



Factors influencing the performance of Colombian nursing students in the SABER PRO tests

Factores que influyen en el desempeño de los estudiantes de Enfermería de Colombia en las pruebas de estado SABER PRO

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ABSTRACT

Introduction: academic performance in standardized evaluations serves as a critical indicator of educational quality and the conditions that surround the formative process of students. The present study aims to analyze the factors that affect the performance in the quality examination of higher education (SABER PRO) of students of the Nursing career in the Republic of Colombia.

Methodology: the study employs a descriptive, quantitative, and retrospective research design. An analysis was conducted on the results obtained in the SABER PRO tests of 16 985 students during the 2016–2019 period.

Results: the students who participated in the SABER PRO test had a mean age of 24.80 years (SD=4.91), and the majority were female, without ethnic identification, single, and employed. The Written Communication and Citizenship Competence modules received the highest and lowest ratings, respectively. The national average of nursing students' performance in the different modules was low.

Conclusion: the variables that were associated with superior performance included being younger, residing in an urban area and in a permanent place, having a scholarship, computer, and internet access, and not having dependents. The study offers valuable insights to inform the development of student support and equity policies in higher education.

Keywords: occupational qualifications, health education, higher education, university students, academic achievement.

JEL Classification: I210, I250, I280

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RESUMEN

Introducción: el rendimiento académico en evaluaciones estandarizadas es un indicador clave de la calidad educativa y de las condiciones que rodean el proceso formativo de los estudiantes. Por ello, el presente estudio tiene como objetivo analizar los factores que inciden en el desempeño en el examen de calidad de la educación superior (SABER PRO) de los estudiantes de la carrera de Enfermería en la República de Colombia.

Metodología: el estudio es descriptivo, cuantitativo y retrospectivo. Se analizaron los resultados obtenidos en las pruebas SABER PRO de 16985 estudiantes durante 2016-2019.

Resultados: los estudiantes que presentaron la prueba SABER PRO tenían una media de edad de 24,80 años (DE=4,91), y la mayoría fueron mujeres, sin identificación étnica, solteros y con trabajo. Los módulos Comunicación Escrita y Competencia Ciudadana fueron los mejor y peor evaluados, respectivamente. La media nacional del desempeño de los estudiantes de enfermería en los distintos módulos fue baja.

Conclusión: las variables que se asociaron con un mejor desempeño fueron tener una menor edad, residir en zona urbana y en un lugar permanente, tener beca, computadora y acceso a internet, y no tener personas a cargo. El estudio aporta evidencia útil para orientar políticas de apoyo estudiantil y equidad en la educación superior.

Palabras clave: competencia profesional, educación sanitaria, enseñanza superior, estudiante universitario, rendimiento escolar.

Clasificación JEL: I210, I250, I280

INTRODUCTION

The quality of education provided to health science students has been an area of interest for public health due to



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its influence on the quality-of-care future graduates will provide when entering the professional field (Saifan et al., 2021). Accordingly, the PAHO and WHO framework document updated in 2020 for the Americas establishes that it must be ensured throughout the training process that health personnel develop up-to-date and appropriate competencies for the performance of their duties and responsibilities. This warrants not only regulating but also evaluating training and establishing standards for undergraduate, residency, and postgraduate education. The success of this approach requires the joint work of the State, health, and education authorities.

Studies focused on the training of health professionals have led to innovative reforms that have redesigned training processes, responding to emerging social needs and advances in medicine and health disciplines (Buabbas et al., 2023; Warnock et al., 2023). At the beginning of the 20th century, educational reforms were based on the germ theory of disease. Currently, in the 21st century and with the recent SARS-CoV-2 pandemic, there has been a focus on the design and implementation of instructional and institutional development reforms that promote the adaptation of future professionals to diverse practice contexts, empowering them to learn and develop independently, and integrating a common strategy for disciplinary training, thus increasing the development of public health competencies (Frenk et al., 2022; Papapanou et al., 2022). Countries such as Colombia have implemented comprehensive exams as part of their higher education quality assessment for advanced students in various disciplines, including health sciences. Until 2009, this exam was called ECAES (Higher Education Quality Exams) and then changed to its current name, SABER PRO. With the enactment of Law 1324 (2009), the exam not only changed its name but also extended it to all professional and technological programs.

The SABER PRO test consists of a series of multiple-choice questions that gather information ranging from the student's personal information, family information, and the institution where they attended to the most relevant professional competencies. The latter are organized into two large groups: generic and specific competencies.

Generic competencies are shared among all test takers nationwide (understood as those that all students must develop regardless of their training focus) and include Written Communication, English, Citizenship Competencies, Critical Reading, and Quantitative Reasoning. Specific competencies are shared by groups of programs with similar training characteristics, referred to as reference groups. In the case of the Nursing program, specific modules include Health Promotion, Disease Prevention, and Health Care.

Several studies have addressed the topic of public health and nursing, referring, among other aspects, to the impact of adequate training processes on the development of competencies for professional practice, decision-making in health, engagement with public/community health, and health services management (Roepke et al., 2021). The impact of outdated curricula that do not incorporate, among other elements, public health, professional practices, or the development of essential competencies for professional practice has also been detailed (Barbera Ortega et al., 2015; Ortigoza et al., 2024; Yaqoob Mohammed Al Jabri et al., 2021).

Based on the above, studies analyzing the quality of nursing training are warranted, with a starting point being the analysis of the results of the professional knowledge tests (general and specific components) assessed in the SABER PRO tests. Based on this, aspects could be raised that merit intervention in the training of future healthcare professionals, thereby improving the social impact, the quality of care provided, and even ensuring their job placement. Considering the elements described, the objective of this study was to analyze the factors that influence the performance of nursing students in the Higher Education Quality Examination (SABER PRO) in the Republic of Colombia from 2016 to 2019.

METHODOLOGY

This article presents a descriptive study with analytical components, a retrospective longitudinal study, and a quantitative approach. The population consisted of all students who took the SABER PRO tests from 2016 to 2019, and the sample consisted of Nursing students ($n=16,983$). All test results taken by Nursing students from the 2016, 2017, 2018, and 2019 periods were included by design. No exclusion criteria were considered for this study by the authors.

To obtain data, the information available on the Colombian Institute for the Evaluation of Higher Education (ICFES) website was extracted by downloading the grouped exams from 2016 to 2019 in CSV format and converting them into a database in Microsoft Excel. The generic and specific competency modules were downloaded from all students in the country during the period analyzed. The researchers then eliminated observations from programs other than nursing. Using a Python script, the results of the generic and specific competencies were linked in a single database. The authors did this proceeding because the competencies are found in different documents and were linked using EK codes (student codes) unique to each student who took the exam.

For data analysis, the statistical program Infostat v/L was used. Absolute and relative frequencies were calculated for categorical variables and mean and standard deviations for quantitative variables.

Applying the modified Shapiro-Wilks test revealed that the data exhibited non-normal behavior in all dimensions ($p < 0.001$). Therefore, nonparametric tests were implemented for data analysis. For inferential analysis, the Mann-Whitney Wilcoxon U test and the Kruskal-Wallis test were used to identify statistically significant differences between two and three or more groups, respectively. The Spearman correlation test (ρ) was used to identify correlations between quantitative variables. The statistical significance level was set at $p=0.05$.

The variables of interest for the study were organized into four groups:

- Personal information, including variables such as gender, age, ethnicity, area of residence, department, and municipality of residence, among others.
- Academic and citation information, including variables such as the higher education institution (name and type), the location where the students took the exam, tuition fees, and scholarship status, among others.
- Socioeconomic information, including aspects such as parents' educational level and occupation, occupation of study, household amenities, household appliance availability, and household socioeconomic status.
- Scores obtained in the SABER PRO test modules, which are divided into five generic competencies (Written Communication, English, Citizenship Competencies, Critical Reading, and Quantitative Reasoning) and two specific competencies (Health Promotion and Disease Prevention and Health Care). This information was also taken into account in the overall test score. Module scores range from 0 to 300, so the higher the score, the better the performance.

The generic modules assess the following competencies:

Written Communication: "Evaluates the ability to communicate ideas in writing related to a given topic. The topics covered in writing are in the public domain; they do not require specialized knowledge" (ICFES, 2019, p. 15).

Quantitative Reasoning: "Evaluates competencies related to mathematical skills to perform adequately in everyday contexts involving quantitative information" (ICFES, 2019, p. 15).

Critical Reading: "Evaluates the ability to understand, interpret, and evaluate texts that can be found both in everyday life and in non-specialized academic settings" (ICFES, 2019, p. 15).

Citizenship Competencies: "It assesses the knowledge and skills that enable the construction of frameworks for understanding the environment, which promote the exercise of citizenship and inclusive coexistence according to the Political Constitution" (ICFES, 2019, p. 15).

English: "It assesses the ability to communicate effectively in English. This competency, aligned with the Common European Framework, allows examinees to be classified according to their level of performance" (ICFES, 2019, p. 15).

Regarding specific competencies, the modules assess the following aspects:

Health Care: "This module assesses the competency that allows for the application of basic public health concepts, which determine the prioritization of actions to be taken according to the health conditions of the individual, family, and community within the national and international political and regulatory framework. Evidence is sought that the student analyzes the personal, social, economic, and environmental determinants that influence the health status of the individual, family, and community to prioritize the actions to be taken; proposes diagnostic, implementation, and evaluation actions within the framework of current health policies and guidelines; recognizes national policies and regulations and international agreements signed by the Colombian State related to public health and applies them in specific situations that affect the health of the individual, family, and community. This module integrates the process of systematizing information related to the health of the individual, family, and community into the prioritization of actions" (Canova-Barrios *et al.*, 2023, p.5; ICFES, 2019).

Health promotion and disease prevention: "This module assesses the competency to apply basic concepts of health promotion and disease prevention, enabling the prioritization of actions to be taken according to the health conditions of individuals, populations, and current regulations. Evidence is sought that the student integrates the basic concepts of health promotion, allowing them to prioritize actions to be taken according to the health conditions of populations and that they integrate the basic concepts of disease prevention, enabling them to prioritize actions to be taken according to the health conditions of populations" (Canova-Barrios *et al.*, 2023, p. 5; ICFES, 2019).

Regarding ethical precautions, this is an observational study that used publicly available data. Ethical guidelines were followed by the authors in the analysis and writing of this work (Canova-Barrios, 2022).

RESULTS AND DISCUSSION

Data from 16,983 final-year nursing students who took the SABER PRO tests between 2016 and 2019 were analyzed. 68.98% of these students came primarily from universities, and based on the legal nature of the institution, they were non-official foundation-type institutions (37.71%) and corporation-type institutions (35.16%) (Table 1). It is noteworthy that the students came primarily from the departments of Antioquia (8.45%) and Bogotá City (25.35%).

Table 1.
Characterization of the institution and year of presentation of the test.

Variable	Categories	n	%
Year of exam submission	2016	4027	23,71
	2017	4188	24,66
	2018	4340	25,55
	2019	4428	26,07
Nature of the HEI	Official – National	2235	13,16
	Official – Departmental	2189	12,89
	Official – Municipal	183	1,08
	Unofficial – Corporation	5971	35,16
	Unofficial – Foundation	6504	38,30
	Not reported	1	0,01
Academic character of the HEI	University	11715	68,98
	University Institution	5267	31,01
	Not reported	1	0,01
Total		16983	100,00

Source: Prepared by the authors.

At the sociodemographic level, at the time of taking the SABER PRO tests, the students had an average age of 24.80 years (SD = 4.91) with a minimum of 18 and a maximum of 62 years. The majority were female (84.97%), of Colombian nationality (99.88%), did not identify with an ethnic group (68.69%), had obtained an academic secondary school degree (52.67%), were single (41.42%) and were actively employed (55.30%) (Table 2).

Table 2.
Sample characterization

Variable	Categories	n	%
Age	Average (SD)	24,80	4,91
Nationality	Colombian	16963	99,88
	Foreign	20	0,12
Gender	Female	14431	84,97
Ethnicity	Male	2551	15,02
	Not reported	1	0,01
High school diploma	Yes	866	5,10
	No	11665	68,69
	Not reported	4452	26,21
Marital status Variable	Academic	8945	52,67
	Pedagogical	366	2,16
	Technical	3160	18,61
	Not reported	4512	26,57

Age Nationality Gender	Single	7035	41,42
	Married	543	3,20
	Common-law union	705	4,15
	Separated or widowed	61	0,36
	Not reported	8639	50,87
	Not working	7210	42,45
	Working	9391	55,30
	Not reported	382	2,25
	Total	16983	100,00

Source: Prepared by the authors.

55.44% of respondents reported residing in their usual residence, and regarding their socioeconomic status (evaluated according to household equipment, material, size, and location of the property), these were mostly from strata 2 (40.00%) and 3 (32.01%). The Socioeconomic Level (SES) of the students mainly was level 2, described as those students with homes with access to basic public services and a low-middle income level. Data shows that the majority of students had access to TV (81.30%) and internet (83.55%) services, and to household appliances such as washing machines (82.92%), ovens (51.89%), and computers (89.32%), while to a lesser extent they reported owning a video game console (8.81%), automobile (27.02%) or motorcycle (34.75%) in their homes (Table 3).

Table 3.

Ownership of services, appliances and means of transportation in the home

Ownership of...	Yes		No		Not reported	
	n	%	n	%	n	%
Internet Service	14190	83,55	2461	14,49	332	1,95
Computer	15169	89,32	1455	8,57	359	2,11
Washing Machine	14083	82,92	2539	14,95	361	2,13
Oven (microwave or gas)	8812	51,89	7597	44,73	574	3,38
TV Service	13808	81,30	2834	16,69	341	2,01
Video Game Console	1496	8,81	6916	40,72	8571	50,47
Car	4588	27,02	12027	70,82	368	2,17
Motorcycle	5902	34,75	10412	61,31	669	3,94

Source: Prepared by the authors.

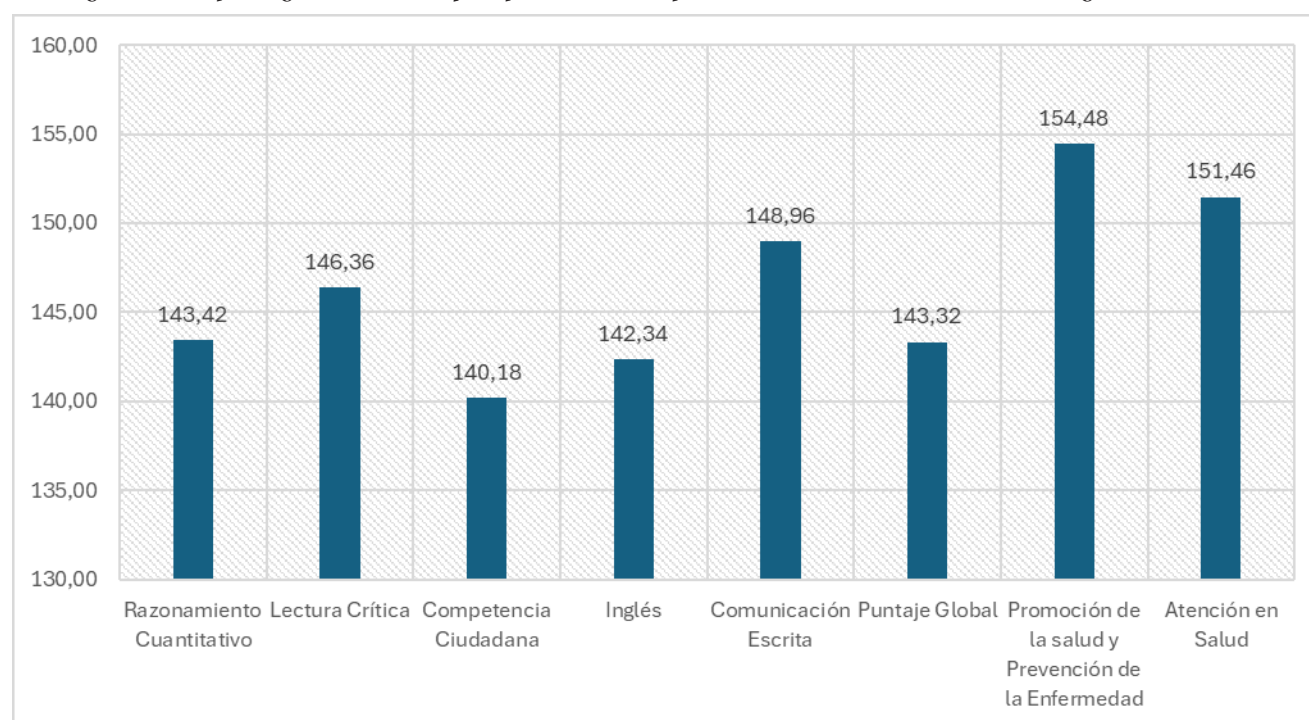
Students mainly reported having between 0 and 10 books (28.82%) and 11 to 25 books (23.56%) available at home. It is noteworthy that 6.02% reported not reading for pleasure, while 28.22% reported reading between 30 and 60 minutes per day. Likewise, 40.69% reported spending between 1 and 3 hours surfing the internet daily. Parents' educational level mainly was secondary, with 34.62% of fathers and 36.66% of mothers.

When analyzing the scores for the five generic modules, data shows that Written Communication had the highest mean (148.96, SD = 28.89), while Citizenship Competence had the lowest mean (140.18, SD = 29.00). The overall score for the test was 143.32 (SD = 20.50). Regarding the specific modules, these presented a better overall performance compared to the generic ones, with the average of Health Promotion and Disease Prevention being the module with the highest score in the entire test (154.48, SD=32.71) (Figure 1).

When analyzing the results obtained in the different modules according to performance level, data shows that students mainly were at level 2 in the Quantitative Reasoning, Critical Reading, Civic Competence, and Written Communication modules (Figure 2). Regarding English language proficiency, data shows that 37.68% of students were at level A1 (basic).

Figure 1.

Average score of the generic and specific modules of the SABER PRO test in nursing students

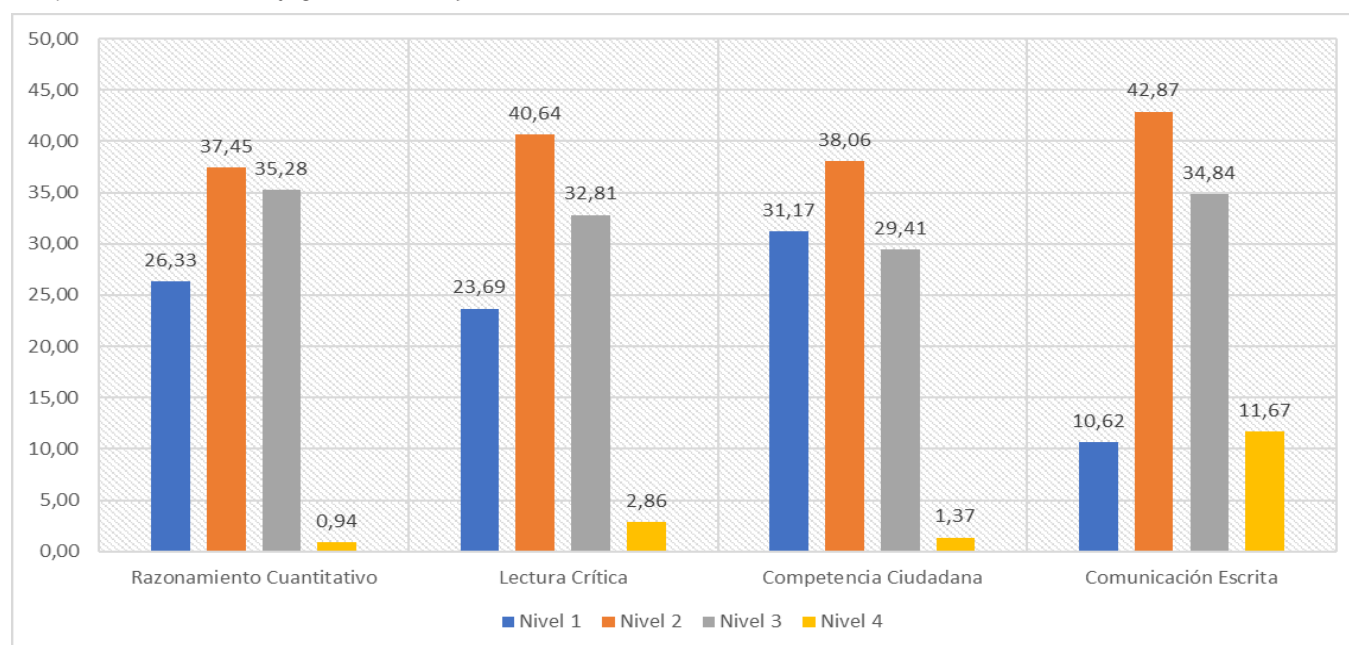


Source: Prepared by the authors

Note: The figure appears in its original language

Figure 2.

Performance levels by generic competencies



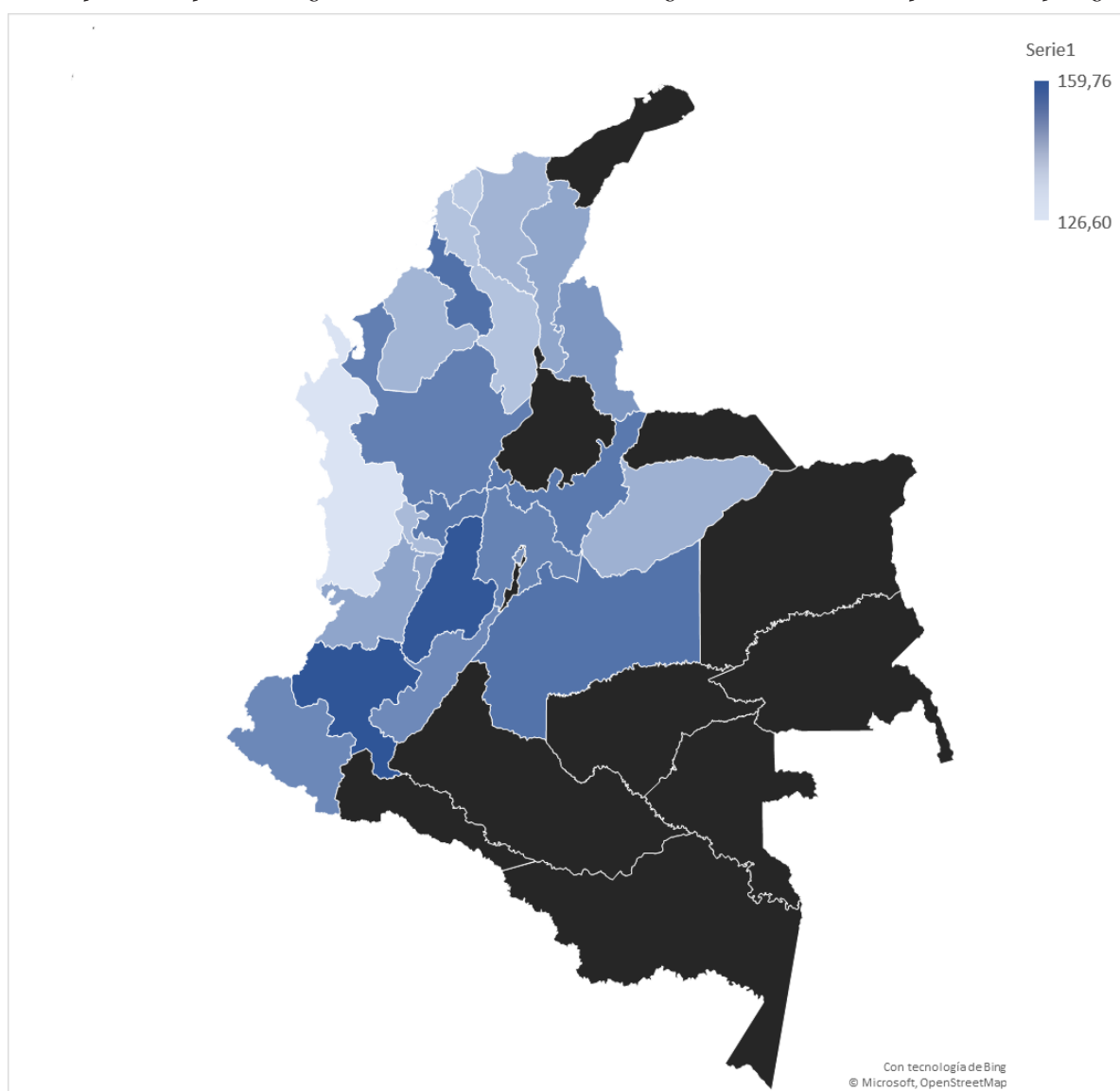
Source: Prepared by the authors

Note: The figure appears in its original language

When analyzing the mean overall score by the department of study for students taking the SABER PRO test, data shows that the department of Chocó had the lowest score, with a mean of 126.60 (SD = 14.25), while the department of Cauca had the highest score, with a mean of 159.76 (SD = 17.70). The complete data is shown in choropleth map I (figure 3).

Figure 3.

Choropleth Map I. Average overall test score according to the student's department of origin



Source: Prepared by the authors.

Departments marked in black do not offer nursing programs.

En la literatura se han descrito diversidad de factores personales y familiares que pueden incidir en el desempeño de los estudiantes de nivel superior. Se han mencionado variables como la edad, sexo, nivel educativo de los padres, estatus socioeconómico, ser cabeza de hogar y tenencia de hijos (Caponnetto et al., 2021; Dante et al., 2016; García et al., 2012; Grajales-Alonso et al., 2022; Vidal Barrantes, 2023; Zárata-Grajales et al., 2021). Asimismo, variables institucionales como el contar con una beca de estudios, costo de la matrícula y la existencia de programas de apoyo estudiantil representan factores de gran relevancia al analizar esta problemática, pues representan motivantes extrínsecos que contribuyen a mantener un óptimo desempeño en el alumnado y una trayectoria académica similar a la teórica.

In the present work, when performing the inferential analysis, a low negative correlation was found between age and performance in the test modules ($\rho = -0.27$, $p < 0.001$). That is, better performance was found in younger students. The described finding coincides with the reports in the literature in which greater ease of learning is described in younger students and a student profile with lower professional, family, and social burdens (Brito-Jiménez y Palacio-Sañudo, 2016; Cala-Calviño et al., 2020; Carreño et al., 2020; García Cabezas y Almeyda Vázquez, 2019; Parra Aguirre y Padilla Contreras, 2022).

Male students had higher mean scores in all modules ($p < 0.001$), with the exception of Written Communication ($p = 0.074$). Two studies conducted by Lancia et al. (2018) and Zárate-Grajales et al. (2021) in Italy and Mexico, respectively, concluded that women performed better in the program compared to their male counterparts, contrasting the findings of this study. However, the texts by Gai and Franco (2021) and Chewaka Gamtessa (2021) are similar to this study. The literature has reported that academic performance can be influenced by biological, psychological, and social factors, detailing a better capacity for integration, greater motivation for challenge and competition, and access to better training opportunities for men (Canova-Barrios et al., 2023). It should be noted that nursing programs tend to have a higher female presence, which could influence the results.

Those who reported residing in rural areas, identified with an ethnic group, reported being heads of household, and were employed had lower averages ($p < 0.001$) in all the modules analyzed. These data are consistent with a study conducted by Sandoval Zúñiga (2021), which identified in a sample of health discipline students that having and the number of children was closely related to academic performance. Having children, being financially responsible for the family nucleus, and caring for relatives (younger siblings or sick relatives) are relevant variables when analyzing academic performance, given their influence on presenteeism, compliance with academic obligations, and dropout rates (Carrasco Aldunate et al., 2022; Musso et al., 2020; Ortigoza, 2022).

Likewise, the area of residence is linked to aspects such as educational inequality, socioeconomic aspects, uprooting, lack of support networks, and limited access to technology and educational materials, which would explain the finding of the area of residence with the performance in the test. However, other studies contrast with this report, mainly by only analyzing the results of students from public institutions where access and maintenance of scholarships are conditioned by educational performance (Canova-Barrios et al., 2023).

Students from higher socioeconomic backgrounds obtained higher GPAs in the English module ($p < 0.001$), those who reported being enrolled in university programs, and those with scholarships obtained higher GPAs across all modules. Tuition fees were negatively correlated with module scores ($p < 0.001$). Regarding the department of residence, students from the department of Chocó obtained lower GPAs across all modules analyzed. The data described are closely related because they indicate a less socioeconomically advantaged student profile, which negatively impacts their academic performance. In turn, various Colombian institutions require scholarship students to maintain high GPAs, suggesting that greater effort during their studies translates into better test performance (Canova-Barrios et al., 2023).

Having internet access and a computer at home was shown to be associated with better performance in the generic modules. Among students who reported owning a video game console, performance in the English module was better (console yes = 142.49, console no = 145.95, $p < 0.001$).

Although a trend toward higher means across test modules was identified among students who reported owning and reading a greater number of books, the differences were not statistically significant. A similar finding was reported by Canova-Barrios et al. (2023).

Living in a permanent home was associated with higher average scores on the overall test (permanent residence = 143.69, temporary residence = 142.63, $p = 0.001$) and on the English module (permanent residence = 142.03, temporary residence = 139.23, $p < 0.001$). This finding is similar to that reported by a study conducted in Australia by Gu and Sok (2021), which found that academic performance was lower among international students and those from non-metropolitan areas, that is, those residing in rural areas who had to travel to access higher education opportunities. This latter aspect was also corroborated in the present study, where students from rural areas had lower average scores on the tests, although it differs from a recent study that reported better performance among those from rural areas (Canova-Barrios et al., 2023). This difference may be related to the fact that the study was conducted at a public university, which has a strict selection system and offers scholarships to students from rural areas. These scholarships are withdrawn for inadequate performance, which is an extrinsic motivating factor for learning (Brito-Jiménez & Palacio-Sauño, 2016; Canova-Barrios et al., 2023).

When comparing the means of the generic modules with the parent's education level, it was found that the higher the educational level of both the mother and father, the better the student's performance on the test, with the exception of the Written Communication module, which was not linked to the parent's educational level. These findings may be linked to social, cultural, economic, and emotional factors. Thus, parents with higher education tend to understand the educational system better, influence the student's discipline, motivation, and ambition, provide more confidence and emotional support by better understanding academic challenges, provide greater cultural capital including knowledge, skills, languages, habits, and values well perceived in higher education. Therefore,

they significantly influence the opportunities, support, and cultural environment of the student, which can make a difference in performance and permanence at the university (Canova-Barrios et al., 2023; Espejel García & Jiménez García, 2019).

Several authors have identified a relationship between academic performance and institutional variables, such as the relationship with faculty, the perception of a challenging learning environment, formal support and monitoring structures for students, and quality faculty (Fooladi et al., 2022). Although these variables were not considered in this study, they are relevant for an in-depth analysis of the factors that directly or indirectly impact the performance of higher education students, including those in nursing programs.

Given the factors described, it is imperative that the State guarantee access to higher education and provide the conditions for student retention, ensuring a smooth academic trajectory that allows for comprehensive development during their studies (Grande et al., 2021; Figueira-Teuly et al., 2022; Casquete-Tamayo & Delgado Mendoza, 2023). The above is even more relevant when it comes to disciplines of public interest, as is the case with future health professionals.

CONCLUSIONS

Findings showed that in specific competencies, the Written Communication module had the highest average, and Citizenship Competence had the lowest. The overall average score was low, reaching nearly 50% of the maximum score.

The variables associated with better performance on the SABER PRO test among nursing students during the period analyzed were age (younger), urban area of residence, higher socioeconomic status, not identifying with an ethnic group, having a scholarship (full or partial), having a permanent residence at the higher education institution, owning a computer, having internet access at home, and not having dependents. Poor performance was identified in foreign language competencies, with only one-tenth of the students achieving a level of independence equivalent to category B1 of the European Reference Framework.

The education and healthcare systems need to review the assessed aspects and monitor the institutions with poor performance. Likewise, it is important to highlight the need to implement training policies that incorporate the principles of social justice and equity, given that a trend toward better training has been identified in the wealthiest departments. The department of Chocó, according to figures from the Ministry of Commerce, Industry, and Tourism, has the lowest average scores in the country, achieving nearly 40% of the maximum score on the test. This is also evident in the relationship between identifying with an ethnic group and lower performance. For higher education institutions, it is suggested that students' SABER PRO test scores be compared with their academic performance throughout their studies. This would allow them to identify those subjects that predict good or poor performance in the areas assessed in order to strengthen the former and intervene in the latter, thus promoting academic excellence and raising the quality of their graduates.

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