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## Original Research

# Public insurance program impact on catastrophic health expenditure on acute myocardial infarction



M. Martínez-García <sup>a,b</sup>, J. Vargas-Barrón <sup>c</sup>, F. Bañuelos-Téllez <sup>d</sup>,  
H. González-Pacheco <sup>e</sup>, C. Fresno <sup>f</sup>, E. Hernández-Lemus <sup>f</sup>,  
M.A. Martínez-Ríos <sup>c</sup>, M. Vallejo <sup>a,\*</sup>

<sup>a</sup> Sociomedical Research Department, National Institute of Cardiology, Mexico City, Mexico

<sup>b</sup> Ph.D. Programme in Collective Health, Practices and Policies in Healthcare, Metropolitan Autonomous University, Xochimilco, Mexico City, Mexico

<sup>c</sup> National Institute of Cardiology, Mexico City, Mexico

<sup>d</sup> Planning Division, National Institute of Cardiology, Mexico City, Mexico

<sup>e</sup> Coronary Care Unit, National Institute of Cardiology, Mexico City, Mexico

<sup>f</sup> Computational Genomics Division, National Institute of Genomic Medicine, Mexico City, Mexico

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## ABSTRACT

**Objective:** ST-segment elevation myocardial infarction (STEMI) has an important economic burden that poised the urgent need to evaluate its catastrophic medical expense. This study evaluates the first 5 years of the national health initiative called Popular Insurance (PI) at the National Institute of Cardiology in Mexico.

**Study design:** Retrospective data analysis.

**Methods:** STEMI patients with ( $n = 317$ ) and without ( $n = 260$ ) PI were selected. Analysed variables included socio-economical context, management care, cost evaluation and three outcomes (mortality, hospital readmission and therapeutic adherence). Descriptive statistical analyses, Kaplan–Meier survival and Support Vector Machine models were used accordingly.

**Results:** Treatment costs were higher for PI-covered individuals ( $P = 0.022$ ) and only 1.89% of them remained in debt, in contrast to 16.15% of those without PI. Statistically significant differences were found in relation to days in hospital wards ( $P < 0.001$ ), imaging studies ( $P < 0.001$ ) and surgical materials ( $P = 0.04$ ). Survival analysis ( $P = 0.44$ ) and therapeutic adherence ( $P = 0.38$ ) showed no differences. Hospital readmission was predicted with an 81.97% accuracy. The most important predictive variables included were stent type, number of days at the coronary care unit and hospital wards.

**Conclusions:** The PI has proven to be a successful program where no differences were found in terms of health care and survival, whereas it provides timely financial support for families facing catastrophic health challenging events.

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\* Corresponding author. Instituto Nacional de Cardiología, Juan Badiano # 1, Sección XVI, Tlalpan, CP 14080, Ciudad de México, México. Tel.: +52 55 55 73 29 11x1415.

E-mail address: [maite\\_vallejo@yahoo.com.mx](mailto:maite_vallejo@yahoo.com.mx) (M. Vallejo).

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## Introduction

Non-communicable diseases have become a threat for human health, also impacting on social development and economic growth. Cardiovascular diseases (CVDs) are the leading cause of mortality worldwide and also an important source of disability in both developed and developing countries.<sup>1</sup> In Latin America (LA), CVDs are responsible for millions of deaths, and their effects will likely increase in the near future.<sup>2</sup>

Mexico is the second largest country in LA. It has been estimated that a heart attack occurs every 3 minutes and the survival rates are worse than those in other emerging countries.<sup>3</sup> The reduction of heart diseases since 1990 has been only of 1%, a very modest decrease compared with other emerging countries where the average reduction has been of up to 48%.<sup>4</sup> Furthermore, from over 110 million inhabitants in Mexico, 4% are still living in multidimensional poverty, according to the Multidimensional Poverty Index.<sup>5</sup> However, measures taken by the health system, such as the Seguro Popular (Popular Insurance [PI]), have reduced impoverishment, especially among the poorest people by reducing their health expenditure from 3.3% to 0.8% according to the Organization for Economic Co-operation and Development recent report.<sup>4</sup> Nevertheless, out-of-pocket expenses have undermined total health spending by nearly 50%.

The PI is a financial mechanism operated by the Mexican Social and Health Protection System (MSHPS)<sup>6,7</sup> to ensure an effective and timely, high-quality access to medical services.<sup>8,9</sup> PI provides protection for households without health coverage in their out-of-pocket expense.<sup>10</sup> This strategy is aligned with the universal health coverage proposed by the World Health Organization, as a policy to ensure that people receive the health services they require without having to endure financial hardship to pay for them.<sup>8</sup>

In Mexico, ST-segment elevation myocardial infarction (STEMI) is considered to cause a catastrophic expenditure of more than 50% of the family income, thus potentially impoverishing families for generations. Therefore, since 2011, diagnosis and treatment of STEMI have been included in the Catastrophic Expenses Protection Fund protocol.<sup>11</sup> This protocol basically pays for care medical management expenses and 1 year follow-up. The first expenses are associated to diagnostic, pharmacologic reperfusion, angioplasty procedure as well as surgical material cost (up to three stents). In all cases, the total expense can cover up to \$106,628 MXN.

At the global level, the MSHPS has achieved sustained financing that has led to a significant reduction of the out-of-pocket expenditure in the population without social security.<sup>8</sup> Conversely, at the local level, the impact that this policy has had for the social benefit of the population remains unknown. Therefore, it is desirable to study the effects of PI to improve our understanding on how the reduction of out-of-pocket spending impact on people's lives. Here, we analysed the impact of the PI in three areas: (1) hospital care management; (2) costs associated with treatment; and (3) main outcomes—hospital readmission, mortality and therapeutic adherence. This study aims to address the extent and

effect of this governmental strategy to cover STEMI catastrophic expenses at the National Institute of Cardiology, Mexico.

## Methods

### Eligibility criteria

The eligibility criterion is men and women between 20 and 60 years old, who had a first STEMI according to the International Classification of Diseases (10th Revision)<sup>12</sup>—I21.0, I21.1, I21.2, I21.3, I21.4, I21.9—who did not have any angioplasty and/or stent placement before, up to 6 h after their STEMI event. In addition, individuals should not be covered by any other form of public (health security) insurance, with the lowest socio-economical levels (1, 2 or 3) according to the institutional guidelines, and those individuals were recruited.

### Subject enrolment

A retrospective study was performed with the data obtained from the medical records of patients diagnosed with STEMI, admitted to the hospital between January 2011 and January 2015. The follow-up continued until March 2017 or mortality occurrence (Fig. 1). Two groups of patients were analysed, 317 treated with a PI (WPI) programme and 260 treated without PI (WOPI) programme.

### General features

The following socio-economic data were obtained from the medical records: scholarship years, marital status (single or married), residence characteristics (rural or urban), socio-economic status, monthly income and expense, comorbidities, the presence and accumulation of risk factors (hypertension, dyslipidaemia, obesity, diabetes mellitus) and self-reported history of smoking and alcoholism.

### Care management

Hospital admission was analysed through the following variables: institutional referral, delay until the first medical contact, Killip–Kimball score, number and type of surgical procedures (primary, elective, urgent, rescue and failed), number and type of stents (bare-metal, unmedicated or both), type of techniques (normal predilatation with balloon or direct stent technique) and number of bed days in the coronary care unit (CCU) and hospital wards.

### Cost evaluation

Costing analyses were performed from the hospital administration perspective, and the strategies used were a hybrid costing; micro-costing (stents, laboratory studies, imaging studies, surgical material) and macro-costing (haemodynamic room, hospital and CCU beds). Catastrophic expenditure of each case was characterised by both payment and hospital debt. All costs are expressed in Mexican pesos (MXN).

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