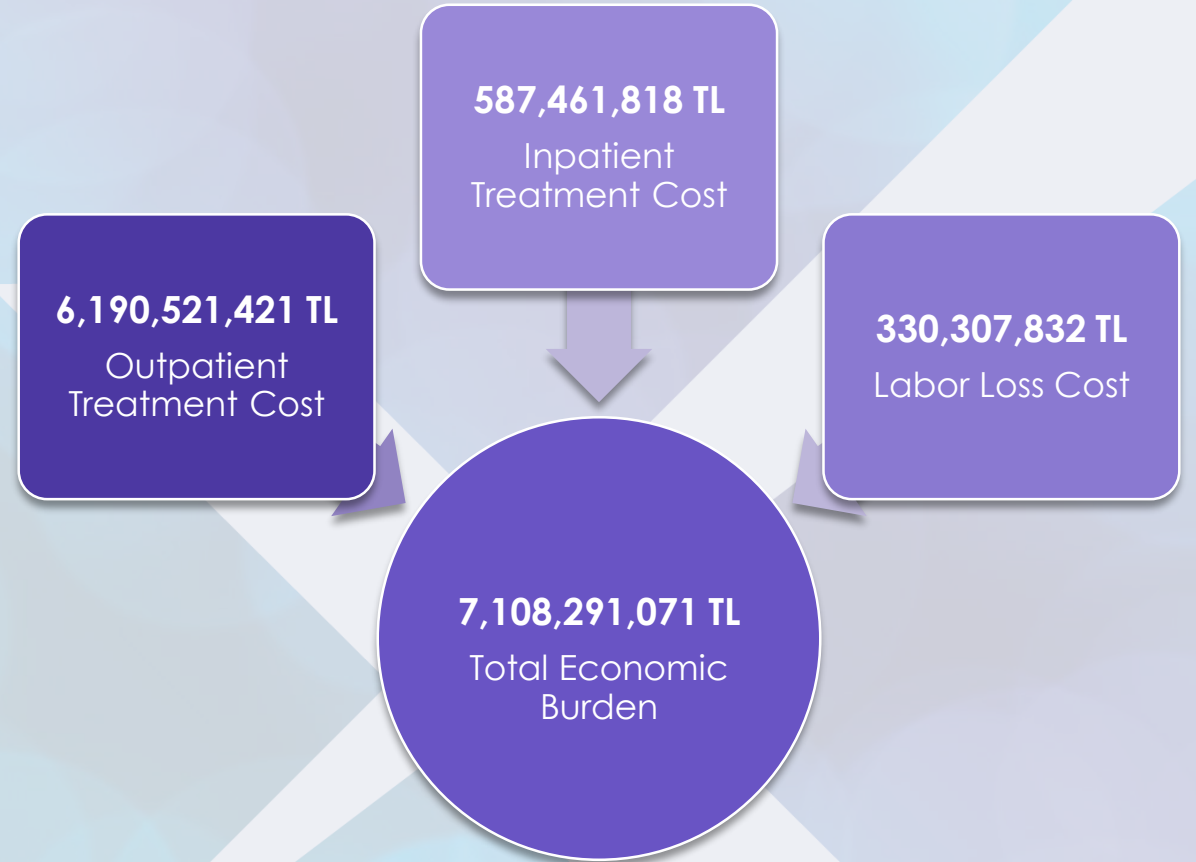
7,831.00 TL

+%60

These costs increase up to 60% if patients have concomitant diseases such as diabetes and kidney failure.

Heart Failure with Reduced Ejection Fraction Cost in Turkey with Real World Data

- The possible total direct and indirect cost of all HFrEF Patients in Turkey has been calculated as 7.1 billion TL.
- The health expenditure made by the Social Security Institution is calculated as 6.8 billion TL.
- It is important for the public that these patients have access to accurate, effective and innovative treatments.
- More efficient health care delivery with cost-effective treatments should be prioritized in planning.



INTRODUCTION, AIM AND METHOD



INTRODUCTION

- The prevalence and incidence of heart failure increases with the aging of the population. The economic burden of heart failure is a major challenge for healthcare systems (1,2.)
- **The prevalence of heart failure is 2% in the adult population and 5-9% in the population aged 65 and over (3).**
- Heart failure patients face a large burden of cardiac and non-cardiac comorbidities More than half of the patients with heart failure have comorbid conditions such as chronic kidney failure, diabetes, obesity, hypertension and atrial fibrillation (4-6).
- The 1-year mortality rate of heart failure patients with reduced ejection fraction is 8.8% (7).
- Despite the provision of appropriate treatment, heart failure with reduced ejection fraction disease poses a significant economic burden, especially in cases requiring rehospitalization or emergency outpatient treatment (8).

1. Cook ve ark., (2014) 2. Savarese & Lund (2017) 3. van Riet ve ark., (2016) 4. Khan ve ark., (2020)
5. Mentz & Felker (2013) 6. Iyngkaran ve ark., (2015) 7. Chioncel ve ark., (2017) 8. Armstrong ve ark., (2020)





AIM

The aim of this study is to calculate the cost of outpatient and inpatient treatment of HFrEF patients with real-world data for Turkey.

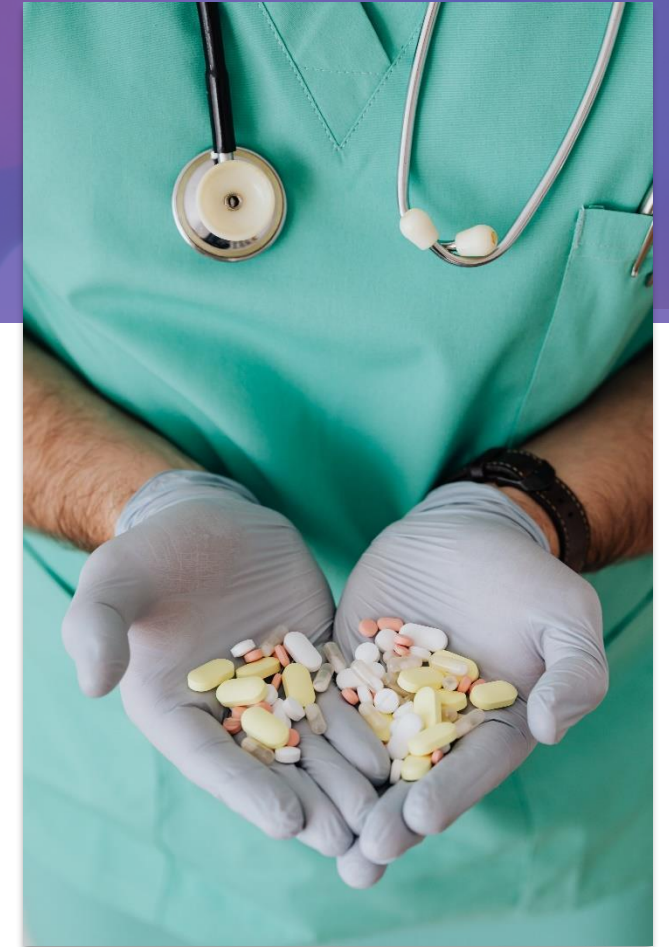
METHOD

With the permission of Yeditepe University, Clinical Research Ethics Committee, dated 08.03.2021 and numbered 1402, the data of HFrEF patients who were treated as outpatients and/or inpatients in 4 university hospitals selected between January 1, 2018 and December 31, 2020, were anonymized and included in the study in accordance with the relevant legislation.

University hospitals included in the study

- Başkent University Ankara Hospital Ankara
- Kocaeli University of Research and Practice Hospital, Kocaeli
- Süleyman Demirel University of Research and Application Hospital, Isparta
- Yeditepe University Hospital İstanbul

HFrEF: Heart Failure with reduced Ejection Fraction





METHOD

- The main patient group in the study was heart failure patients with reduced ejection fraction.
- This patient group was analyzed as 4 subgroups according to the diagnosis of diabetes and/or kidney failure;
 - Heart failure with reduced ejection fraction patients with diabetes and kidney failure
 - Heart failure with reduced ejection fraction patients with diabetes and without kidney failure
 - Heart failure with reduced ejection fraction patients without diabetes and with kidney failure
 - Heart failure with reduced ejection fraction patients without diabetes and kidney failure

All analyzes in the study were carried out for general (including all hospitals) and separately 4 university hospitals, combined data of 4 sub-patient groups and main group.





METHOD

- Detailed descriptive analyzes of the criteria such as number of patients, hospitalization days, number of hospitalizations, age (mean and median) etc. were made.
- The costs of in patients were calculated with consultation, health care use and medication costs.
- In calculating the costs of using health services, the transaction scores of the Health Implementation Communiqué published by the Social Security Institution (SGK) for 2021 were used (9).
- The unit costs of consultation, laboratory and imaging operations were obtained by multiplying the corresponding transaction in the SUT Annex-2/B Per Service Process Points List with the transaction coefficient of 0.593 (9).
- Pharmaceutical prices were obtained through www.econalix.net/İlacTakipUygulaması according to 2021 prices, taking into account public discounts.

9. Sosyal Güvenlik Kurumu, Sağlık Uygulama Tebliği, 2021

10. ECONALIX, İlaç Takip Uygulaması, 2021



A top-down view of a meeting table with several people's hands and arms visible. The table is cluttered with laptops, tablets, and smartphones, all displaying a blue screen with the percentage '85.00%'. There are also notebooks, pens, and coffee cups scattered on the table. The overall lighting is dim and blue-tinted.

LIMITATIONS

econix

LIMITATIONS

- The sample of the study is limited to the 4 selected hospitals.
- In this study, patient data were evaluated retrospectively. The diagnosis code is based on the diagnosis of the disease. Due to the limitations in the analyzed data, additional evaluation, validation and subgroup analyzes of the diagnostic tests could not be performed.
- The data of the study includes only the data of patients who received treatment depending on HFrEF indication between 01.01.2018 and 31.12.2020. The results of the study should be interpreted with caution, considering possible changes over time in demographics, reimbursement of drugs and services, and clinical practice.
- Due to the lack of data on disease severity (NYHA classes), the impact of disease severity on resource use and overall costs has not been evaluated.

NYHA : New York Heart Association





ANALYSIS FINDINGS

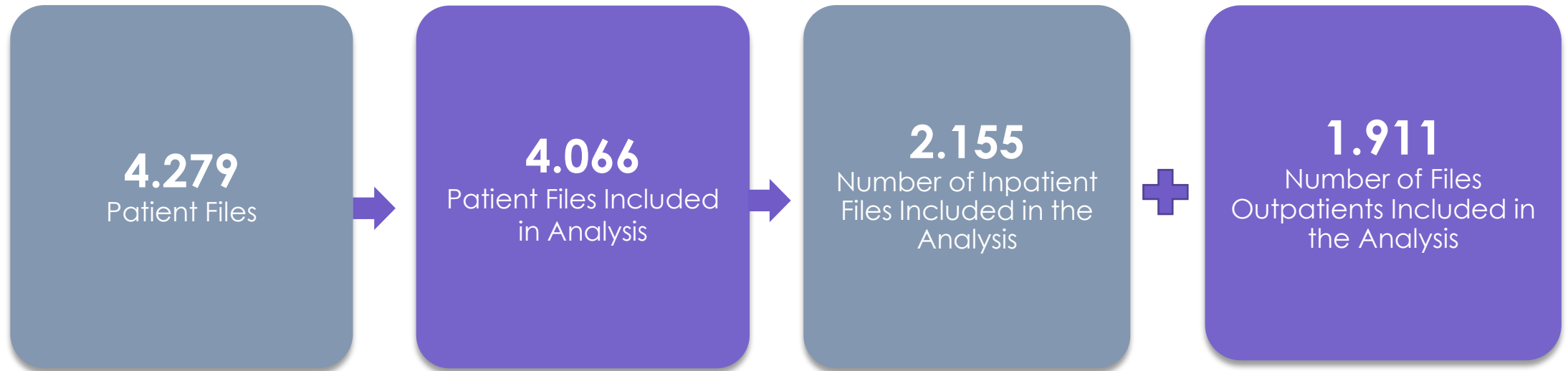
econix



DESCRIPTIVE ANALYSIS

A total of 4,279 patient files (2,333 inpatients, 1,946 outpatients) from 4 university hospitals included in the study were obtained. Patient files that were not suitable for the study were not included in the analysis.

A total of 4,066 patient files (2,155 inpatients, 1,911 outpatients) belonging to 2,846 patients were included in the analysis.

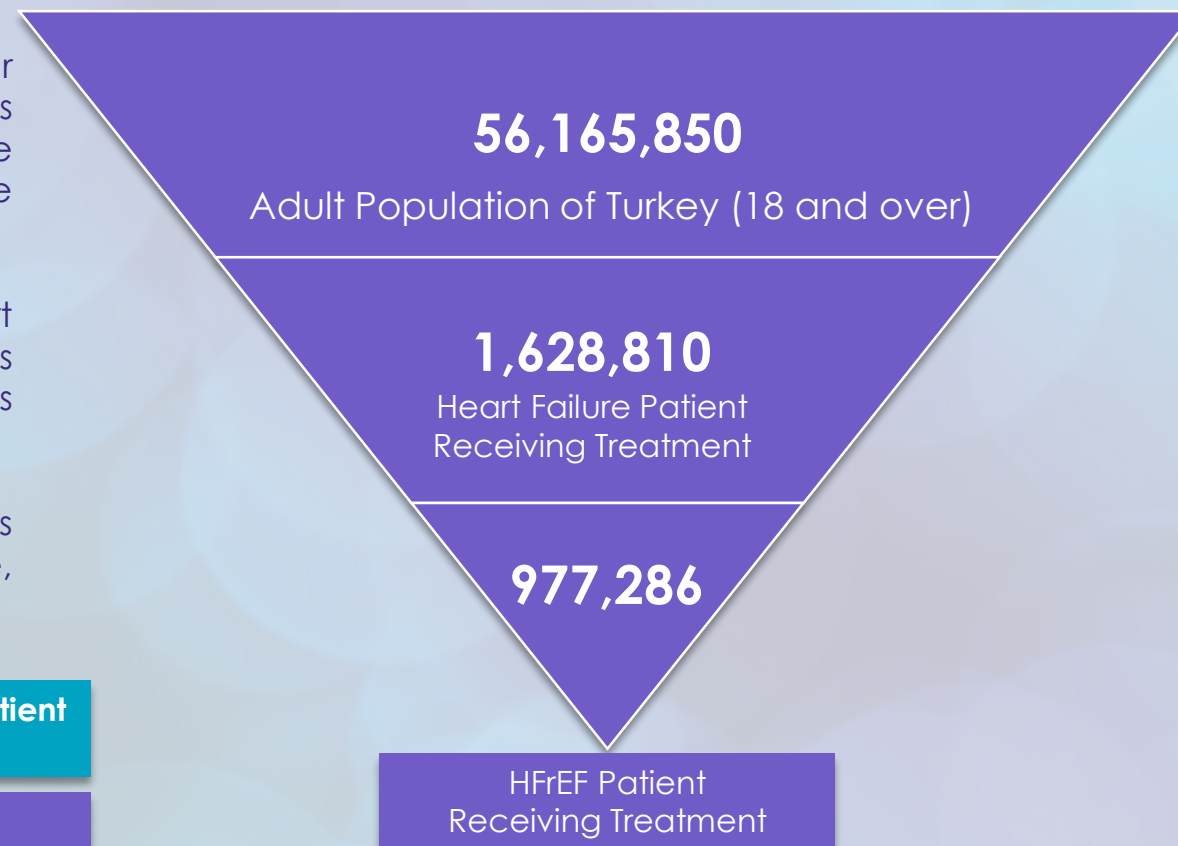


Demographic Data

- According to the Turkish Statistical Institute (TUIK) mid-year population data projection, the population of Turkey is 86,409,000 in February 2021 (11). It is assumed that 65% of the total population is 18 years and over. With this calculation, the population aged 18 and over is taken as 56,165,850.
- According to the literature review, the prevalence of heart failure in Turkey was found to be 2.90% (12). According to this rate, the number of patients with heart failure in Turkey is 1,628,810.
- According to the literature review, 60 of heart failure patients under treatment are HFrEF patients (13). According to this rate, the number of HFrEF patients in Turkey is thought to be 977,286.

According to real-world analysis, 15.85% of patients receiving outpatient treatment are hospitalized within a year.

It was observed that the mean age of the inpatients included in the study was 67.46 years and the median age was 69.00 years.



Descriptive and Economic Findings for Outpatients

- According to the files examined, it was found that the average number of control visits per patient in a year in HFrEF patients was 1.70 and 5.40 visits to the physician for medication prescribing.
- It has been observed that patients receiving outpatient treatment make a total of 7.10 doctor visits per year.
- According to the files examined, the average outpatient treatment cost per patient for HFrEF patients was calculated as 6,334.40 TL.

Annual Average Cost of HFrEF Outpatient Follow-up and Treatment per Patient

6,334.40 TL

	Average Number of Visits per Patient	Average Annual Cost per Patient
Outpatient	7.10	6,334.40 TL
Laboratory and Imaging	1.70	75.13 TL
Polyclinic Visit for General Control		61.52 TL
Clinic Visit for Medication Prescribing and Medication Cost	5.40	6,197.75 TL

Descriptive and Economic Findings for Inpatients

- According to analysis the average number of hospitalizations per patient in HFrEF patients was calculated as 1.40. The highest number of hospitalizations, 1.99 times, is seen in HFrEF patients with diabetes and kidney failure.
- The mean hospitalization day per patient for HFrEF patients was calculated as 6.51. The longest hospital stay is seen in HFrEF patients with diabetes and kidney failure with 8.84 days.

The average hospitalization cost per patient for HFrEF patients was calculated as 2,702,34 TL depending on the analysis.

Presence of kidney failure in HFrEF patients seems to increase the cost per hospitalization

In terms of the economic burden of the disease, attention should be paid to cardio renal protection.

Annual Average Cost of per HFrEF Inpatient
Follow-up and Treatment per Patient
3,792.55 TL

	Average Cost per Hospitalization	Average Annual Number of Inpatients Hospitalized	Average Inpatient Cost	Average Hospitalization Rate per Patient	Weighted Average Cost of Hospitalization per Patient
General	2,702.34 TL	1.40	3,792.55 TL	%15.85	601.12 TL
DM+ KF+	2,861.46 TL	1.99	5,683.73 TL		900.87 TL
DM+ KF-	2,563.60 TL	1.44	3,698.63 TL		586.23 TL
DM- KF+	3,477.59 TL	1.55	5,394.72 TL		855.06 TL
DM- KF-	2,651.12 TL	1.26	3,351.20 TL		531.16 TL

DM: Diyabet Mellitus, **KF:** Kidney Failure

Labor Loss Analysis, Economic Findings

- In line with the TÜİK the average monthly salary of individuals working in Turkey in 2021 has been calculated as 3,468.09 TL (14).
- The cost of paid salaries to the employer is calculated as 70,626.67 TL per year, 5,855.56 TL per month and 284.78 TL per day for an employee.
- The annual labor loss cost per patient when HFrEF patients receive outpatient treatment is 482.88 TL, and the annual labor loss cost per patient when inpatient treatment is 2,603.18 TL and the annual average labor loss cost was calculated as 895.49 TL.

Annual Average Cost of
HFrEF Labor Loss Per Patient
895.49 TL

Average Labor Cost per Patient

Labor loss cost, weighted	895.49 TL
Labor loss cost of outpatients	482.88 TL
Labor loss cost of inpatients	2,603.18 TL

TÜİK: Turkish Statistical Institute

HFrEF: Heart Failure with reduced Ejection Fraction

14. Türkiye İstatistik Kurumu, Gelir ve Yaşam Koşulları Araştırması, 2020

Annual Treatment and Labor Loss Costs per Patient for HFrEF Disease

- The cost of outpatient treatment per patient for HFrEF patients was calculated as 6.334.40 TL, the average inpatient treatment cost per inpatient was 601.12 TL and the total cost of treatment per patient was calculated as 6.935.52 TL. The average labor loss cost per patient was calculated as 895.49 TL.
- The cost of outpatient treatment for HFrEF patients with diabetes and kidney failure was calculated as 9,493,10 TL, the average inpatient treatment cost per inpatient was 900.87 TL, and the cost of treatment per patient was 10,393.96 TL. The cost of labor loss per patient was calculated as 1,275.48 TL.

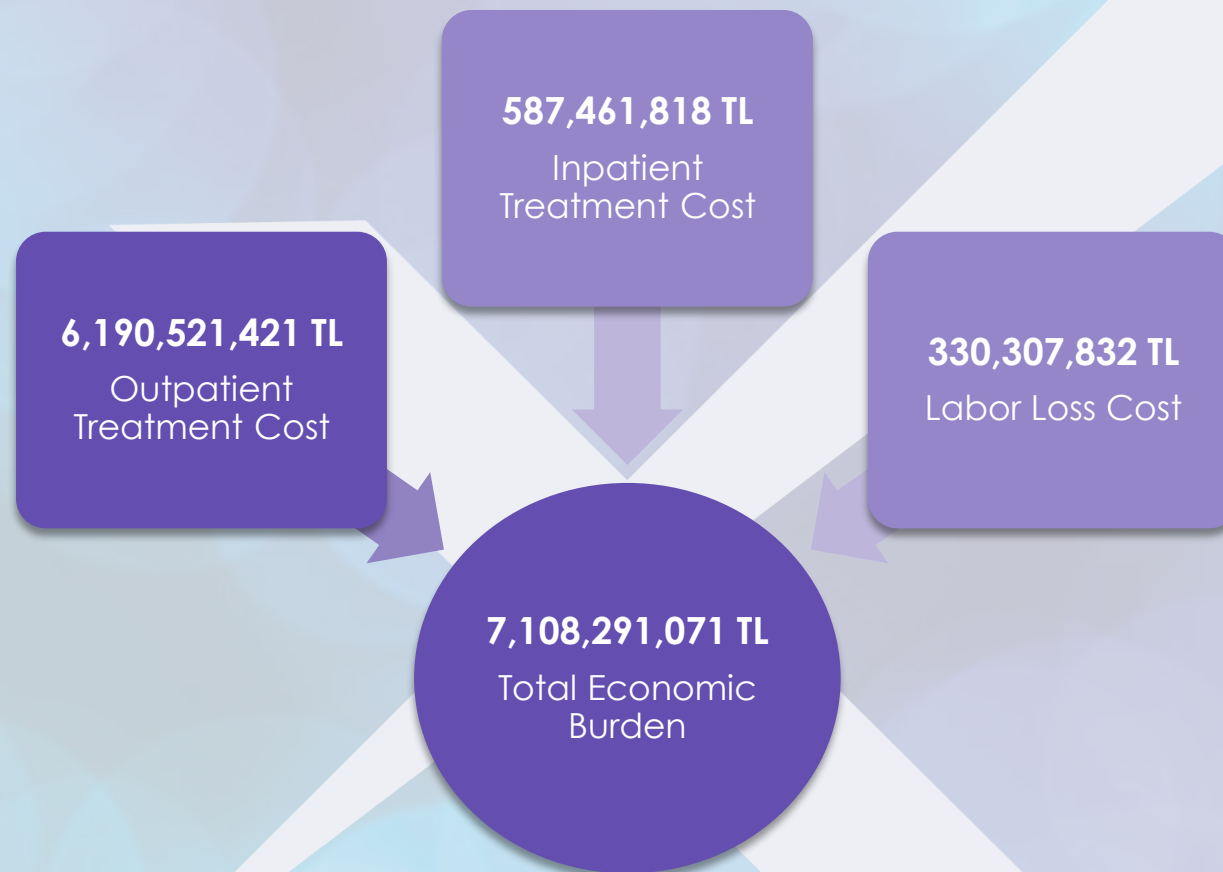
Annual Per Patient
HFrEF Total Direct and Indirect Costs
7,831.00 TL

	Cost of Outpatient Treatment Per Patient	Cost of In patient Treatment Per Patient	Cost of Labor Loss per Patient	Direct and Indirect Cost per Patient
HFrEF	6.334,40 TL	601,12 TL	895,49 TL	7.831,00 TL
DM+ KF+	9.493,10 TL	900,87 TL	1.275,48 TL	11.669,45 TL
DM+ KF-	6.177,55 TL	586,23 TL	890,29 TL	7.654,06 TL
DM- KF+	9.010,39 TL	855,06 TL	1.064,78 TL	10.930,23 TL
DM- KF-	5.597,26 TL	531,16 TL	829,93 TL	6.958,35 TL

DM: Diyabet Mellitus, **KF:** Kidney Failure
HFrEF: Heart Failure with reduced Ejection Fraction

Annual Total Economic Burden of HFrEF Disease

- The annual total economic burden of HFrEF disease was calculated as **7,108,291,071 TL**.
- The annual total treatment cost of HFrEF was calculated as **6,777,983,239 TL**. 6,190,521,421 TL consists of outpatient treatment and 587,461,818 TL inpatient treatment costs.
- The annual total labor loss cost due to HFrEF disease was calculated as **330,307,832 TL**.



A person wearing a striped shirt is reading a newspaper. The image is overlaid with a dark blue filter. A purple rounded rectangle is centered in the lower half of the image, containing the word 'REFERENCES' in white capital letters.

REFERENCES

1. Cook, C., Cole, G., Asaria, P., Jabbour, R., & Francis, D. P. (2014). The annual global economic burden of heart failure. *International journal of cardiology*, 171(3), 368-376.
2. Savarese, G., & Lund, L. H. (2017). Global public health burden of heart failure. *Cardiac failure review*, 3(1), 7.
3. Van Riet, E. E., Hoes, A. W., Wagenaar, K. P., Limburg, A., Landman, M. A., & Rutten, F. H. (2016). Epidemiology of heart failure: the prevalence of heart failure and ventricular dysfunction in older adults over time. A systematic review. *European journal of heart failure*, 18(3), 242-252.
4. Khan, M. S., Samman Tahhan, A., Vaduganathan, M., Greene, S. J., Alrohaibani, A., Anker, S. D., ... & Butler, J. (2020). Trends in prevalence of comorbidities in heart failure clinical trials. *European journal of heart failure*, 22(6), 1032-1042.
5. Mentz, R. J., & Felker, G. M. (2013). Noncardiac comorbidities and acute heart failure patients. *Heart failure clinics*, 9(3), 359-367.
6. Iyngkaran, P., Majoni, W., Cass, A., Sanders, P., Ronco, C., Brady, S., ... & Thomas, M. C. (2015). Northern territory perspectives on heart failure with comorbidities—understanding trial validity and exploring collaborative opportunities to broaden the evidence base. *Heart, Lung and Circulation*, 24(6), 536-543.
7. Chioncel, O., Lainscak, M., Seferovic, P. M., Anker, S. D., Crespo-Leiro, M. G., Harjola, V. P., ... & Filippatos, G. (2017). Epidemiology and one-year outcomes in patients with chronic heart failure and preserved, mid-range and reduced ejection fraction: an analysis of the ESC Heart Failure Long-Term Registry. *European journal of heart failure*, 19(12), 1574-1585.
8. Armstrong, P. W., Pieske, B., Anstrom, K. J., Ezekowitz, J., Hernandez, A. F., Butler, J., ... & O'Connor, C. M. (2020). Vericiguat in patients with heart failure and reduced ejection fraction. *New England Journal of Medicine*, 382(20), 1883-1893.
9. Sosyal Güvenlik Kurum, Sağlık Uygulama Tebliği, 2021.
10. ECONALiX, İlaç Takip Uygulaması, 2021.
11. Türkiye İstatistik Kurumu, Yıl Ortası Nüfus Verileri Projeksiyonu, Şubat 2021.
12. Değertekin M, Erol Ç, Ergene O, Tokgözoğlu L, Aksoy M, Erol M, et al. Türkiye'deki kalp yetersizliği prevalansı ve öngördürücüleri: HAPPY çalışması. *Türk Kardiyol Dern Arş* 2012;40(4):298-308.
13. Özlek, B., Özlek, E., Çelik, O., Çil, C., Doğan, V., Tekinalp, M., ... & Biteker, M. (2018). Rationale, Design, and Methodology of the APOLLON trial: A comprehensive, observational registry of heart failure with mid-range and preserved ejection fraction. *Anatolian journal of cardiology*, 19(5), 311.
14. Türkiye İstatistik Kurumu, Gelir ve Yaşam Koşulları Araştırması, 2020



Contact

Offices

 Etiler Mh. Seheryıldızı Sk. No:23/9
Beşiktaş, İstanbul, Türkiye

Harju maakond, Kesklinna linnaosa,
Tornimäe tn 5 Tallinn, 10145, Estonya

26 Avenue Mohamed Abdelwaheb,
Tunis, 2092, Tunus

Research and Development Center

Samsun OMU Atakum Campus Teknopark
Atakum/ Samsun, Türkiye

 + 90 850 255 19 34

heor@econix.net



econix.net

econix

econix
Estonia – Tunisia - Turkiye

www.econix.net