Modeling the Utilization of Outpatient Medical Services for a Population with Private Health Insurance Using a Structural Equation Model

Mariano Granero[1], Mariela Weisbrot[1], Ignacio Ricci[1], Mercedes Laurenza[2] y Fernando Vázquez Peña[1]

1. Servicio de Medicina Familiar y Comunitaria, Hospital Italiano de Buenos Aires. Buenos Aires, Argentina
2. Ministerio de Salud de la Nación Argentina. Argentina

ABSTRACT

Introduction: Structural equation models serve as a valuable tool for guiding decision-making by enabling the identification of relationships between different variables and explaining the behavior of more abstract ones. Such is the case with the probability of an individual seeking consultation within the healthcare system, where demographic, social, and psychological factors come into play.
The current study aimed to construct an explanatory model of the utilization of outpatient medical services in a population with private health insurance, linking demographic, social, and self-perceived health variables.
Methods: A structural equation model with a longitudinal design (prospective cohort) was employed. For this purpose, two surveys were conducted at different moments, followed by a longitudinal analysis considering the information obtained.
Results: In order of strength of association, the use of outpatient medical services had the following explanatory variables: Regular health check-ups (RHC) coefficient (0.57), service utilization in the previous period (0.23), perceived health in the last period (-0.15), and family problems in the latest period (0.08). Other variables did not have a statistically significant association.
Conclusions: The performance of regular health check-ups (RHC) is the variable with the highest explanatory power for the variability in the utilization of outpatient health services by individuals with private health insurance. That could have significant implications for management to ensure the sustainability of the healthcare system through a rational organization of available resources.

Keywords: health planning, outpatient care, quality of health care, preventive medicine.

Modelización de la utilización de los servicios médicos ambulatorios para una población con seguro de salud privado, mediante un modelo de ecuaciones estructurales

RESUMEN

Introducción: los modelos de ecuaciones estructurales constituyen una herramienta valiosa para orientar la toma de decisiones al permitir identificar las relaciones entre diferentes variables y explicar el comportamiento de aquellas más abstractas. Tal es el caso de la probabilidad de que una persona consulte en el sistema de salud, donde intervienen factores demográficos, sociales y psicológicos.
El presente trabajo se propuso construir un modelo explicativo de la utilización de los servicios médicos

Author for correspondence: mariano.granero@hospitalitaliano.org.ar, Granero M.

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ambulatorios en una población con seguro de salud privado, relacionando variables demográficas, sociales y de autopercepción de salud.

Métodos: el estudio se llevó a cabo a través de un modelo de ecuaciones estructurales con diseño longitudinal (cohorte prospectiva). Para ello se realizaron dos encuestas en diferentes momentos, y luego se realizó el análisis longitudinal teniendo en cuenta la información obtenida.

Resultados: la utilización de los servicios médicos ambulatorios fue explicada en el siguiente orden, según su fuerza de asociación: *control periódico de salud (CPS)* coeficiente (0,57), la *utilización de los servicios* en el período anterior (0,23), la *salud percibida* en el último período (- 0,15), y los *problemas familiares* del último período (0,08). Las demás variables no tuvieron una asociación estadísticamente significativa.

Conclusiones: la realización de CPS es la variable con mayor capacidad explicativa de la variabilidad de la utilización de servicios ambulatorios de salud de personas que tienen seguro de salud privado. Esto podría tener implicaciones importantes en la gestión para asegurar la sustentabilidad del sistema de salud a través de una organización racional de los recursos disponibles.

Palabras clave: planificación en salud, atención ambulatoria, calidad asistencial, medicina preventiva, economía de la salud.

INTRODUCTION

Information Technologies facilitate the generation and access to information. Information serves as input for evidence-based decision-making, in other words, using verifiable, solid, and reliable data to make decisions. While an increasing number of organizations implement statistical and quantitative analyses along with exploratory and predictive models to define their actions, the main challenge arises around generating value from these analyses.

This complexity is even greater if the processes to be measured involve variables with a certain level of abstraction, making them more difficult to objectively measure directly. Such is the case with the variable of interest in this study, which is the use of healthcare services.

The literature describes multiple variables related to an increased likelihood of a person consulting the healthcare system. People over 50 have a 10 to 15% higher probability of making a healthcare visit[2]. More women use the health care system, even after adjusting for variables related to the need for care[3]. People with some alteration in their self-perceived health have a greater need to seek a consultation[4]. Family, economic, or work-related problems and the lack of a social support network also influence the use of services[5-6]. Moreover, people not only consult due to comorbidities and alterations in their self-perceived health but also to undergo regular health check-ups (RHC)[5-7]. The probability of having these preventive check-ups increases among middle-class urban residents with some form of health insurance[8].

While these variables have been studied individually in the literature, few works have addressed them together through models with a longitudinal design.

The present study used a structural equation model to study the utilization of health services through the variables that could explain it. It is a multivariate statistical analysis technique where it is possible to analyze one independent variable with one or more dependent variables, with the advantage over other methods of modeling error.[9]

The objective of this study was to build an explanatory model of the utilization of outpatient medical services in a population with private health insurance, relating demographic, social, and self-perception of health variables.

The hypothesis we started from is that people seek care in the healthcare system to address some biopsychosocial ailment or discomfort, thus making self-perception of health the variable with the most predictive power for *health services utilization*.

MATERIALS AND METHODS

General Design

The work method used was a structural equation model with a longitudinal prospective cohort design. Initially, two surveys were conducted at different times, followed by a longitudinal analysis considering the information obtained.

This study was evaluated and approved by the Ethics Committee for Research Protocols (CEPI) of the Hospital Italiano de Buenos Aires (File number: #3786).

The research consisted of three main stages (Fig. 1):

1. a) Generation of the necessary instruments to collect information.
2. a) Collection of information.
3. a) Processing of the obtained results.

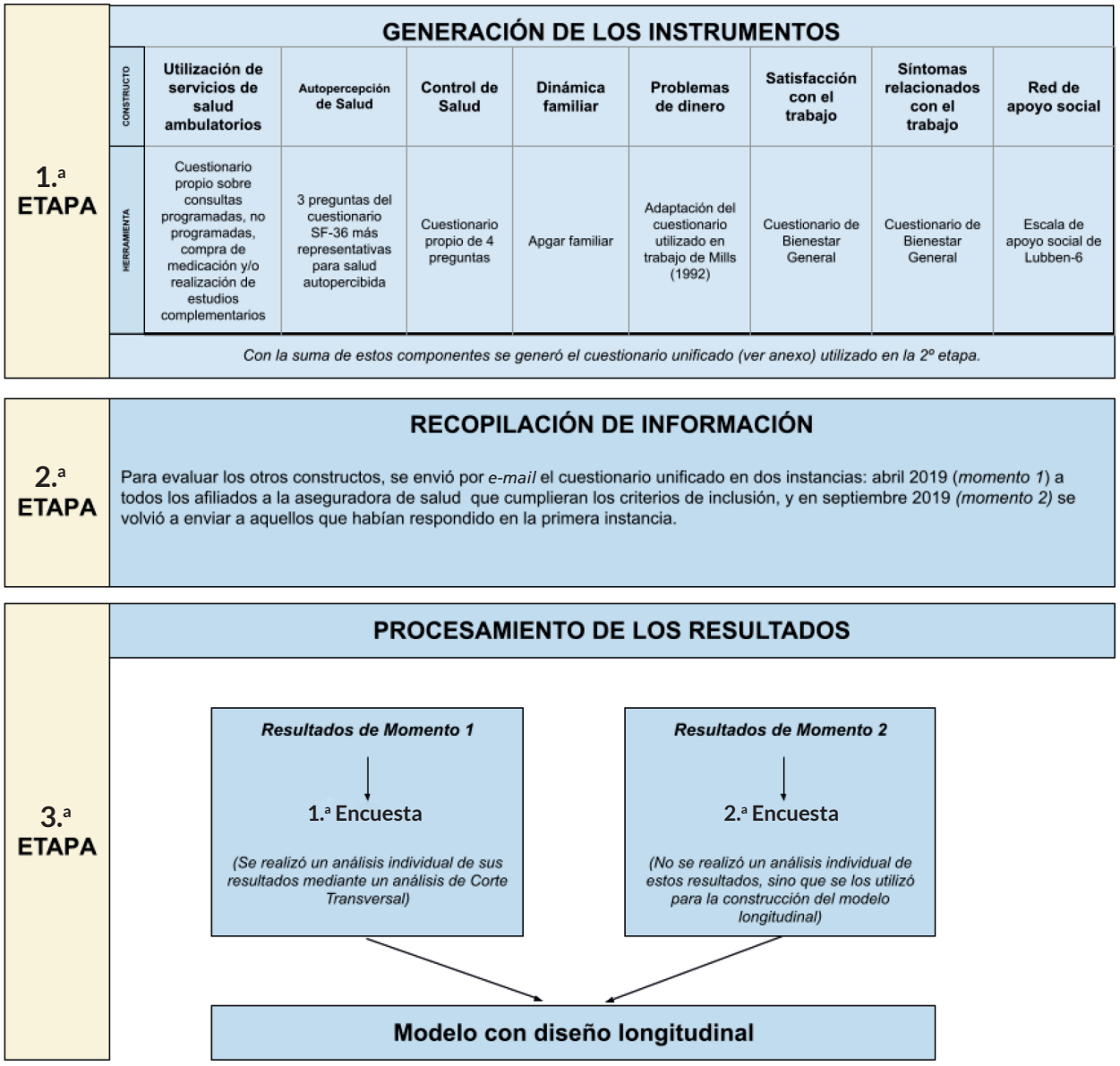

Figure 1. Graphical representation of the successive stages and the specific tasks associated with each..

1) Generation of the instruments

We created a custom four-item questionnaire to objectify the *use of health services*. It asked the number of times each patient had attended an unscheduled consultation (emergency department or walk-in), scheduled consultation, purchased medication, or underwent complementary tests during the last two months. The questionnaire was administered over 30 days to randomly selected patients from the caseload of two authors (see *population 1* in Table 1) to test the instrument and analyze whether these four variables were proxy indicators for health services use. The information obtained from this questionnaire was cross-referenced with the data from the Electronic Medical Record of each patient (*reference test*), assessing its external criterion validity through a correlation test.

We confirmed that the four questions and the four numerical data collected through the medical records had a unidimensional structure through an Exploratory Factor Analysis (EFA).

We considered the sample size (n) sufficient given that, as suggested, we had more than 10 cases per indicator and more than 50 in total[10,11]. We deemed that the instrument behaved in a unidimensional manner if only one factor had an eigenvalue higher than one and if the ratio between the difference of the first eigenvalue

Table 1. ??????

Name	n	Averge age	% of Women	% with completed tertiary and/or university studies
Population 1	54	47,1	55,4	*
Population 2	51	41	86	86
Population 3	100	42	67	(99% completed secondary education)
Population 4	5425	49	70	53
Population 5	1251	50	72	55,8
Population 6	564	47	73	61

* This data was not collected. However, they are patients from the Health Plan aged between 30 and 64 years, therefore they would initially present a similar percentage to population 4.

and the second, and the difference between the second and third eigenvalues, was higher than 3 [12-14]. We also evaluated internal consistency by calculating Cronbach's alpha coefficient. Minimum values of 0.6 to 0.711 were considered acceptable. Factor scores were then calculated and stored as independent variables using the SPSS® program (Regression method). Finally, we conducted the correlation analysis assuming that – in the face of two instruments measuring related constructs (but not the same construct) – it is expected to document a moderate statistical correlation (correlation coefficients between 0.3 and 0.7)[13].

The single factor and Cronbach's alpha guidelines as described, provided a reference for this and the other analyses that formed part of this study.

Aiming to probe *self-perception of health*, we used the Spanish version of the SF-36 questionnaire, which evaluates health-related quality of life^[16]. Our team agreed to use the three most representative questions for self-perceived health, including one on general health, another on the physical domain, and another on the affective-emotional domain. We included them in the previously described questionnaire for *health service utilization* to assess their psychometric properties. We confirmed that they behaved unifactorially and that their internal consistency (Cronbach's alpha) was acceptable, as the three questions could thus form a single factor in the structural equation models analyzed.

We explored the other variables using pre-existing instruments or their adaptations. We used the family function questionnaire (Family Apgar) validated for Spanish, to evaluate family dynamics[17]. For financial problems, we adapted the questionnaire used in a study similar to this one[18]. We used the General Labor Well-being questionnaire to assess job satisfaction and work-related symptoms[19]. The factors of satisfaction and symptoms were both considered as individual constructs. Under the satisfaction factor, we excluded the four items with the lowest factor loadings in the original study. To measure the social support network, the Lubben-6 questionnaire validated in Argentina was used[20]. The three questions about family and the three questions about friends were taken as individual factors.

We generated a unified questionnaire with the sum of the components described above and tested it in two stages. First, we conducted ten cognitive interviews under the *think-aloud* format, in which the interviewees indicated their difficulties in understanding any part of the questionnaire. Then, the instrument was administered to 100 people (see *Population 3* in Table 1) to verify that all aspects or factors evaluated behaved unidimensionally and had an appropriate Cronbach's alpha value. For both tests, we took into account that the samples were demographically similar to the final sample used in the study.

2) Data Collection

A unified questionnaire was created by combining the components developed in the previous section (Appendix 1). That was adapted to the Google Forms format and sent via email to members of the Hospital Italiano de Buenos Aires Health Plan (health insurer) aged between 30 and 64. The first distribution took place in April 2019. Five months later, the same questionnaire went out again to those who had already responded during the first round. The collected data was fed into a database.

3) Processing of the Results

The information analysis was initially conducted through a cross-sectional approach with the first survey; once we obtained the second survey, we created a model with a longitudinal design. In the first cross-sectional model, we analyzed four groups: women under 50 years old, women over 50 years old, men under 50 years old, and men over 50 years old. We assessed the association between outpatient medical services and the identified variables. Subsequently, a second cross-sectional analysis was performed with the second survey, not analyzing it individually but as part of a longitudinal model that included the results of both surveys (with the same

latent variables or domains). We added the health control construct to the second cross-sectional analysis.

In the longitudinal design, a second analysis was conducted focusing only on healthy patients (without chronic conditions) to explore whether this subgroup exhibited behavior different from that predicted by the general model.

Since the variable *spontaneous demand* in the construct of the *use of outpatient services* did not show a relatively high factor loading, the same model was also tested without considering this variable.

RESULTS

The first survey was sent to all members of the Health Plan of Hospital Italiano de Buenos Aires who were between 30 and 64 years old (approximately 60,000 members). A total of 5,425 responded (response rate of 9%, see population 4 in Table 1). The second mailing went out to the 5,425 members who had responded to the first, and 1,251 people responded (response rate of 23%, see *population 5* in Table 1).

All 5425 patients in the complete database were subdivided into four subgroups based on age and gender: women aged 30 to 49, women aged 50 to 64, men aged 30 to 49, and men aged 50 to 64. In no case did the Mardia Index (used to assess the distribution among variables) result in a value below 3, indicating a lack of multivariate normality.

Table 2 shows the results related to the single-factor behavior of the *proxy indicators of health services utilization* and the four corresponding values collected from the medical records. The Spearman correlation value between the two factors was 0.605 ($p < 0.00001$). The kurtosis value of the factor score for the questions was 2.8, meaning that its distribution is not strictly normal. That led us to use Spearman's correlation instead of Pearson's, as the latter occurs in variables with a normal distribution.[21] The table also shows the values regarding the unifactorial behavior of the three questions on *self-perception of health*. We can also observe the values related to the unifactorial behavior of the various questionnaires used in population 3.

Results of the Longitudinal Study (Two Consecutive Moments)

The sample size (n) of the longitudinal study was 1251. This model explained 49% of the variability in *the use of services* at the second moment (R^2: 0.49). Figure 2 shows that most of the variations in *the use of services* at the second moment account for changes in

The sample size (n) of the longitudinal study was 1251. This model explained 49% of the variability in the use of services at the second moment (R^2: 0.49). Figure 2 shows that most of the variations in the use of services at the second moment account for changes in the performance of *health checkups* (coefficient of 0.57) and the use of services at the first moment (0.23). *Perceived health* at the second point affects usage in the same period with a coefficient of (-0.15), while family problems at the second point affect usage with a coefficient of 0.08. All the mentioned coefficients were statistically significant (t-values greater than 1.96). If we exclude the health checkup construct, the R^2 of the model decreases to 27%. As the factor loading for spontaneous consultation visits was very low (0.27 in the first period and 0.28 in the second), we ran the same model but removed this variable from both periods. Similar values resulted: *health checkups* show a coefficient of 0.58, use of services in the previous period 0.23, *perceived health* at the first point associated with service use at the first point (-0.25), perceived health at the second point (-0.14), and *family problems* in the last period 0.08. The R^2 remained the same (Table 3).

In the model that included only patients without chronic health problems, the sample size was 564 (see

Table 2. Psychometric properties of the variables included in the questionnaire (unidimensionality of the indicators and the questionnaires used)

Questionnaires/indicators	1.[a]	2.[a]	3.[a]	C
Proxy indicators of service utilization (4 indicators)[b]	2,8	0,6	0,4	0,9
Values of hospital records (4 indicators)	2,4	0,8	0,5	0,7
Perceived health (3 items)	1,9	0,7	0,4	0,7
Family dynamics (5 items)	2,8	0,8	0,6	0,8
Money problems (5 items)	3,7	0,5	0,4	0,9
Job satisfaction (4 items)	4	0,7	0,5	0,9
Work-related symptoms (5 items)	2,6	0,9	0,7	0,8
Family network (3 items)	1,8	0,6	0,6	0,7
Friends network (3 items)	2,4	0,4	0,2	0,9
Health control	3,1	0,6	0,1	0,9

a: eigenvalue. 1: first, 2: second, and 3: third. C: Cronbach's alpha coefficient.

b: Proxy indicators: scheduled consultations, unscheduled consultations, purchase of medications, and performance of complementary tests.

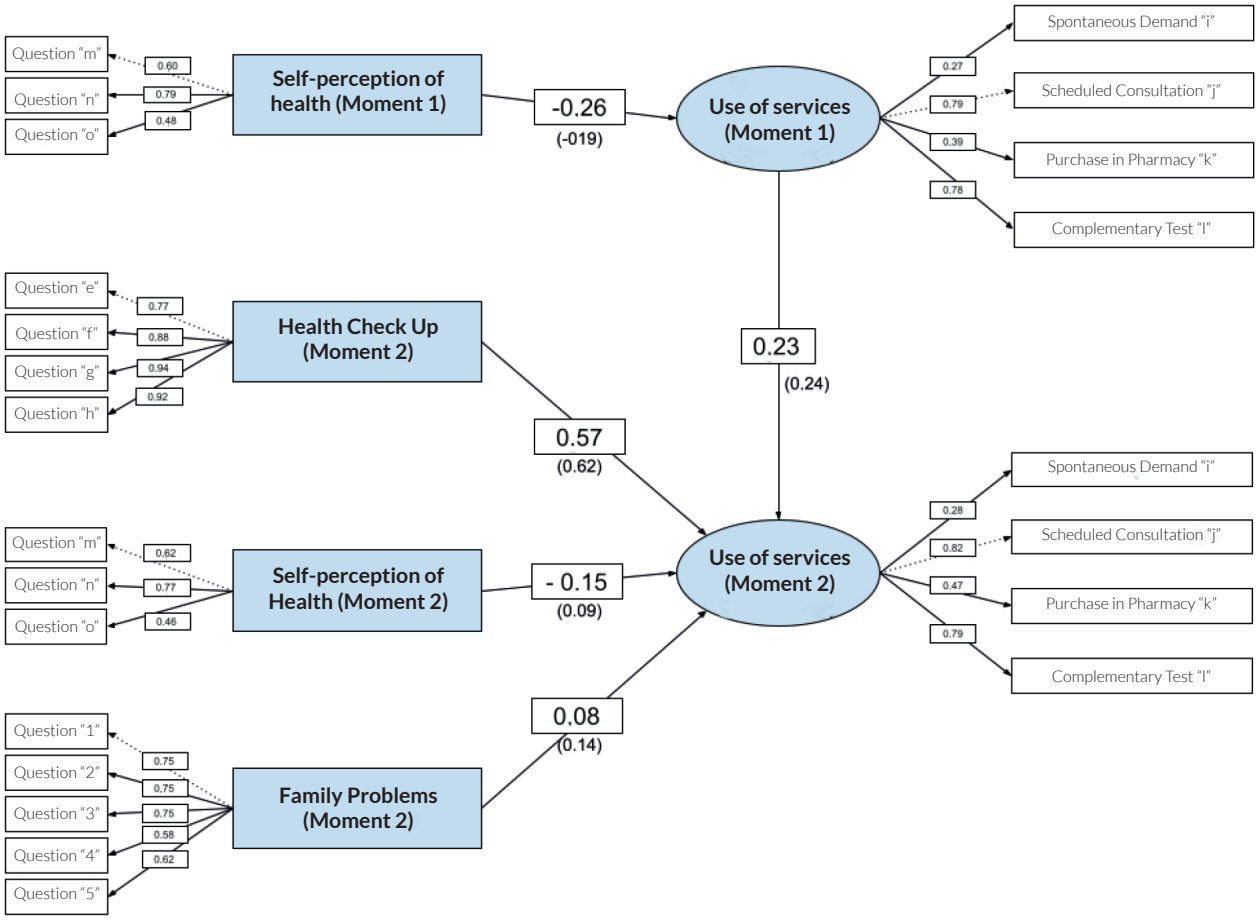

Figure 2. Graphical representation of the longitudinal model that includes the variable "spontaneous demand." The large boxes show the standardized regression coefficients (magnitude of association) of the variables from the general model, and the values obtained from the model with patients without chronic diseases appear in parentheses. The letters and numbers in quotes ("") are provided to locate these items in Annex 1.

Population 6 in Table 1), representing 45.08% of the total sample from the longitudinal study. Regarding the results, the differences with the complete model are minimal: the R^2 is the same (0.49), the *health control* coefficient is slightly higher, as is the coefficient for *prior use of services* (see Table 3 and Fig. 2). *Self-perceived health* in the last period is associated with *service utilization* in the same period with a coefficient of (-0.09) and is no longer statistically significant. If we exclude the *preventive health control* construct, the R^2 of the model decreases to 16%. As explained in the previous paragraph, we ran the same model excluding the *spontaneous demand* variable; similar values resulted: *health control* had a coefficient of 0.62, preceding *use of services* 0.22, self-perceived health in the first period associated with utilization in the first period (-0.16), *self-perceived health* in the last period (-0.09), which was no longer statistically significant, and *family problems* in the previous period 0.13. The R^2 was 48%. Excluding the strictly preventive construct, the R^2 of the model decreases to 14%.

Results of the analysis of the first cross-sectional cut (temporal simultaneity)

The standardized regression coefficients (magnitude of association) from the structural equation models of the four subgroups in the first cross-sectional cut (5425 participants) and the R^2 values are shown in Table 4. We can see that few variables are significantly associated directly with the use of services, and they generally do so through the perceived health variable. We also note that the proportion of variability explained by these models (R^2) is low.

The fit indicators of the four models show acceptable values according to the literature, as presented in Table 3.

Coefficients of standardized regression close to 0 indicate no association, while values close to 1 indicate a strong association. Since we are working with factors, missing data (which did not exceed 13%) are not computed to achieve greater accuracy by eliminating cases that had them.

In the models, the values of the relationships between statistically significant variables appear in bold. The

Table 3. Fit Indicators of Structural Equation Models: Longitudinal Studies (General Model and Model Without Patients with Chronic Diseases)

Models	N	Chi 2 (1)	RMSEA (2)	NFI (3)	CFI (3)	RMRs (4)	R^2 (percentaje explained by the model)	FL Sign.	% of FL < 0.5 (with one decimal) (5)	ME
M 30 to 49	1690	0,0	0,06	0,94	0,95	0,06	7%	100%	9%	100%
M 50 to 64	1493	0,0	0,05	0,96	0,97	0,05	9%	100%	8,6 %	100%
H 30 to 49	668	0,0	0,06	0,92	0,94	0,06	11,4%	100%	9 %	100%
H 50 to 64	833	0,0	0,05	0,94	0,96	0,05	14%	100%	10 %	100%
????	1251	0,0	0,068	0,92	0,93	0,076	49%	100%	13%	100%
?????	1251	0,0	0,074	0,93	0,94	0,078	49%	100%	4%	100%
?????	1251	0,0	0,074	0,89	0,90	0,068	27%	100%	13%	100%
CLS only patients without CHP	564	0,0	0,058	0,91	0,94	0,062	49%	100%	13%	100%
CLS only patients without CHP and without SD	564	0,0	0,059	0,92	0,94	0,059	48%	100%	9,5%	100%
CLS only patients without CHP and without PHC	564	0,0	0,063	0,87	0,91	0,063	16%	100%	13%	100%

Abreviations: W = Women // M = Men // N = Sample Size // FL = Factor Loadings // Sign. = Significant // ME = Measurement Errors // CLS = Complete Longitudinal Study // SD = Spontaneous Demand // PHC = Periodic Health Control // CHP = Chronic Health Problems // (1) Due to n and the number of variables, a significant Chi-square value is expected11; (2) Good < 0.08, Mediocre from 0.08 to 0.1, Poor > 0.1 (Brown, 2006) // (3) Good > 0.9 (Norman and Streiner, 2008) // (4) Less than 0.08 (Brown, 2006) // It is recommended that the FL be greater than 0.5 and ideally 0.711.

unhighlighted values correspond to the non-significant relationships before being removed from the final model.

The models use the ML (Maximum Likelihood) Robust estimator, as all items or indicators have a 6-category Likert response scale and collectively exhibit a Mardia's Index of Multivariate Normality greater than 3 (Finney and DiStefano, 2013). We worked with the Lisrel® program.

DISCUSSION

In our models, *health control* was identified as the primary variable explaining the observed variability in *health service utilization*, followed by *service utilization* in the previous period. In the longitudinal model, we found no significant relationship between this *service utilization* and the other variables developed in the literature (work problems, limited social support network, etc.). In the cross-sectional model of the first survey, some of these variables did achieve statistical significance; they had a very low R^2, indicating that they explain little of the variability in *health service utilization*.

Regarding the other variables that did yield statistically significant values in the longitudinal model, there were *health self-perception* and *family problems*. However, their influence was -0. and 0.08, respectively, which is quantitatively much lower than the 0.57 measured for *health control*. It is also noteworthy that, in the model with only healthy patients, *health self-perception* did not have a significant association.*

The magnitude of the explanatory capacity demonstrated by *health check-ups* on health *service utilization* is noteworthy. Studies with longitudinal models generally show that what explains a particular phenomenon the most is that same phenomenon from a previous instance. For example, in our model, it would be expected that what explains a person's *service utilization*

Table 4. Regression coefficients and R^2 values of the structural equation models for the 4 subgroups of the first cross-sectional analysisl

Subgroups by age and gender	Variability of the outcome variable explained by the model	Family dinamics	Money problems	Symptoms due to work related problem	Job satisfaction	Network of friends	Family network	Perceived health
Women aged 30 to 49 (n=1690)	Perceived health R^2= 0.24	0.14 (t = 4.32)	-0.13 (t = -4.18)	-0.34 (t = -9.63)	0.07 (t = 2.08)	0.01 (t = 0.23)	0.03 (t = 0.67)	–
	Service utilization R^2= 0.07	0.13 (t = 3.67)	-0.04 (t = -1.20)	-0.09 (t = -2.44)	0.02 (t = 0.51)	0.001 (t = 0.03)	-0.001 (t = -0.03)	-0.27 (t = -5.86)
Women aged 50 to 64 (n=1493)	Perceived health R^2= 0.28	0.21 (t = 5.97)	-0.06 (t = -1.73)	-0.4 (t = 9.15)	0.12 (t = 3.35)	-0.03 (t = -0.92)	-0.01 (t = -0.29)	–
	Service utilization R^2= 0.09	0.14 (t = 3.67)	0.001 (t = 0.06)	-0.001 (t = -0.11)	0.06 (t = 1.81)	0.02 (t =0.48)	0.02 (t = 0.39)	-0.28 (t = -5.05)
Men aged 30 to 49 (n=668)	Perceived health R^2= 0.2	0.15 (t = 2.86)	-0.12 (t = -2.63)	-0.35 (t = -6.21)	0.06 (t = 1.18)	0.08 (t = 1.59)	-0.07 (t = -1.00)	–
	Service utilization R^2= 0.11	-0.02 (t = -0.3)	-0.12 (t = -2.56)	-0.06 (t = -1.12)	0.03 (t = 0.69)	0.11 (t = 1.91)	-0.01 (t = -0.19)	-0.32 (t = -4.31)
Men aged 50 to 64 (n=833)	Perceived health R^2= 0.32	0.11 (t = 2.35)	-0.10 (t = -1.90)	-0.52 (t = -8.94)	0.05 (t = 1.13)	0.09 (t = 2.24)	-0.04 (t = -0.65)	–
	Service utilization R^2= 0.14	0.18 (t = 3.52)	-0.04 (t = -0.78)	0.09 (t = -1.38)	0.06 (t = 1.14)	-0.02 (t = 1.13)	0.05 (t = 0.86)	-0.32 (t = -4.46)

t = value to make statistical significance explicit. Must be higher than 1.96.

at time two the most would be that same person's service utilization at time one. That is because, when comparing the same person at two different points in time within the construct of service utilization at time one, personal characteristics that may motivate a consultation (such as gender, age, fears, or if the person tends to consult frequently) are grouped together and typically remain constant from time one to time two. However, in our study, *health control* showed an association 2.5 times stronger than utilization in the previous moment. We can interpret this as suggesting that the decision to seek a consultation depends primarily on external factors that operate at the population level, placing individual history, personal characteristics, values, and preferences in a secondary role. Among these external factors, the culture of undergoing periodic health check-ups, social pressure from healthcare professionals, and awareness campaigns, among others, could be included. Two out of three people who have any ailment do not consult the healthcare system (a phenomenon known as the "iceberg of disease"[23,24]). Due to this, in addition to *service utilization*, we analyzed *self-perception of health* as a dependent variable of the other variables under study. That allowed us to explore whether the proposed variables, regardless of whether they prompted a consultation or not, worsened people's *self-perception of their health*. In the cross-sectional models, statistically significant associations were evident, although with marginal influence values, which coincides with findings identified by previous studies also conducted with Structural Equation Models, where the strength of the effects of various variables on perceived health was evaluated [25,26].

The implications of this study are closely related to its results. Our initial hypothesis was that the primary reason people consulted the health system was to address some biopsychosocial ailment or discomfort, making *self-perception of health* the variable with the highest predictive power for *service utilization*. However, our results show that many individuals using outpatient medical services are healthy, asymptomatic individuals who seem to consult in response to a particular culture that *dictates the need for preventive check-ups*. That raises questions at several levels. Firstly, regarding the quality of care provided. There is increasing evidence that general health check-ups do not seem to have the net benefit (the relationship between potential benefits and potential harms) that health professionals and the community typically attribute to them. For example, a 2019 meta-analysis concludes that these medical health checks have little or no effect on all-cause and cancer mortality and likely have little or no effect on cardiovascular mortality[27]. In this scenario, the fact that there are so many healthy individuals in the healthcare system is unlikely to be associated with a clear net benefit, as they are at an increased risk of experiencing harm through false positives or overdiagnoses[28-29]. On the other hand, this represents a problem concerning equity in access to healthcare services. Since resources are finite, when we allocate a resource to someone who does not need it, there is a possibility that it may be denied or delayed for someone who does need it[30]. This situation, where the healthcare system becomes saturated with individuals who do not require care and excludes those who do ("inverse care law"), is a significant and ongoing issue in our healthcare system[31]. Finally, this dynamic of utilization undermines the sustainability of the healthcare system, as available resources must respond to ever-increasing needs at the expense of technological development, population growth, and aging[32]. In this context, decision-makers should prioritize the healthcare strategies that provide the highest value (understood as the best possible relationship between the health benefits generated and the cost of the intervention) to the highest number of people[32]. We believe the issues raised here represent a complex problem influenced by many variables[29]. Addressing these questions goes beyond the objectives of this work, and future research will be necessary to contribute to their resolution.

We believe the main strength of this study lies in its methodological design, as having both dependent and independent variables and a longitudinal design allows for models that more closely resemble real-life dynamics compared to traditional regressions or cross-sectional study designs. Regarding limitations, we highlight that the sample was not random, as we only have information from those who responded to the sent questionnaire (response rate of 9%). A similar issue arises from the fact that the questionnaire was sent via email since, due to the digital divide, it excluded from the sample people between the ages of 30 and 64 who do not have or know how to use email. Additionally, one could interpret as a drawback that we only included the health check-up variable in the second survey. As mentioned, we initially hypothesized that *self-perception of health* would be the variable with the heaviest explanatory power for healthcare utilization. However, during the cross-sectional analysis of the first survey, the results showed that the included variables had a low *R2* for *healthcare utilization* (as seen in Table 4). We then decided to include the health check-up variable at Moment 2, based on a systematic review suggesting some association in populations with higher education and private health insurance coverage[5]. We understand that it would have been ideal to include this variable from the start of the study; however, we believe that the results obtained do not lose scientific rigor due to this later inclusion.

Finally, we emphasize that the study comprised members of the Health Plan of the Hospital Italiano de Buenos Aires, and these results may not necessarily be generalizable to members of other health coverages treated at this or another institution.

CONCLUSION

The performance of Periodic Health Check-ups (PHC) is the variable with the heaviest explanatory power for the variability in the utilization of outpatient health services by people with private health insurance. That could have significant management implications to ensure the sustainability of the healthcare system through a rational organization of available resources.

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Ethical considerations: This study was reviewed and approved by the Ethics Committee of Research Protocols (Comité de Ética de Protocolos de Investigación, CEPI) of the Hospital Italiano de Buenos Aires (File number: #3786). Buenos Aires, Argentina.

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ANNEX 1. Questionnaire sent via email

At the Health Plan of the Hospital Italiano, we are interested in getting to know our patients better to improve the quality of our services. You will not need to provide your name; instead, we will ask you to write your email address to allow us to link your current responses to the answers you generously gave in April of this year. Afterward, your email will be removed from the record to ensure strict confidentiality.

a. Please indicate your age.

b. Please indicate your highest level of education completed: Incomplete Primary | Complete Primary | Incomplete Secondary | Complete Secondary | Incomplete University/Tertiary | Complete University/Postgraduate

c. Please indicate your gender: Female | Male | Other. Please provide your email address:

d. Please indicate if you are undergoing treatment for any of the following health problems (check all that apply): Hypertension | Diabetes | High Cholesterol | Thyroid | I am not receiving treatment | Other:

e. In the past three months, have you felt the need to get health check-ups, medical exams, or check-ups for any chronic health issue?: All the time | Very frequently | Frequently | Somewhat frequently | Occasionally | Never

f. In the past three months, have you scheduled an appointment for health check-ups, medical exams, or check-ups for any chronic health issue?: All the time | Very frequently | Frequently | Somewhat frequently | Occasionally | Never

g. In the past three months, have you undergone any medical tests for health check-ups, medical exams, or check-ups for any chronic health issue?:All the time | Very frequently | Frequently | Somewhat frequently | Occasionally | Never

h. In the past three months, have you visited your medical center for health check-ups, medical exams, or check-ups for any chronic health issue?:All the time | Very frequently | Frequently | Somewhat frequently | Occasionally | Never

i. In the past two months, how many times have you visited the walk-in clinic at any Hospital Italianolocation for matters related to yourself?: Never | 1 time | 2 times | 3 times | 4 times | 5 times or more

j. In the past two months, for matters related to yourself, how many times have you attended an appointment (whether scheduled or unscheduled) with a specialist or primary care doctor at the Hospital Italiano?: Never | 1 time |2 times | 3 times | 4 times | 5 times or more

k. In the past two months, how many times have you purchased medication from the pharmacy at any Hospital Italiano location for matters related to yourself?: Never | 1 time | 2 times | 3 times | 4 times | 5 times or more

l. In the past 2 months, how many times have you undergone any type of test (whether laboratory, imaging or any other type of test) at the Hospital Italiano for matters related to yourself?: Never | 1 time | 2 times | 3 times | 4 times | 5 times or more

m. In the past 2 months, overall, would you say your health has been: Very poor | Poor | Fair | Good | Very good | Excellent

n. In the past 2 months, how often have your physical problems made it difficult for you to carry out daily tasks and duties, like work or household chores? Never | Occasionally | Sometimes | Frequently | Almost always | Every day

o. In the past 2 months, how often have your emotional problems made it difficult for you to carry out daily tasks and duties, like work or household chores? Never | Occasionally | Sometimes | Frequently | Almost always | Every day

1. Thinking about the past 2 months: Were you satisfied with the help you received from your family when you had a problem? Choose the option that best reflects how you felt: Never | Almost never | Rarely | Often | Almost always | Always

2. Thinking about the past 2 months: Have your family discussed the problems they are facing? Never | Almost never | Rarely | Often | Almost always | Always

3. Thinking about the past 2 months: Have important decisions been made together in your family? Never | Almost never | Rarely | Often | Almost always | Always

4. Thinking about the past 2 months: Are you satisfied with the time you and your family spend together? Never | Almost never | Rarely | Often | Almost always | Always

5. Do you feel that your family loves you? Never | Almost never | Rarely | Often | Almost always | Always

6. In the past 2 months, have you had money problems? Never | Almost never | Rarely | Often | Almost always | Always

7. In the past 2 months, have you spent a lot of time worrying about money-related issues? Never | Almost never | Rarely | Often | Almost always | Always”

8. In the past 2 months, have financial problems interfered with your work or daily routine? Never | Almost never | Rarely | Many times | Almost always | Always

9. In the past 2 months, have financial problems interfered with your relationships with other people? Never | Almost never | Rarely | Many times | Almost always | Always

10. In the past 2 months, have you thought that you wouldn't make it to the end of the month? Never | Almost never | Rarely | Many times | Almost always | Always

11. Considering family as the people with whom you are related, with how many family members do you have personal or telephone contact at least once a month? 0 | 1 | 2 | 3 or 4 | 5 to 8 | 9 or more

12. How many family members do you feel comfortable talking with easily about the personal matters that concern you? 0 | 1 | 2 | 3 or 4 | 5 to 8 | 9 or more

13. How many family members do you feel close enough to call if you need help? 0 | 1 | 2 | 3 or 4 | 5 to 8 | 9 or more

14. Considering friends as those with whom you have some connection but who are not family, with how many friends do you have personal or telephone contact at least once a month? 0 | 1 | 2 | 3 or 4 | 5 to 8 | 9 or more

15. How many friends do you feel comfortable talking with easily about the personal matters that concern you? 0 | 1 | 2 | 3 or 4 | 5 to 8 | 9 or more

16. How many friends do you feel close enough to call if you need help? 0 | 1 | 2 | 3 or 4 | 5 to 8 | 9 or more

17. In the past 2 months, have you worked? YES | NO

Thinking back over the last 2 months at work you felt:

18.

Dissatisfaction						Satisfaction
1	2	3	4	5	6	7

19.

Unease						Calm
1	2	3	4	5	6	7

20.

Powerlessness						Empowerment
1	2	3	4	5	6	7

21.

Discomfort						Well-being
1	2	3	4	5	6	7

22.

Dissatisfaction						Satisfaction
1	2	3	4	5	6	7

23.

Uncertainty						Certainty
1	2	3	4	5	6	7

To conclude, in the last 2 months due to his work, you felt

24. Digestive disorders

Never						Always
1	2	3	4	5	6	7

25. Headaches

Never						Always
1	2	3	4	5	6	7

26. Insomnia

Never						Always
1	2	3	4	5	6	7

27. Back pain

Never						lways
1	2	3	4	5	6	7

28. Muscle tension

Never						Always
1	2	3	4	5	6	7

THANK YOU VERY MUCH FOR PARTICIPATING!

From a legal standpoint, we will adhere to Law 25326 on personal data protection, enacted in 2000. According to this law, you have the right to access your data, request correction if necessary, and have it not processed in the future if you withdraw, except for the data collected up to that point. Within the framework of this regulation, allow us to give you information about the study and your rights as a participant. Completing the questionnaire will take you 5 minutes. There are no correct or incorrect answers. You should choose the options that best indicate your situation. You will not be required to provide your name; we will ask you to write your email address, as we will conduct the same survey again in 5 or 6 months. The data provided by you will be treated confidentially, and security measures will prevent it from being associated with your name or other personal information that could identify you. Your responses will appear in a spreadsheet (similar to Excel) and only be visible to the principal investigator. After the second survey, your email address will be deleted from the records to ensure strict confidentiality. Your responses will not form part of any medical information in your medical history; what you choose will not affect the healthcare you usually receive. Participation in this study will be voluntary, so you will not receive financial compensation or other personal benefits. Even if you have agreed to participate, you have the right to stop answering at any time, but it is of great value that you try to answer all the questions. This protocol has been evaluated and approved by the Ethics Committee for research protocols and authorized by the Medical Directorate of the Hospital. If you have further concerns, you can contact ....”