

# Utilizations and Spending of Low-Value Healthcare under a National Health Insurance program: a nationwide population-based study

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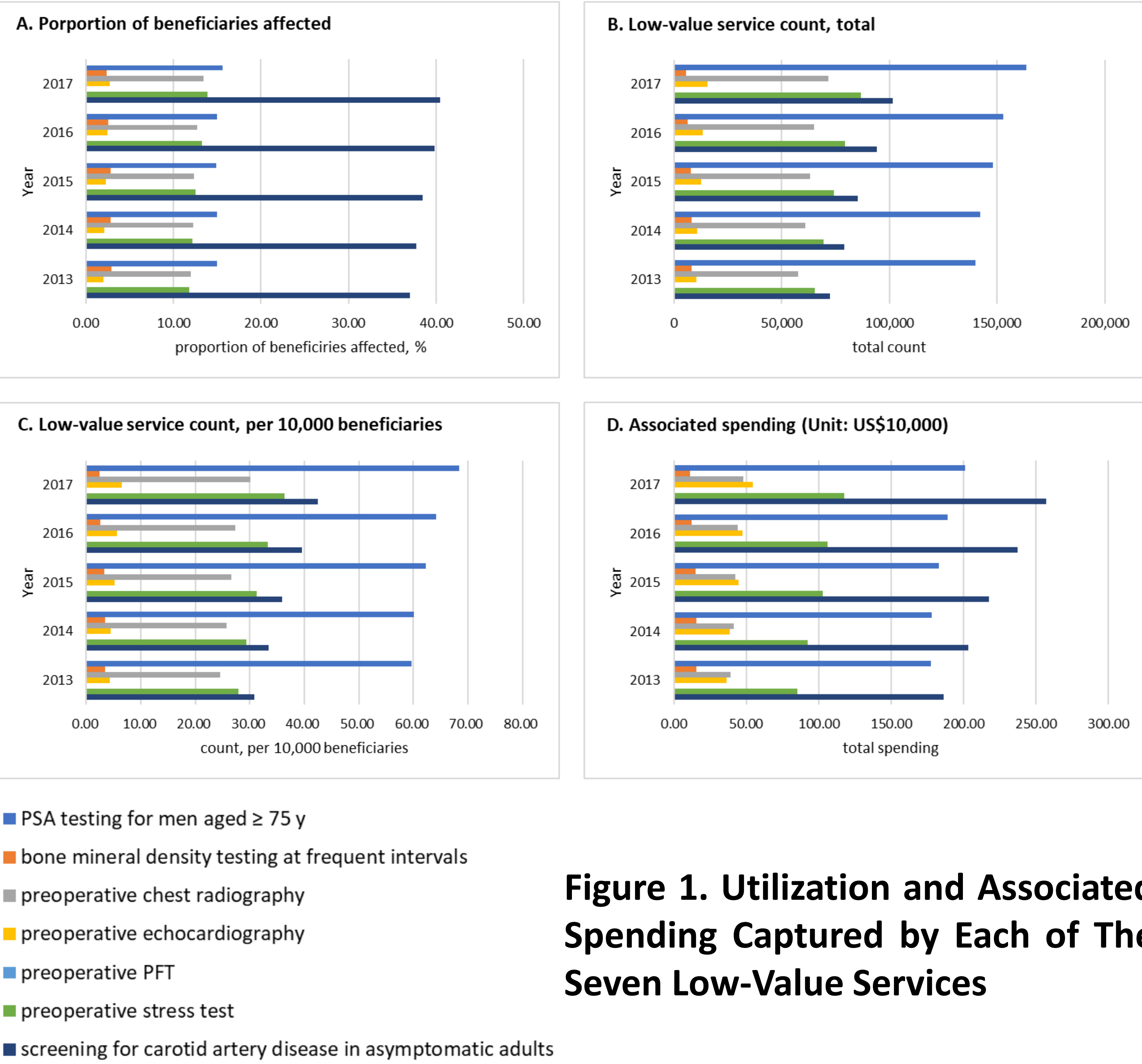
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## OBJECTIVE

Healthcare spending grew rapidly. To deal with the finance shortage of healthcare systems, healthcare resources reallocation has become a critical issue worldwide. Reducing the low-value healthcare utilization not only keeps the healthcare expenditure down but ensures the quality of health care. The objective of this study is to evaluate the prevalence, spending, and correlation of seven low-value healthcare services under the National Health Insurance program (NHI) in Taiwan.

## METHODS

- A longitudinal study was conducted by using NHI claims data during 2013-2017. The proportion of beneficiaries receiving low-value healthcare services, the number of low-value healthcare services, and healthcare spending were estimated.
- Seven low-value services included:
  - PSA testing for men aged  $\geq 75$  y
  - Bone mineral density testing at frequent intervals
  - Four preoperative examination (chest radiography, echocardiography, pulmonary function test, and stress test)
  - Screening for carotid artery disease in asymptomatic adults
  - A composite measure
- Patients who received at least one of the selected low-value services were included. We excluded patients who aged under 20 years old, with unknown gender or with missing information of beneficiaries' data.
- The hierarchical linear model (HLM) and hierarchical generalized linear model (HGLM) were used to estimate the variations and association of low-value healthcare services among hospitals.



**Figure 1. Utilization and Associated Spending Captured by Each of The Seven Low-Value Services**

## RESULTS

- A total of 220 thousands to 271 thousands people receiving at least one selected low-value service which contributed to the total amount of 353,578 to 444,712 low-value services, and the healthcare spending of these seven low-value services was from US\$5.39 million to US\$6.90 million during 2013-2017. (Figure 1)
- Among these seven low-value services, PSA testing for men aged  $\geq 75$  years old, preoperative chest radiography, preoperative echocardiography, preoperative stress test, and screening for carotid artery disease in asymptomatic adults increased from 2013 to 2017. However, bone mineral density testing at frequent intervals decreased during the follow-up period. (Figure 1)
- Medical centers, hospitals with higher ambulatory visits, greater length-of-stay (LOS), higher mean age of the patient and higher average combined comorbidity score of patients led to significantly higher utilization and spending of low-value healthcare services. (Table 1 & 2)

**Table 1. Characteristics of Low-Value Service Counts Per 10,000 Beneficiaries under Composite Measure estimated by HLM**

| Variables                                 | Estimate(SE)  | P      |
|-------------------------------------------|---------------|--------|
| Intercept                                 | -44.28(40.81) | 0.279  |
| Year (Ref=2013)                           |               |        |
| 2014                                      | 3.17(2.17)    | 0.143  |
| 2015                                      | 6.87(2.25)    | 0.002  |
| 2016                                      | 3.10(2.67)    | 0.245  |
| 2017                                      | 13.45(3.09)   | <.0001 |
| Accreditation level (Ref: Medical Center) |               |        |
| Regional hospital                         | -19.69(20.01) | 0.325  |
| Local hospital                            | -45.12(20.81) | 0.030  |
| Ownership (Ref: Public hospital)          |               |        |
| Private hospital                          | -27.33(12.22) | 0.025  |
| Non-profit hospital                       | -15.62(11.85) | 0.188  |
| Volume of ambulatory visits (Ref: <Q1)    |               |        |
| Q1 - Q2                                   | 21.69(5.02)   | <.0001 |
| Q2 - Q3                                   | 60.41(6.82)   | <.0001 |
| $\geq$ Q3                                 | 79.08(9.61)   | <.0001 |
| Volume of length of stay (Ref: <Q1)       |               |        |
| Q1 - Q2                                   | 6.65(4.99)    | 0.183  |
| Q2 - Q3                                   | 5.71(6.84)    | 0.404  |
| $\geq$ Q3                                 | 11.88(9.71)   | 0.222  |
| Average specialist seniority              | -0.69(0.54)   | 0.205  |
| Average patients age                      | 1.85(0.60)    | 0.002  |
| Proportion of male patients               | 36.64(7.16)   | <.0001 |
| Average CCS* of patients                  | 0.89(0.34)    | 0.008  |

**Table 2. Characteristics of Low-Value Spending Estimated by HGLM**

| Variables                                 | Estimate(SE) | P      |
|-------------------------------------------|--------------|--------|
| Intercept                                 | 6.55(0.73)   | <.0001 |
| Year (Ref=2013)                           |              |        |
| 2014                                      | 0.06(0.04)   | 0.161  |
| 2015                                      | 0.09(0.04)   | 0.054  |
| 2016                                      | 0.12(0.06)   | 0.050  |
| 2017                                      | 0.18(0.07)   | 0.006  |
| Accreditation level (Ref: Medical Center) |              |        |
| Regional hospital                         | -1.61(0.37)  | <.0001 |
| Local hospital                            | -2.55(0.38)  | <.0001 |
| Ownership (Ref: Public hospital)          |              |        |
| Private hospital                          | -0.71(0.22)  | 0.002  |
| Non-profit hospital                       | -0.11(0.22)  | 0.613  |
| Volume of ambulatory visits (Ref: <Q1)    |              |        |
| Q1 - Q2                                   | 1.04(0.09)   | <.0001 |
| Q2 - Q3                                   | 2.00(0.11)   | <.0001 |
| $\geq$ Q3                                 | 2.78(0.16)   | <.0001 |
| Volume of length of stay (Ref: <Q1)       |              |        |
| Q1 - Q2                                   | 0.30(0.09)   | 0.001  |
| Q2 - Q3                                   | 0.55(0.12)   | <.0001 |
| $\geq$ Q3                                 | 0.56(0.17)   | 0.001  |
| Average specialist seniority              | -0.02(0.01)  | 0.008  |
| Average patients age                      | -0.01(0.01)  | 0.289  |
| Proportion of male patients               | -0.11(0.12)  | 0.371  |
| Average CCS* of patients                  | 0.10(0.01)   | <.0001 |

\*CCS: Combined comorbidity score

## CONCLUSIONS

The utilization and spending of the selected low-value services were increased in Taiwan during 2013-2017. Hospital's accreditation level, ownership, the volume of ambulatory visits and admissions, the average age of patients, and the average combined comorbidity score have significant impacts on low-value healthcare utilization.