

Satisfaction of healthcare consumers: Analysis and comparison of different methodologies



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INTRODUCTION

1. INTRODUCTION

CONTEXTUALIZATION

Healthcare expenditure
impact (%) on GDP:

2016 → 9.4%

2017 → 9.3%

2018 → 9.4%

2019 → 9.5%

26% of total healthcare
expenditure is allocated to the
internment service
(data concerning the year 2017)



Portugal

Number of hospitals:
(data concerning the year 2018):

Private hospitals: 119

Public hospitals: 107

1. INTRODUCTION

OBJECTIVES

Despite the existence of a strong legal and political commitment to the well-being of society, health inequalities are an issue in Portugal. Hence, adjustments need to be made to increase the efficiency and quality of health services. In Portugal, specifically, satisfaction studies are held on a national level. This keeps the results from translating the actual reality of each health unit.



To apply distinct methodologies in order to evaluate the effect and impact of patients' partial satisfaction in their global satisfaction related to a single healthcare unit.

STRUCTURE OF HEALTHCARE IN PORTUGAL

2. STRUCTURE OF HEALTHCARE IN PORTUGAL

The three main stakeholders in the Portuguese health system are:

- ① The State → **Created the National Health Service in 1979**
- ② The public sector
- ③ The private sector

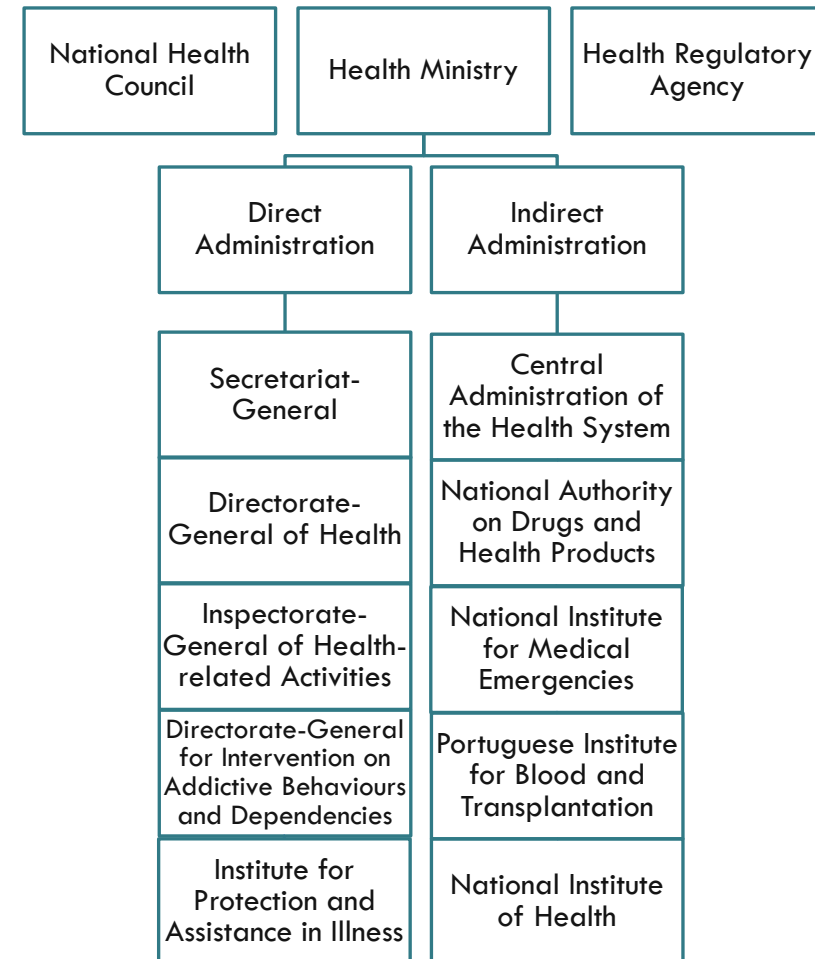


Figure 1. Structure of the Portuguese Health System.

LITERATURE REVIEW

3. LITERATURE REVIEW

GENERAL OVERVIEW

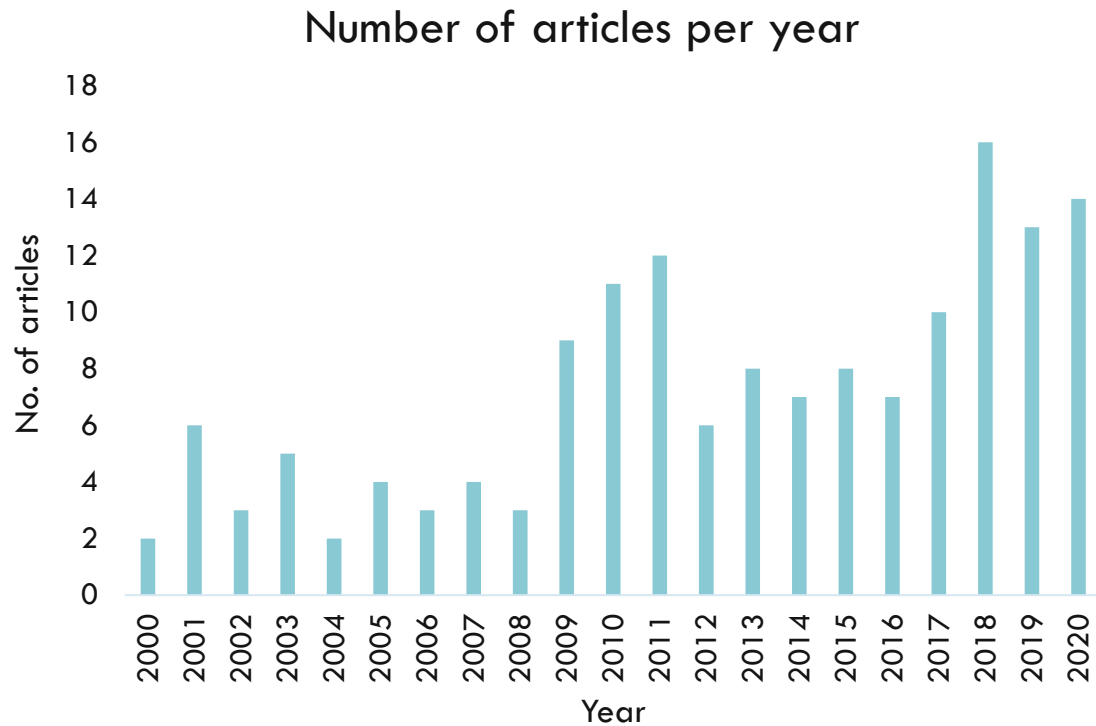


Figure 2. Number of published articles throughout the years.

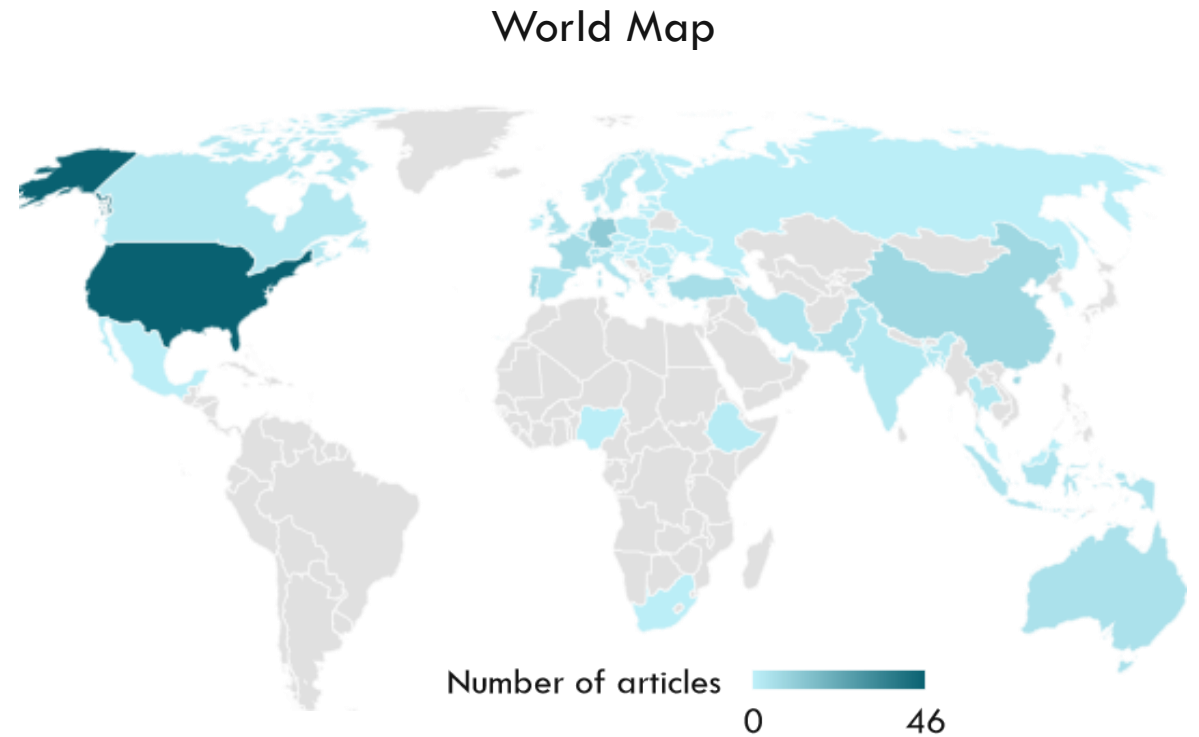


Figure 3. Country of study distribution.

3. LITERATURE REVIEW

UTILIZATION ANALYSIS

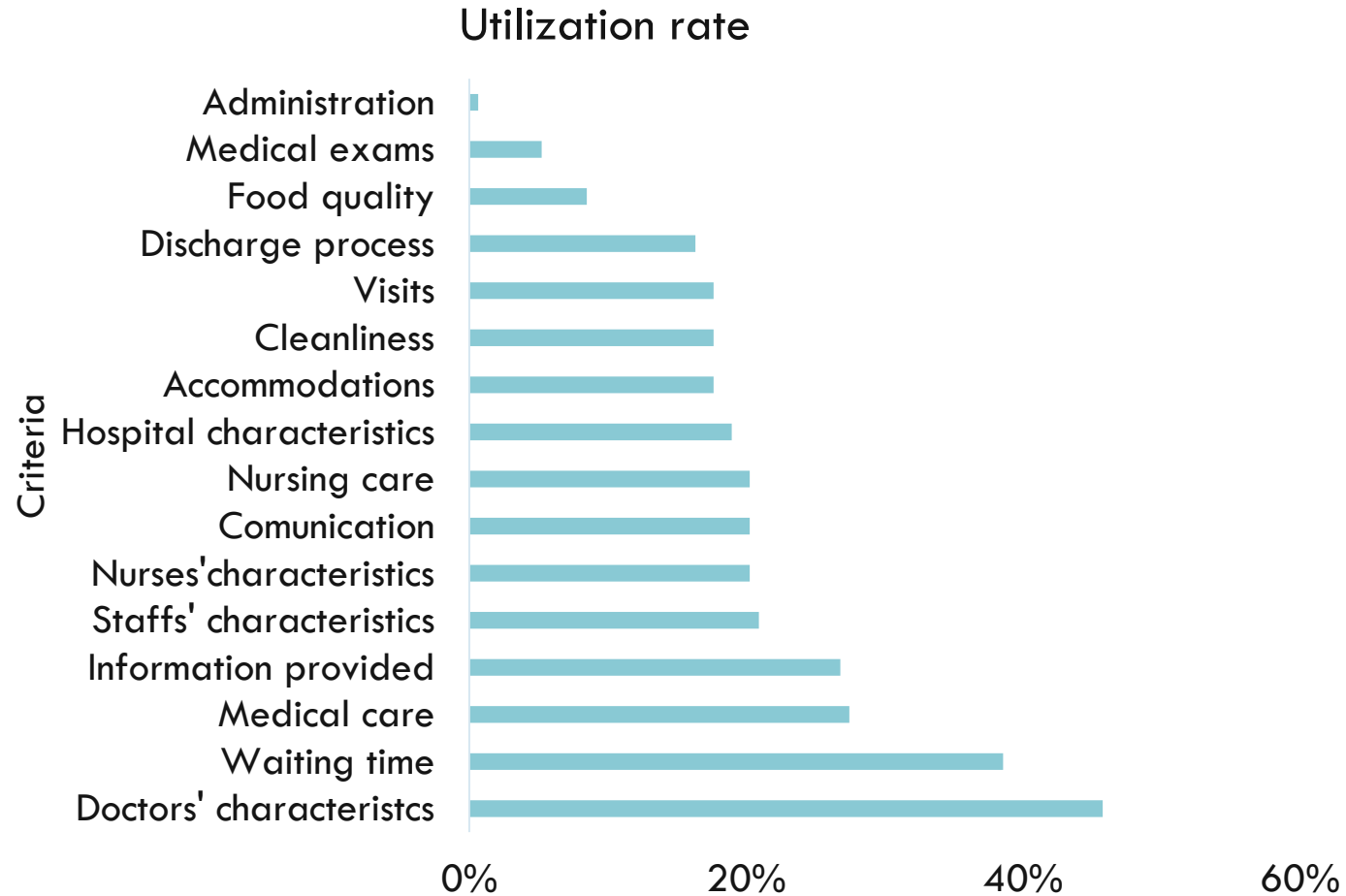


Figure 4. Analysis of utilized criteria in the literature.

3. LITERATURE REVIEW

INFLUENCE ANALYSIS

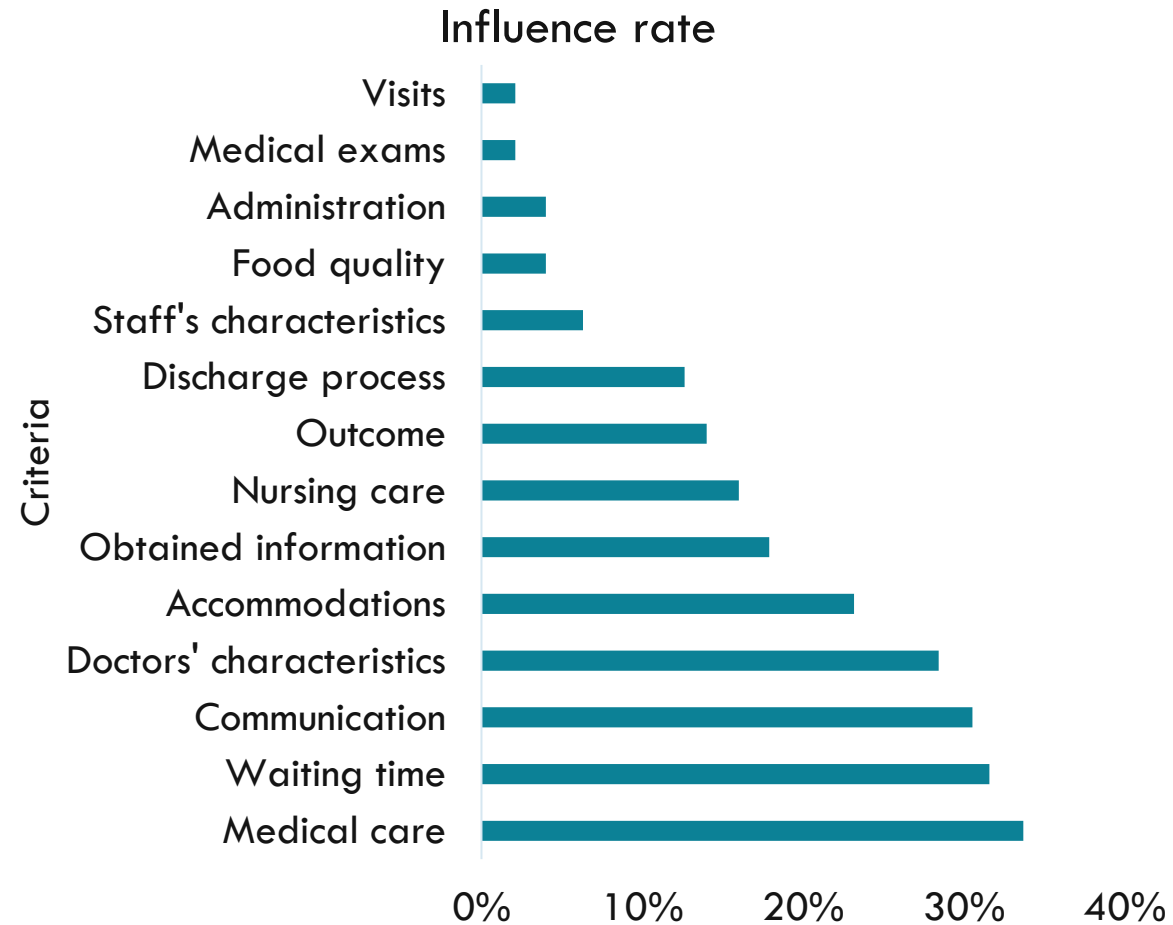


Figure 5. Analysis of most influential criteria in the literature.

METHODOLOGY

4. METHODOLOGY PRESENT IN THE LITERATURE REVIEW

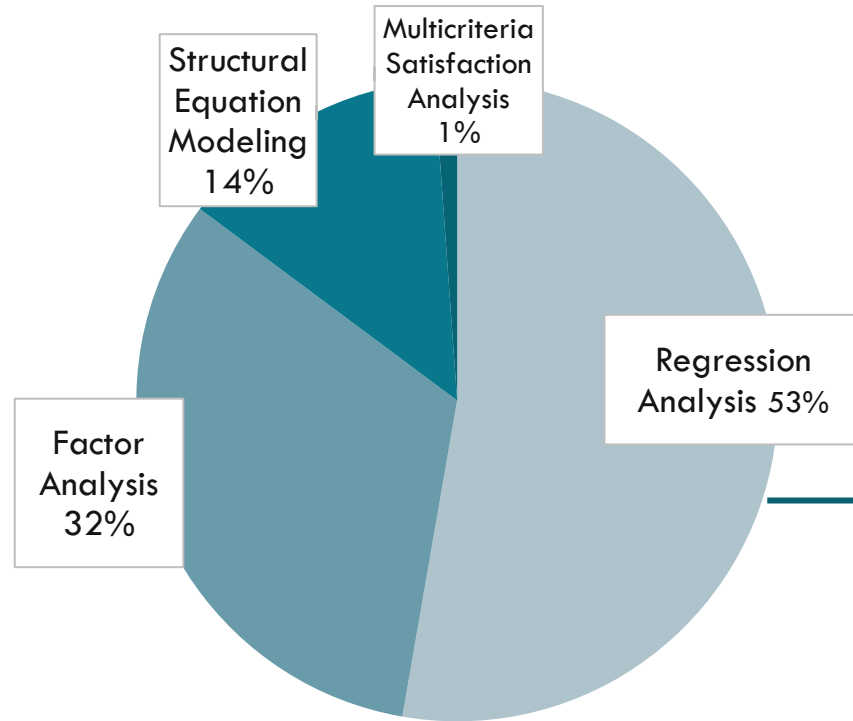


Figure 6. Utilization rate of each method.

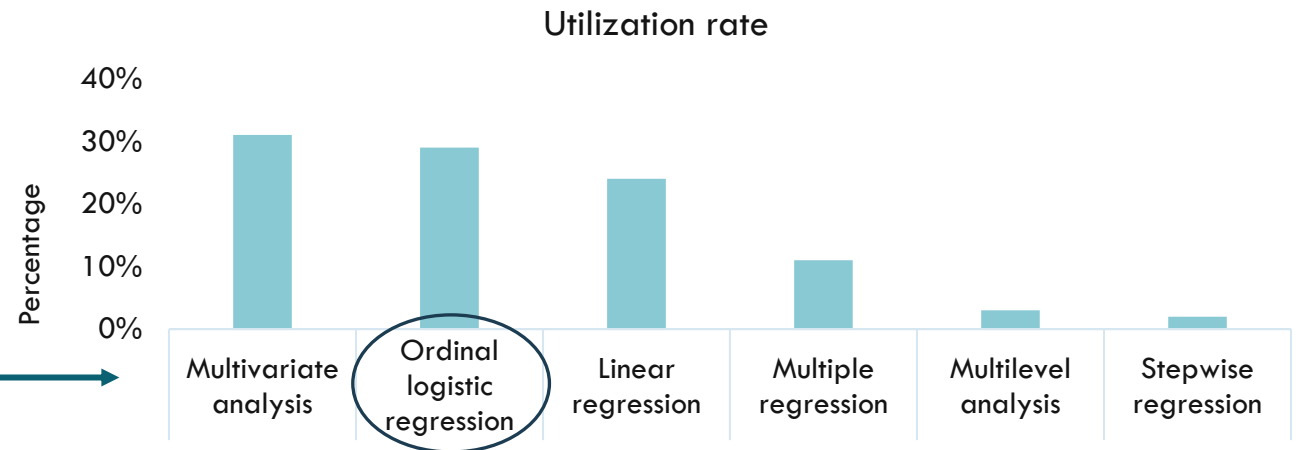


Figure 7. Utilization rate of each regression analysis method.

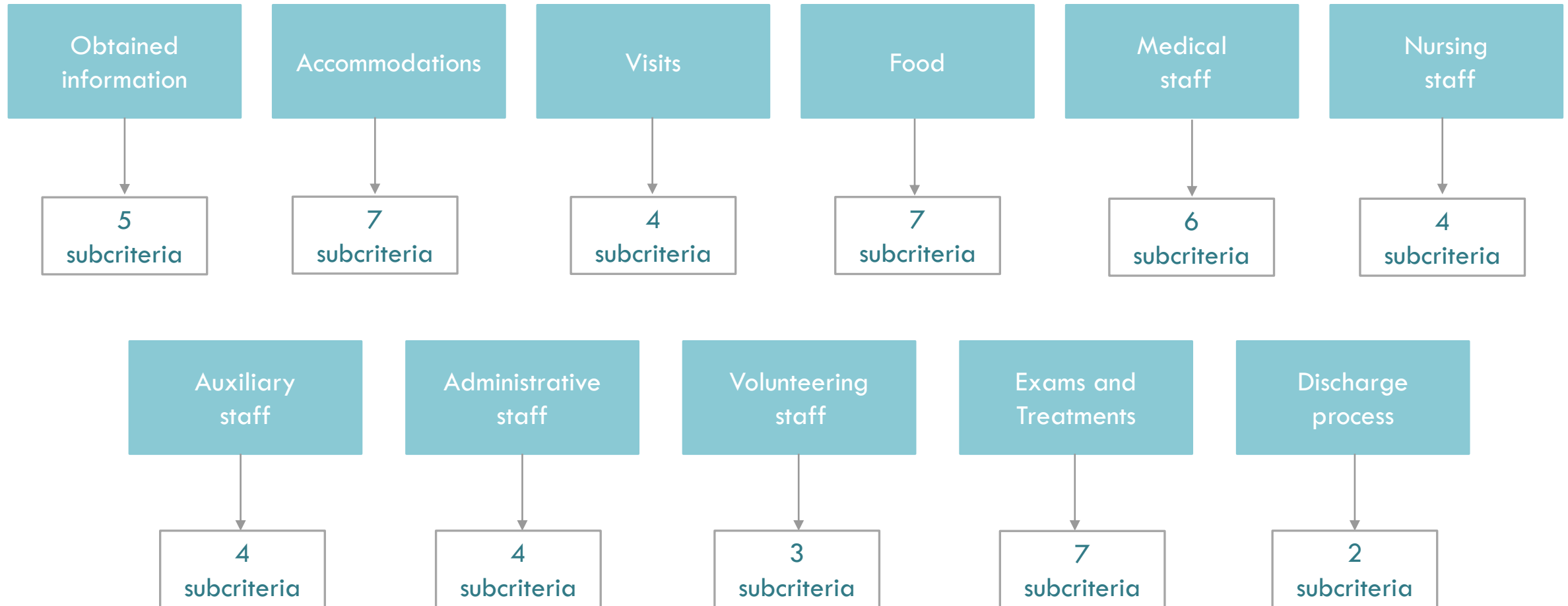
Factor Analysis is used in a **complementary** manner, being the first step of the analysis. Ordinal logistic regression, Structural equation modeling, and Multicriteria Satisfaction Analysis are used in a **comparative** manner.

CASE STUDY

5. CASE STUDY

SAMPLE

65 questions
11 criteria
53 subcriteria



5. CASE STUDY

PATIENTS' DISTRIBUTION (251 PATIENTS OF THE INTERNMENT SERVICE)

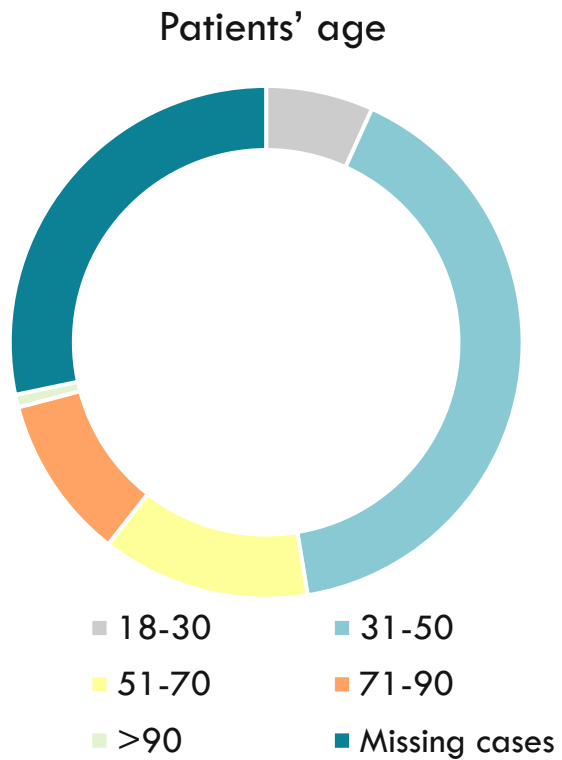


Figure 8. Patient's age distribution.

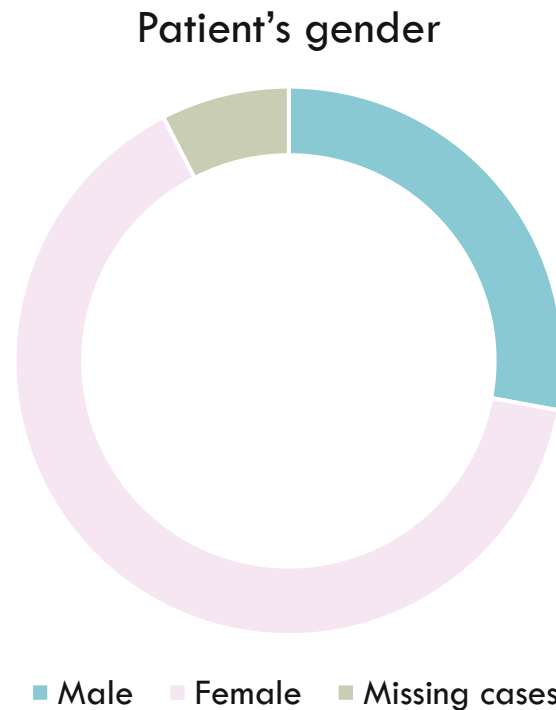


Figure 9. Patient's gender distribution.

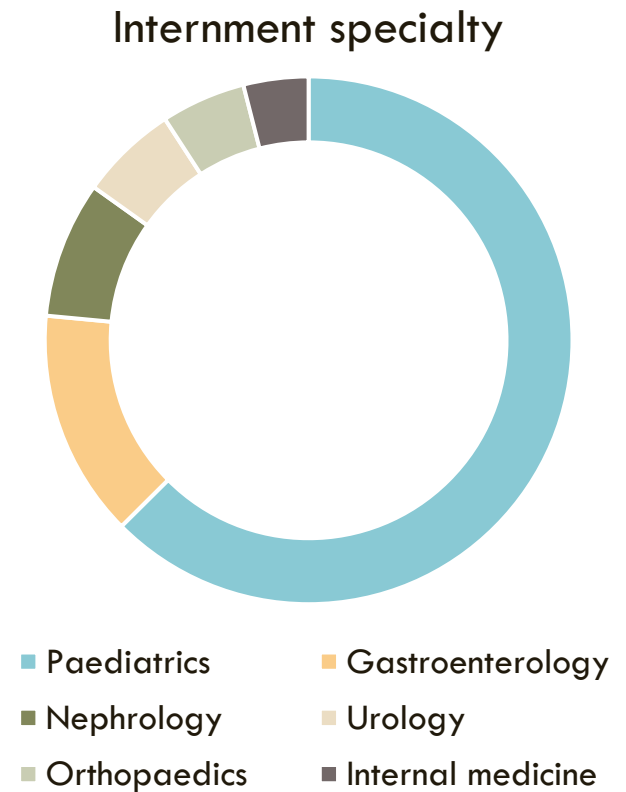


Figure 10. Internment specialty distribution.

IMPLEMENTATION AND RESULTS

6. IMPLEMENTATION AND RESULTS

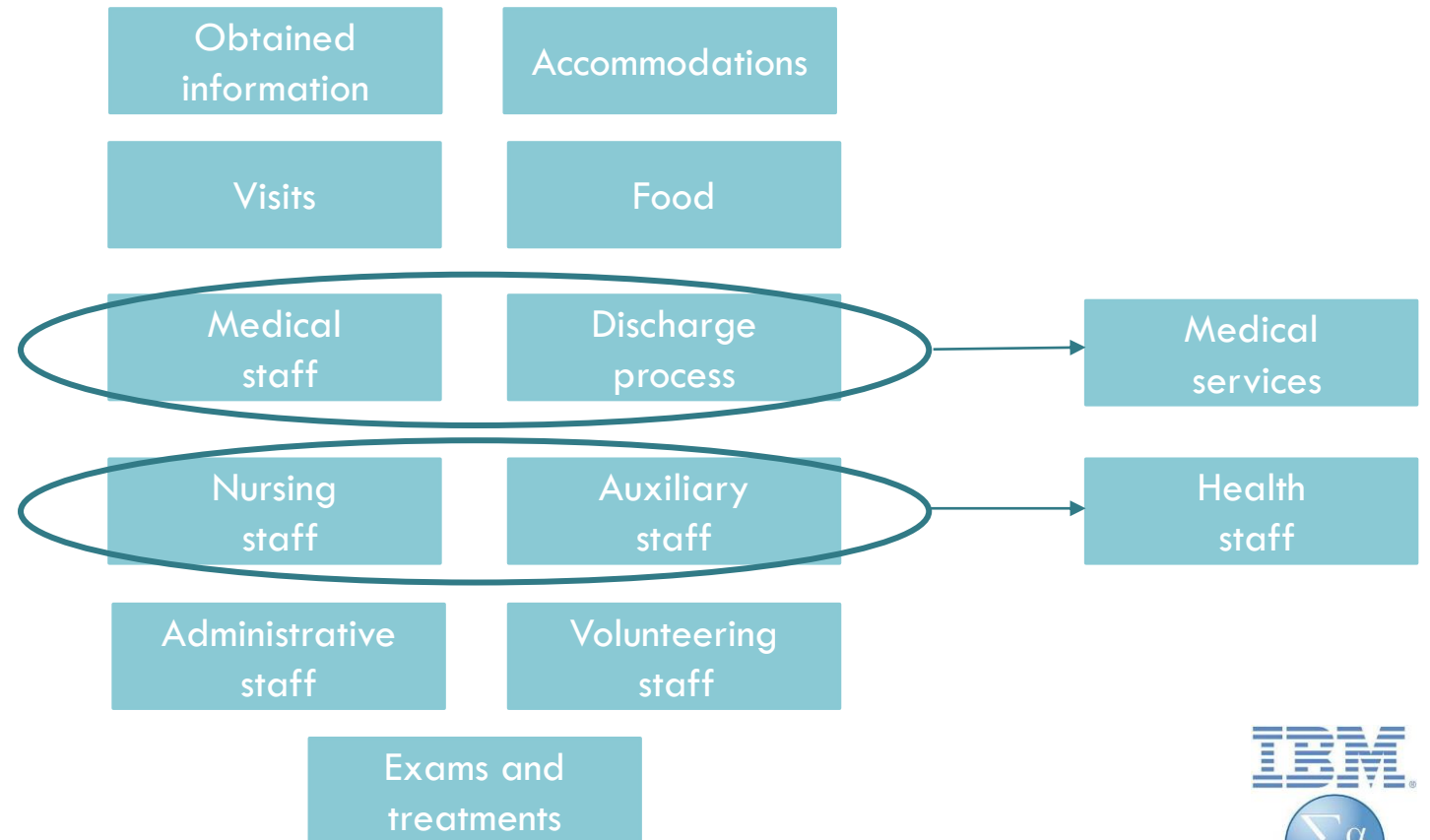
FACTOR ANALYSIS

IS THERE A SIGNIFICATIVE DIFFERENCE BETWEEN THE TWO GENDERS?

- ⊗ ANOVA (p-value>0.05);
- ⊗ Mann-Whitney U test (p-value>0.05);
- ⊗ Independent t-test (p-value>0.05);

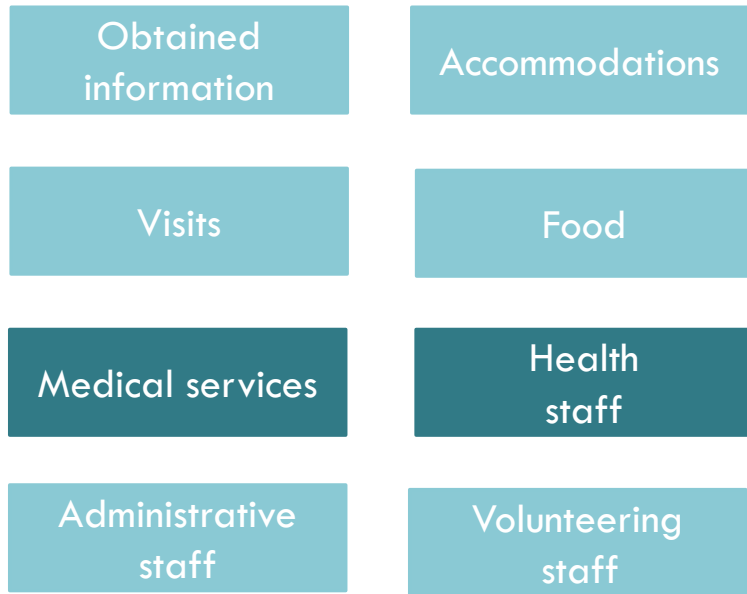
$H_0: \mu_{Female} = \mu_{Male}$ vs $H_1: \mu_{Female} \neq \mu_{Male}$

The null hypothesis is not rejected



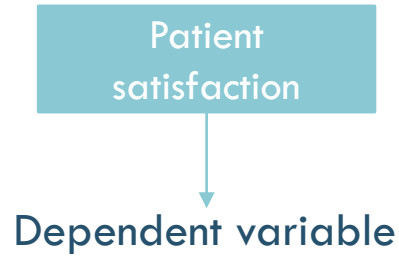
6. IMPLEMENTATION AND RESULTS

Analysis A

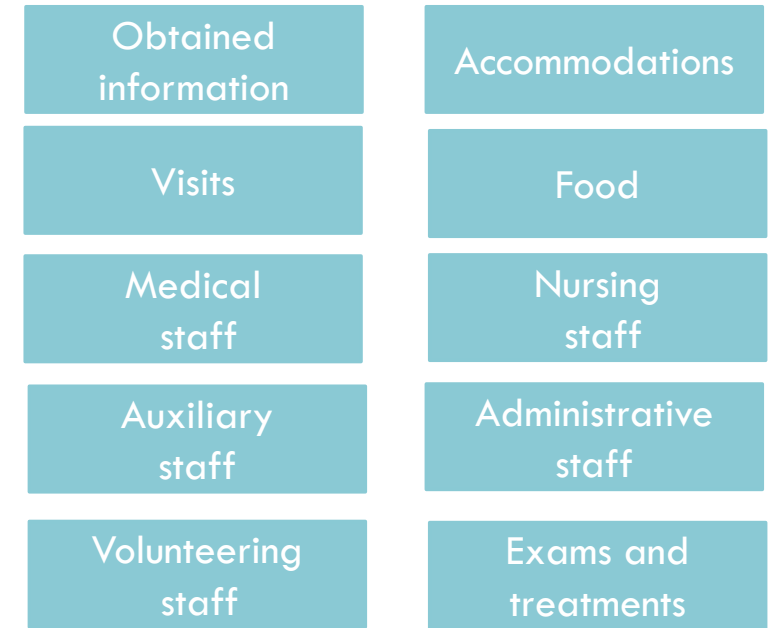


Exams and treatments

9 criteria
53 subcriteria



Analysis B



Discharge process

11 criteria
53 subcriteria

6. IMPLEMENTATION AND RESULTS

STRUCTURAL EQUATION MODELING – ANALYSIS A

- 1 Initial stability analysis – Poor adjustment;
(GFI, CFI, NFI < 0.8; PGFI < 0.6; RMSEA > 0.1);
- 2 Removal of outliers;
- 3 Second stability analysis – Poor adjustment;
(GFI, CFI, NFI < 0.8; PGFI < 0.6; RMSEA > 0.1);
- 4 Establishment of modification indices and removal of subcriteria belonging to *health staff*;
- 5 Third stability analysis- Fair adjustment;
(GFI < 0.8; CFI,NFI> 0.8; PCFI, PGFI, PNFI >0.6; RMSEA < 0.9);
- 6 Establishment of modification indices and removal of subcriteria belonging to *medical services and exams and treatments*;
- 7 Final stability analysis – Good adjustment
(GFI<0.8; CFI >0.9; NFI> 0.8; PCFI > 0.6. PGFI>0.8. PNFI>0.7).

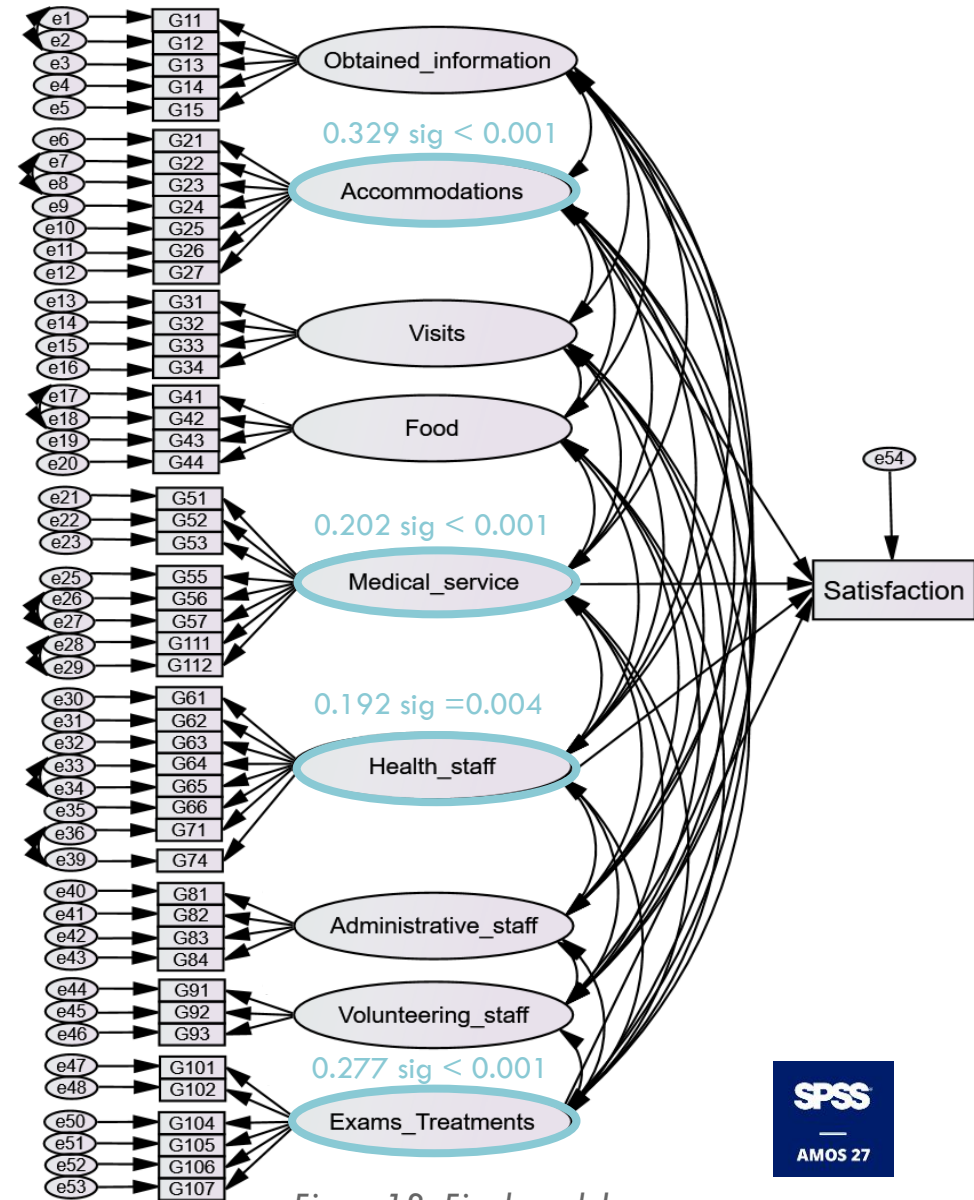


Figure 13. Final model.

6. IMPLEMENTATION AND RESULTS

STRUCTURAL EQUATION MODELING – ANALYSIS B

- 1 Removal of outliers;
- 2 $R^2 > 0.500$ – Demonstrating good fit of the model.

| Criteria | Weight | P-value |
|----------------------|--------|---------|
| Auxiliary staff | 0.408 | <0.001 |
| Exams and treatments | 0.395 | <0.001 |
| Medical staff | 0.362 | <0.001 |
| Accommodations | 0.271 | <0.001 |

Tabel 1. SEM results – Analysis B.

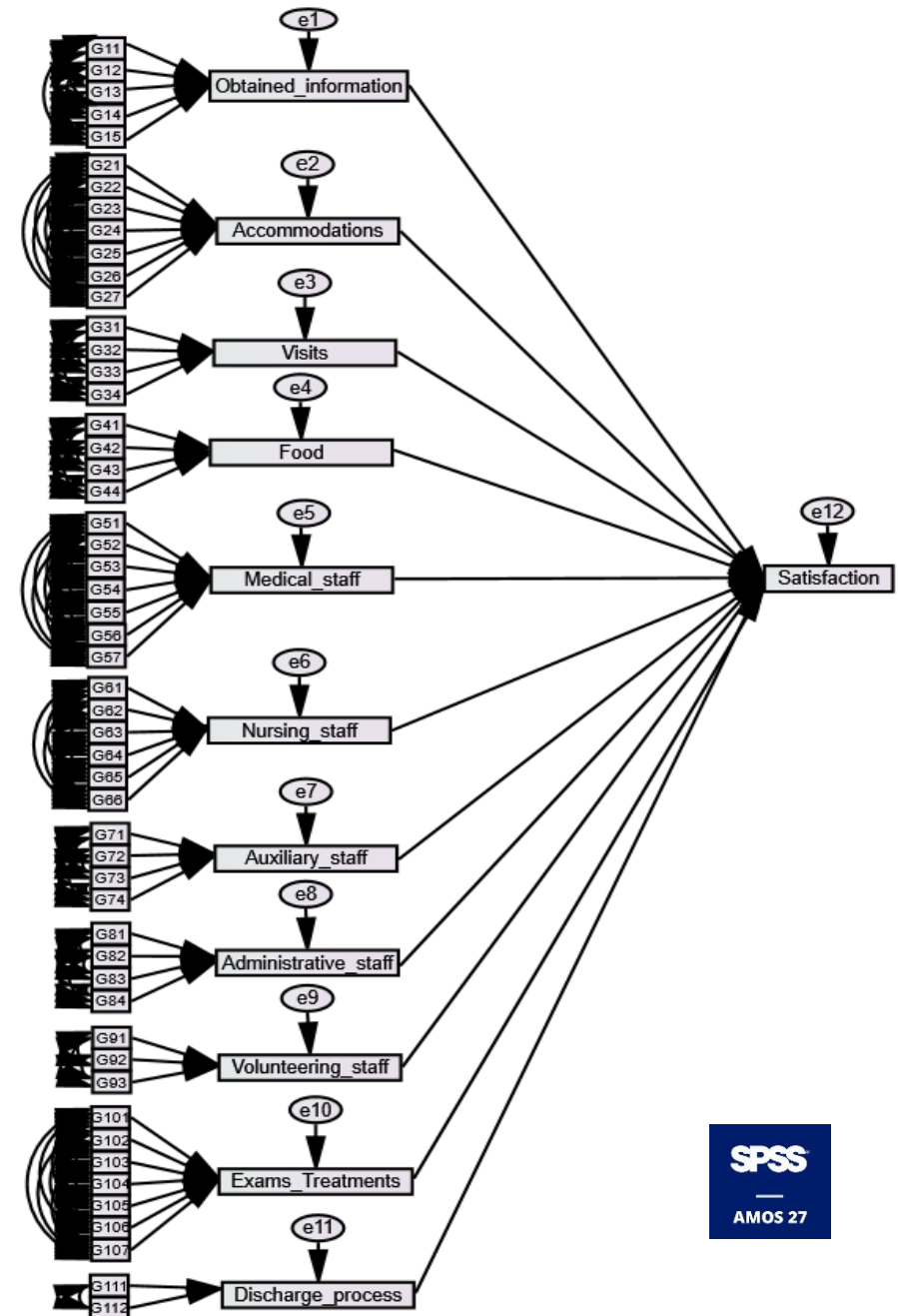


Figure 14. Final model.

6. IMPLEMENTATION AND RESULTS

STRUCTURAL EQUATION MODELING – ANALYSIS A VS ANALYSIS B

| Analysis A | Analysis B | Final analysis |
|---|----------------------|----------------------|
| Accommodations | Auxiliary staff | Accommodations |
| Exams and Treatments | Exams and treatments | Auxiliary staff |
| Medical services (Medical staff + Discharge process) | Medical staff | Exams and treatments |
| Health staff (Nursing staff + Auxiliary staff) | Accommodations | Medical staff |

Tabel 2. Results comparison – Structural Equation Modeling.



The differences that emerge might be due to misjudgments attributed, by SEM, to latent constructs. Since in analysis A criteria were treated as latent variables, their values were created by SEM and do not correspond to the real values used in analysis B.

6. IMPLEMENTATION AND RESULTS

ORDINAL LOGISTIC REGRESSION – ANALYSIS A

- ✓ Likelihood ratio X^2 test: p-value < 0.001;
- ✓ Pearson and deviance tests: p-value = 1.000;
- ✓ Pseudo R^2 (Cox and Snell; Nagelkerke; McFadden) > 0.500;
- ✓ Parallel lines test: p-value = 0.983.

| Location | OR | p-value | OR 95% confidence interval | |
|----------------------|-------|---------|----------------------------|-------------|
| | | | Lower bound | Upper bound |
| Obtained information | 0.844 | 0.440 | 0.548 | 1.298 |
| Accommodations | 4.937 | 0.001 | 2.005 | 12.146 |
| Visits | 0.941 | 0.743 | 0.654 | 1.352 |
| Food Quality | 1.934 | 0.065 | 0.958 | 3.900 |
| Medical services | 2.201 | 0.012 | 1.191 | 4.063 |
| Health staff | 1.532 | 0.285 | 0.701 | 3.347 |
| Administrative staff | 0.865 | 0.532 | 0.549 | 1.361 |
| Voluntary staff | 0.896 | 0.570 | 0.609 | 1.315 |
| Exams and treatments | 2.673 | 0.000 | 1.657 | 4.310 |

Tabel 3. Ordinal logistic regression results – analysis A.

6. IMPLEMENTATION AND RESULTS

ORDINAL LOGISTIC REGRESSION – ANALYSIS B

- ✓ Likelihood ratio X^2 test: p-value < 0.001;
- ✗ Pearson's test: p-value < 0.050;
- ✓ Deviance test: p-value > 0.050;
- ✓ Pseudo R^2 (Cox and Snell; Nagelkerke; McFadden) > 0.500;
- ✓ Parallel lines test: p-value = 0.994.

| Location | OR | p-value | OR 95% confidence interval | |
|----------------------|-------|---------|----------------------------|-------------|
| | | | Lower bound | Upper bound |
| Obtained information | 0.964 | 0.835 | 0.677 | 1.370 |
| Accommodations | 2.401 | 0.000 | 1.582 | 3.644 |
| Visits | 0.925 | 0.664 | 0.649 | 1.317 |
| Food quality | 1.045 | 0.799 | 0.748 | 1.459 |
| Medical staff | 1.270 | 0.214 | 0.871 | 1.850 |
| Nursing staff | 1.311 | 0.445 | 0.654 | 2.633 |
| Auxiliary staff | 3.582 | 0.000 | 1.846 | 6.959 |
| Administrative staff | 1.100 | 0.716 | 0.658 | 1.839 |
| Voluntary staff | 0.851 | 0.424 | 0.573 | 1.264 |
| Exams and treatments | 2.646 | 0.000 | 1.660 | 4.216 |
| Discharge process | 1.438 | 0.068 | 0.973 | 2.123 |

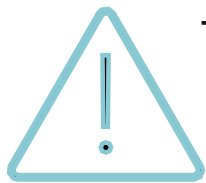
Tabel 4. Ordinal logistic regression results – analysis B.

6. IMPLEMENTATION AND RESULTS

ORDINAL LOGISTIC REGRESSION – ANALYSIS A VS ANALYSIS B

| Analysis A | Analysis B | Final analysis |
|--|----------------------|----------------------|
| Accommodations | Auxiliary staff | Accommodations |
| Exams and treatments | Exams and treatments | Exams and treatments |
| Medical services (Medical staff+ Discharge process) | Accommodations | |

Tabel 5. Results comparison – Ordinal logistic regression.



The differences that emerge might be due to misjudgments attributed, by SEM, to latent constructs. Since in analysis A criteria were treated as latent variables, their values were created by SEM and do not correspond to the real values used in analysis B.

6. IMPLEMENTATION AND RESULTS

MULTICRITERIA SATISFACTION ANALYSIS



| Criteria | Weight [0-1] | Satisfaction index [0-100%] | Demanding index [-1;1] | Room for improvement [0-100%] | Unsatisfied patients | Satisfied patients | Kano's model category |
|----------------------|-----------------|-----------------------------------|------------------------------|-------------------------------------|-------------------------|-----------------------|-----------------------|
| Obtained information | 0.1144 | 9.4400 | 0.0200 | 10.3601 | 0.1106 | 0.1377 | Highly attractive |
| Accommodations | 0.0557 | 4.1600 | 0.2100 | 5.3383 | 0.8168 | 0.2944 | Must-be, necessary |
| Visits | 0.0902 | 7.7900 | -0.0600 | 8.3173 | 0.9837 | 0.1117 | Less attractive |
| Food quality | 0.1262 | 9.2500 | 0.3400 | 11.4527 | 0.1477 | 0.8661 | Must-be, critical |
| Medical staff | 0.0804 | 6.2600 | 0.4400 | 7.5367 | 0.0811 | 0.0239 | Must-be, necessary |
| Nursing staff | 0.0892 | 7.9000 | 0.2500 | 8.2153 | 0.0561 | 0.1264 | Less attractive |
| Auxiliary staff | 0.0836 | 7.8100 | -0.1500 | 7.7071 | 0.0626 | 0.1035 | Less attractive |
| Administrative staff | 0.0873 | 7.5200 | -0.1000 | 8.0735 | 0.0877 | 0.1099 | Less attractive |
| Voluntary staff | 0.1163 | 9.0400 | 0.1100 | 10.5786 | 0.1305 | 0.1124 | Must-be, critical |
| Exams and treatments | 0.0748 | 6.1400 | 0.0800 | 0.0000 | 0.0737 | 0.0936 | Less attractive |
| Discharge process | 0.0819 | 6.5700 | 0.3300 | 7.6519 | 0.0699 | 0.0650 | Must-be, necessary |
| Centroid | 0.0909 | 6.2900 | 0.1130 | 6.9621 | | | |

Tabel 6. Multicriteria satisfaction analysis results.

6. IMPLEMENTATION AND RESULTS

MULTICRITERIA SATISFACTION ANALYSIS

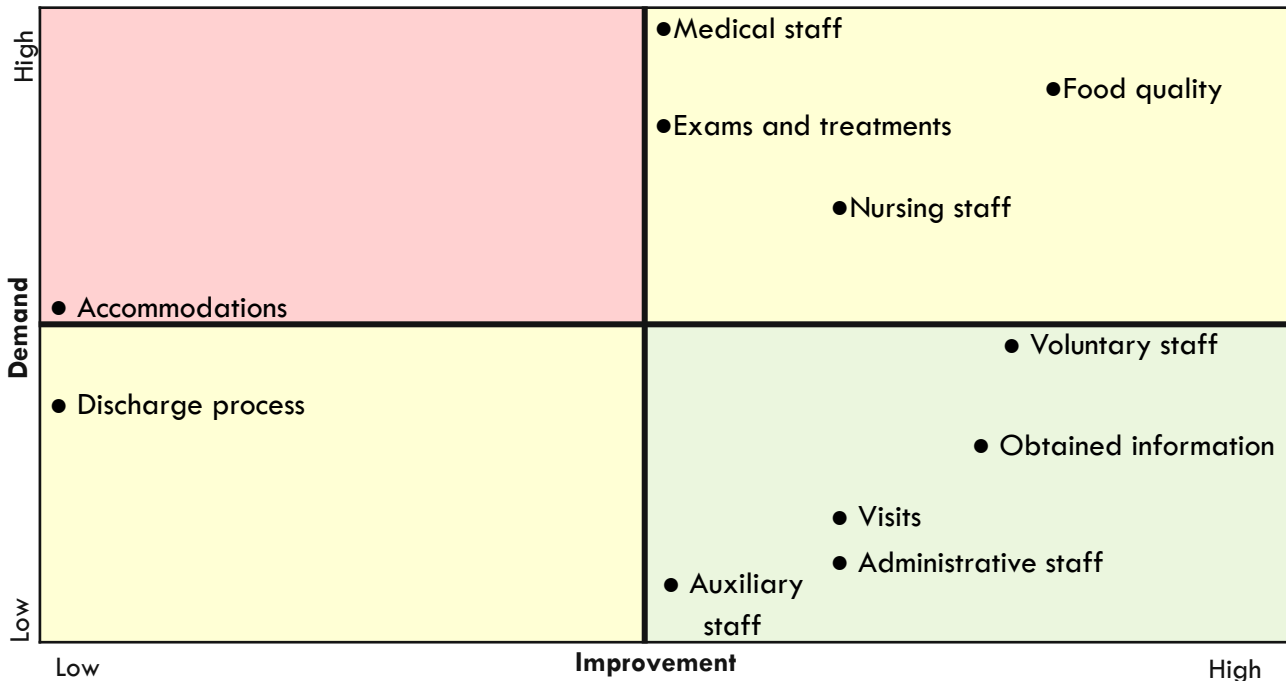


Figure 15. Improvement diagram.

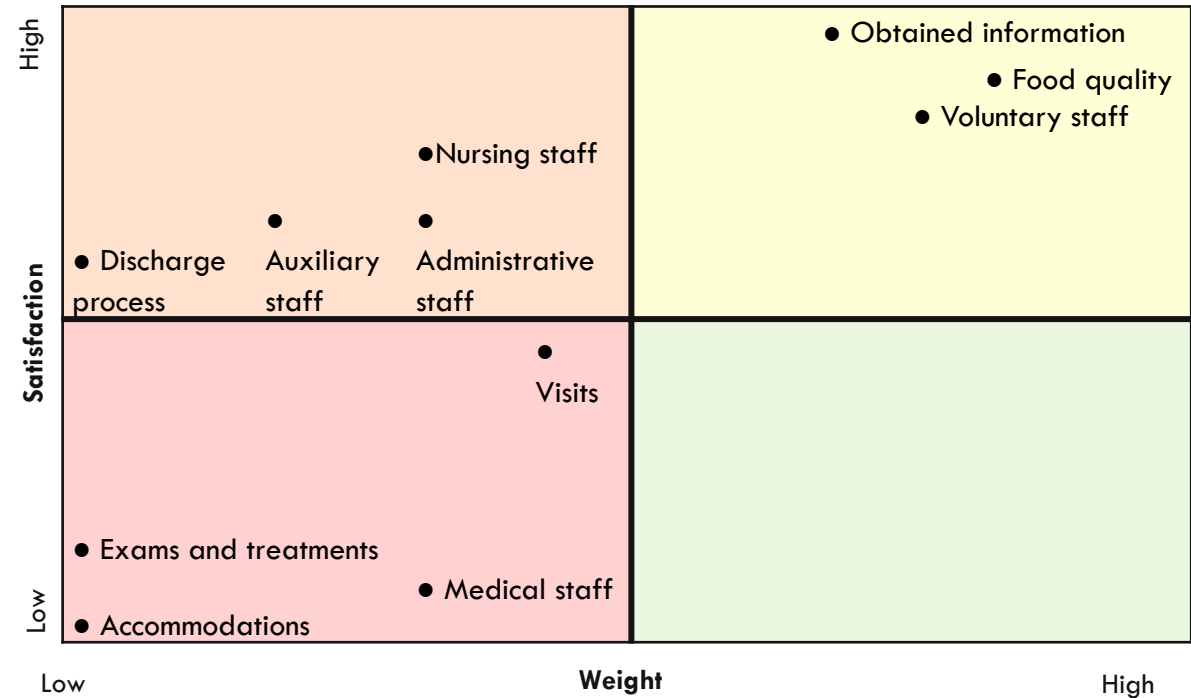


Figure 16. Action diagram.

CONCLUSIONS

7. CONCLUSIONS

Conclusions

Patient satisfaction predictors:

1. Accommodations
2. Exams and treatments
3. Auxiliary staff
4. Medical staff
5. Food quality
6. Voluntary staff
7. Obtained information

Limitations

Bias associated with each method

Structural equation modeling and factor analysis are unsuitable for dealing with ordinal scales

Homoscedasticity principle present on ordinal logistic regression

Multicriteria satisfaction analysis' assumption that criteria/subcriteria are independent of each other

Future work

Identification of different groups of patients

Application of categorical factor analysis in a complementary nature

Implementation of MUSA-INT (Multicriteria Satisfaction Analysis with Interacting Criteria)

THANK YOU!