Research Article

Assessing Predictors of Academic Performance for NMEI Curriculum-Based Medical Students Found in the Southern Ethiopia

Tsegaye Mehare ¹, Reta Kassa,² Birhanie Mekuriaw,³ and Tewodros Mengesha¹

¹Department of Biomedical Science, College of Medicine and Health Sciences, Dilla University, Dilla, Ethiopia

²School of Public Health, College of Medicine and Health Sciences, Dilla University, Dilla, Ethiopia

³Department of Psychiatry, College of Medicine and Health Science, Dilla University, Dilla, Ethiopia

Correspondence should be addressed to Tsegaye Mehare; tseyeshe96@gmail.com

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Background. In Ethiopia since 2012, the Ethiopian Federal Ministry of Health and Education implemented a new medical education initiative in 13 institutions. Currently, as a nation, very little is known about the predictors of academic performance for new medical education curriculum-based students. Identifying different factors affecting students' academic performance in the local context so as to enrich the empirical evidence and provide new insights into the effect of variables in developing countries is very important. Thus, the main aim of this study was to assess predictors of academic performance for new medical education initiative curriculum-based medical students. **Objective.** This study designed to assess the predictors of academic performance for new medical education initiative curriculum-based medical students found in Southern Nations and Nationalities Peoples' Region, Ethiopia. **Methods.** Institutional-based cross-sectional study design was used on 472 new medical education system students. The study setting includes three medical institutions (Dilla University College of Medicine and Health Science, Wolaita Sodo University College of Medicine and Health Sciences, and Yirgalem Hospital Medical College) within southern region from February to July 2020. The study subjects were those medical students under the NMEI curriculum and had at least one-year cumulative grade point average in the abovementioned institutions. **Results.** A total of 167 (35.4%) of the students' academic performance scores were poor. Being agriculture graduate with educational background, mothers with no formal education, being married, first-degree performance score of 2.7–3.2 CGPA, monthly allowance of 10–24.99 USD, nondormitory, student age of 31–35 years old, and being stressed have shown an association with poor academic performance score of the students. **Conclusion.** First-degree educational background, marital status, maternal educational status, first-degree academic performance, age of the student, monthly allowance, residency during medical school, and history of stress were significant predictors of academic performance for new medical education system students. Thus, it is recommended that special attention should be paid to the admission criteria and financial support of the students.

1. Background

Medical education has been discussed for its system, aim, and structure for many years. Recently, it is more reformed to produce more competent medical professionals [1–3]. Changes are primarily aimed at maximizing the competencies through providing contextual, problem-oriented, and self-directed learning. Education is meaningful when

students integrate the knowledge of basic science facts into clinical problems so that the quality of health care is achieved, and of course, this would be real with good achievements of academic qualities [2, 4].

Ethiopia has been implementing traditional medical education and graduates were missing some competencies [5]. Studies elsewhere reported that students were passively engaged in the educational process and courses are discrete

and discipline-based [6]. Since 2012, the Ethiopian Federal Ministry of Health and Education implemented a new medical education initiative (NMEI) in 13 institutions [5, 7]. NMEI utilizes modern educational principles like self-directed learning, problem-based learning (PBL), and professional competency development (PCD) [8, 9]. The curriculum utilizes a modular system and provides horizontal and vertical integration of basic and clinical courses. During the first three years of study, PBL, PCD, and community attachment sessions are focused on; assisted by lectures, skills training, basic science laboratory, and clinical attachments. Social and population health courses are longitudinally given throughout the students' study [5]. Empirical evidence showed that PBL stimulates communication skills, deep learning, and a better understanding of medical competencies [8]. Research has shown that it helps integrating basic sciences to clinical courses at earlier years of medical education [1, 8, 9].

The information on the predictors of academic performance among traditional medical education students was documented at different times and places in Ethiopia [10–12]. A study on predictors of self-reported academic performance among undergraduate medical students of Hawassa University showed that substance use at university, medicine as first choice by students, and university entrance examination results were identified as predictors of variation in self-reported academic performance [10]. A study done in Jimma University Medical School reported that stress was a significant problem among medical students and had a negative impact on their academic performance [11]. Another study done in Wolaita Sodo University showed that grade 12 average mark, university entrance exam score, and socioeconomic variables were identified as predictors of academic achievement for first-year students [12].

Besides, a study done at the University of Ghana School of Medicine and Dentistry, Ghana, on evaluation of sleep patterns and self-reported academic performance among medical students reported that sleep quality associated with academic performance [13] while the study done at the Saudi Medical College in 2019 is in contrary, which indicated that poor sleep or stress did not show any significant association with academic performance [14]. Currently as a nation (Ethiopia), very little is known about the predictors of academic performance for NMEI curriculum-based students. Pilot reports in Ethiopia showed that even though NMEI utilizes modern educational principles, students are poorly performing in the qualifying exams [15]. Pieces of evidence from SWOT analysis showed that there is a problem with the admission policy. Therefore, this study is very important to identify factors affecting students' academic performance in the local context and enrich the empirical evidence in the developing nations and help to provide new insights into the effect of variables in developing countries, where curricular experts and national policy makers use productively to design and implement policies that improve the students' performance and educational quality accordingly. In addition, this study result provides baseline resource in the catchment area for other researchers. The research question is: What are the predictors of academic performance for new

medical education initiative curriculum-based medical students found in Southern Nation and Nationalities and Peoples' Region (SNNPR), Ethiopia?

2. Materials and Methods

2.1. Study Context. The study was conducted in three medical schools in SNNPR which teach medical students through new medical education innovative curriculum. The medical schools with new medical education curriculum-based initiatives were established in 2012. Applicants with a first degree in health science, computational science, and agriculture educational background were considered for admission to NMEI schools. The main feature of the NMEI program is integrating basic sciences to clinical skills complemented by early clinical and frequent community exposure, PBL, and PCD where all need the active engagement of the students [5, 7].

The study duration is five years. Students study the normal and abnormal function and structure of human body for the first two years, followed by two clinical years and the final one year is block internship time. The grading system of the school is based on the fixed-scale system of NMEI curriculum with 90%–100% (A+), 85%–89.9% (A), 80%–84.9% (B+), 70%–79.9% (B), 65%–69.9% (C+), 60%–64.9% (C), 55%–59.9% (D+), 50%–54.9% (D), and less than 50% (F). According to the system, A+ and A have a score of 4.0 whereas B+, B, C+, C, D, and F have scores of 3.5, 3.0, 2.5, 2.0, 1.0, and 0, respectively [5, 16]. Accordingly, the maximum and the minimum cumulative grade point average (CGPA) a medical student can achieve will be 4.0 and 0, respectively.

2.2. Study Design and Setting. Institution-based cross-sectional study design was conducted. The study was conducted in medical schools with the NMEI curriculum found in the SNNPR region from February to July 2020. All the three medical schools (Dilla University College of Medicine and Health Science; Wolaita Sodo University, College of Medicine and Health Sciences and Yirgalem Hospital Medical College) found in Southern Nation Nationalities and People's Region with NMEI curriculum were included.

2.3. Sample Size. The number of students in all three medical schools who had computed 1st-year CGPA was less than 500. Since the number of students in all the three medical schools was small to carry out random sampling, we were using the entire available plus eligible 476 students.

2.4. Source Population. All medical students admitted to the NMEI curriculum at Dilla University, Wolaita Sodo University, and Yirgalem Hospital Medical College were the source population.

2.5. Study Population. All NMEI students from three medical schools whose 1st-year CGPA at least calculated were included in the study.

2.5.1. Inclusion Criteria. Students whose 1st-year CGPA was computed at least.

2.5.2. Exclusion Criteria. Students who had not at least one complete year CGPA. Besides, students who were seriously sick at the time of data collection.

2.6. Data Collection Tool and Procedure. Data were collected using structured self-administered questionnaires. If students fail to remember their CGPA, it was collected from the registrar and alumni office because the formal institutional letter of cooperation was already submitted to the registrar and alumni office of the corresponding institution. The questionnaire was prepared in English and then translated into Amharic, a federal institution language. The questionnaire consisted of items assessing sociodemographic characteristics of students and education-related factors. Three experienced higher diploma program graduate teachers for data collection and two experienced Master of Science (MSc) graduate health professionals for supervision were recruited. One-day training was given for data collectors and a pretest was done on 47 samples out of the main study area. During the pretest, the questionnaire was assessed for its clarity, understandability, completeness, and time consumption. The principal investigator and supervisors supervise the data collectors' data collection process as if it was per the standard. The investigators reviewed and checked the data each day after data collection for its completeness and accuracy.

2.7. Operational Definition

Poor academic performance score: students who scored <3.2 cumulative grade point average

Good academic performance score: students who scored ≥ 3.2 cumulative grade point average

2.8. Ethical Approval and Consent to Participate. Ethical clearance was obtained from Dilla University, Centre for Educational Studies and Research. An official letter of cooperation was distributed to each of the data collection sites. Before the questionnaire, the aims and objectives of the study were clearly explained to the participants. Verbal informed consent was obtained from each study participant before data collection. Confidentiality of the data was maintained by excluding their identifiers. All participants were involved in this study only with their willingness.

2.9. Statistical Analysis. The entire data collected using a structured questionnaire were validated, edited, coded, and entered into SPSS version 23. Followed by checking for any inconsistencies, descriptive analysis was performed. Descriptive statistics, such as frequencies, and percentages were used to describe the sociodemographic and educational background, substance use history in the campus, and CGPA of the students. A chi-square test was used to find the potential association of dependent and independent

variables. Bivariate logistic regression analysis was done to decide whether there is an association between academic performance and different factors to select nominee variables for multivariate logistic regression. Variables with p values of up to 0.20 in the bivariate logistic regression analysis were identified and fitted to the multiple logistic regression analysis to identify the independent effects of each variable to the outcome variable. The odds ratio with 95% confidence intervals (CI) was calculated to distinguish the occurrence and strength of associations, and statistical significance was affirmed if $p < 0.05$.

3. Results

3.1. Sociodemographic Characteristics. In this study, a total of 472 students from the three medical schools were included giving a response rate of 99.2%. Of the total number of respondents, 35.3% were in the preclinical year two, and the remaining 64.7% were in the clinical years. Nearly three-quarters (73.5%) of the participants were male, and the mean age of the participants was 33.08 ± 4.13 years. Participants reported an average monthly allowance of 32.49 ± 21.98 USD. The predominant religion of the study population was found to be Protestant, 244 (51.7), followed by Orthodox, 98 (20.8%), and Muslim, 75 (15.9%), while the rest were neither Christians nor Muslims. The predominant ethnic group was 141 (29.9%) Amhara followed by Oromo 128 (27.1%). Analysis of educational levels of mothers showed that the majority 147 (31.2%) had primary education, 111 (23.5%) had no formal education, and 110 (23.3%) grade 7–8 education while the rest 104 (22.0%) had secondary school and above levels of educational (Table 1).

3.2. Education-Related Factors. With regard to first-degree educational background, nearly half (49.8%) of participants graduated with their first degree in agriculture and the average CGPA performance score was 3.35 ± 0.38 . The average self-reported medical school entrance examination result was $82.24\% \pm 8.19\%$. There was not a statistically significant difference between the mean entrance examination results of male and female students (82.66% versus 81.06% , resp., $p = 0.061$). The average self-reported work experience before joining medical school was 3.22 ± 1.39 years. Of the total number of participants, more than a quarter (28.6%) used any substances during the data collection period. Cigarettes, alcohol, and Khat together were the most commonly used substance, followed by alcohol and Khat chewing. When substance use was disaggregated by academic year, the proportion of substance users increased with increment in the academic year. The students' mean lengths of time usually spent studying in 24 hours were 6.22 ± 3.46 hours (Table 2).

The self-reported academic performance had been decreasing as the academic years progressed, with the highest and lowest performance being in preclinical I (mean GPA 3.14) and clinical I medicine (mean GPA 2.81), respectively. The mean current cumulative GPA of the participants was 3.1 ± 0.33 ; more than half (64.6%) of

TABLE 1: Sociodemographic characteristics of new medical education system students in SNNPR.

Characteristics	Frequency	Percent
Sex		
Male	347	73.5
Female	125	26.5
Age category in years		
25–30 yrs	116	24.6
31–35 yrs	197	41.7
>35 yrs	159	33.7
Residency during medical school		
Dormitory	369	78.2
Nondormitory	103	21.8
Marital status		
Unmarried	223	47.2
Divorced	115	24.4
Married	134	28.4
Medical education status		
Preclinical II	167	35.3
Clinical I	150	31.8
Clinical II	97	20.6
Internship	58	12.3
Monthly allowance, USD		
<10	121	25.6
10–24.99	105	22.3
25–50	118	25.0
>50	128	27.1
Ethnicity		
Amhara	141	29.9
Oromo	128	27.1
Wolaita	80	17.0
Gurage	63	13.3
Others	60	12.7
Religion		
Protestant	244	51.7
Orthodox	98	20.8
Muslim	75	15.9
Others	55	11.7
Maternal education level		
No formal education	111	23.5
Primary education	147	31.2
Grade 7-8 education	110	23.3
Secondary and above education	104	22.0
Paternal education level		
No formal education	68	14.4
Primary education	34	7.2
Grade 7-8 education	33	7.0
Secondary and above education	337	71.4

the students had a cumulative GPA ≥ 3.2 , and there was no difference in cumulative GPA between female and male students (3.14 and 3.11, $p = 0.4$). In addition, there was no difference in cumulative GPA between preclinical and clinical students (3.15 and 3.10, $p = 0.14$, Table 3). More than one-third of the participants (34.1%) had ever been delayed (needed to repeat a course) in their time as medical students; nonetheless, 11.6% had needed to resit an examination. The academic performance was good for 64.6% of the students (cumulative GPA of ≥ 3.2). Poor

TABLE 2: Former first-degree educational background and behavioral characteristics of new medical education system students in SNNPR.

Characteristics	Frequency	Percent
First-degree educational background		
Agriculture	235	49.8
Computational science	109	23.1
Health science	128	27.1
Performance in former first degree, CGPA		
2.7–3.2	168	35.6
3.3–3.6	173	36.7
>3.6	131	27.8
Work experience with first degree		
2 yrs	225	47.7
3-4 yrs	123	26.1
>4 yrs	124	26.2
Medicine entrance examination result (%)		
70–79.99	225	47.6
80–89.99	123	26.1
≥ 90	124	26.3
The average daily duration of study hours		
<5 hours	225	47.7
5–10 hours	123	26.1
>10 hours	124	26.2
Substance use in medical school		
No	337	71.4
Yes	135	28.6
Type of substance currently used ($n = 135$)		
Khat only	33	24.4
Alcohol and khat	34	25.2
Cigarettes, alcohol, and khat	68	50.4
Substance use by academic yrs ($n = 135$)		
Preclinical II	16	11.9
Clinical I	31	23.0
Clinical II	32	23.7
Internship	56	41.5
History of stress in medical school		
No	345	73.1
Yes	127	26.9

academic performance (cumulative GPA < 3.2) was reported by 35.4% of the students (Table 3).

3.3. Predictors of Academic Performance. The bivariate logistic regression analysis showed that maternal educational status, paternal educational status, marital status, age of the student, monthly allowance, average study hour per day, residency during medical school, medicine entrance exam result, first-degree educational background, substance use in campus, first-degree performance score, and history of stress were associated with academic performance. After adjustments for possible effects of confounding variables, maternal educational status, marital status, age of the student, monthly allowance, residency during medical school, first-degree educational background, first-degree performance score, and history of stress were significantly and strongly associated with academic performance of the students.

Students who were graduated with their first degree in agriculture showed a significant association with poor

TABLE 3: Patterns of academic performance among new medical education system students in SNNPR.

Have you ever been delayed (repeated) course?		
No	311	65.9
Yes	161	34.1
Academic year of delay (<i>n</i> = 161)		
Preclinical II	39	24.2
Clinical I	37	23.0
Clinical II	26	16.1
Internship	59	36.7
Have you ever had a resit exam?		
No	417	88.4
Yes	55	11.6
The academic year of the resit exam (<i>n</i> = 55)		
Preclinical II	14	25.5
Clinical I	11	20.0
Clinical II	9	16.4
Internship	21	38.1
Withdrawal history in any case		
No	405	85.8
Yes	67	14.2
GPA	Mean	SD
Preclinical I	3.14	0.34
Preclinical II	2.90	0.26
Clinical I	2.81	0.28
Clinical II	2.74	0.28
Current cumulative	3.1	0.33
Academic performance, cumulative GPA		
Good (≥ 3.2)	305	64.6
Poor (< 3.2)	167	35.4

academic performance. In epidemiological explanation, this showed us that students who graduated with their first degree in agriculture were 9.58 times more likely to score poor academic performance as compared to those students who graduated with their first degree in health science (AOR: 9.58, 95% CI 4.51, 20.36). The likelihood of scoring poor academic performance among students who had mothers with no formal education were 4.58 times more compared to students who had mothers with a secondary and above level of education (AOR: 4.58, 95% CI 1.99, 10.54). Being married was strongly associated with poor academic performance. Those students who were married were 4.32 times more likely to score poor academic performance as compared to unmarried (AOR: 4.32, 95% CI 2.43, 7.68). Student first-degree performance score was another variable associated with academic performance in medical school. Those students who scored 2.7–3.2 CGPA during their first-degree education were 3.07 times (AOR: 3.07, 95% CI 1.62, 5.81) more likely to perform poor CGPA in medical school as compared with those students who scored > 3.6 CGPA in their first-degree education.

Students who earned a monthly allowance of 10–24.99 USD were 3.58 times as likely to score poor academic performance (AOR: 3.58, 95% CI 1.70, 7.56) than students who earned > 50 USD. Being a nondormitory was also associated with poor academic performance. Those students who were nondormitory were 2.49 times more likely to score poor academic performance compared with their

counterparts (AOR: 2.49, 95% CI 1.39, 4.46). On the other hand, we noted an association between students' age and academic performance. Students who had age between 31 and 35 years old had a lower risk of scoring poor academic performance as compared to those students who had age between 25 and 30 years old (AOR 0.30, 95% CI 0.20–0.44) (Table 4).

4. Discussion

According to this study result, both educational and sociodemographic factors were a substantial predictor for academic performance of medical students. Poor academic performance was found to be significantly higher in those students who were graduated with their first degree in agriculture than those who graduated in health science. This may be related to the exposure deficit in medical knowledge for those students whose first-degree educational background was agriculture. Maternal educational status was another important variable associated with student's poor academic performance. Poor academic performance was higher for those students whose mothers had no formal education as compared to those students whose mothers had high school and above level of education. This might be explained by the fact that mothers might support morally, psychologically, and economically, thus providing a positive triggering factor for their children to be successful [17]. Similarly, marital status enlightened a significant association with poor academic performance scores. Married students had higher odds to score poor academic performance than unmarried students. The possible rationalization for this difference is that marrieds are in stress to fulfill social and financial economies for their family in addition to academic stress. Monthly allowance was also another associated factor for poor academic performance scores. Those students whose monthly allowance was 10–24.99 USD scored poor academic performance as compared to those students whose monthly allowance was > 50 USD. This finding is in line with studies done in Jimma University [11] and Canada memorial's medical students [18]. This might be explained by the fact that students' financial constraints could be an additional source of stress besides academic stressors which might result in poor academic performance. Even though food and dormitory services are provided to the students by the university, students need money for jaunts, stationaries, to buy dressings, and other necessities. However, the current result is contrary to the study done in Southeast Nigeria [19]. The possible rationalization we speculate that the less financial capability for a medical student has, the less probable s/he would be engaged in extracurricular activities, hence the more likely s/he would focus on academic-related activities.

Poor academic performance was found to be significantly higher in those students who scored 2.7–3.2 CGPA on their first degree than those scored > 3.6 CGPA on their first degree. This finding is in agreement with studies done at Arabian Gulf University (Bahrain) [20], Scotland medical school applicants [21], and United Kingdom school leaver entrants for medical school [22]. The possible rationalization could be that a previous academic achievement is a stronger

TABLE 4: Binary and multiple logistic regression analysis of academic performance based on CGPA as a dichotomous variable, for new medical education system students in SNNPR.

Variables	Academic performance, CGPA		COR (95% CI)	AOR (95% CI)
	Good (≥ 3.2)	Low (< 3.2)		
Paternal educational status				
No formal education	12	56	8.02 (4.14, 15.54)	4.58 (1.99, 10.54)***
Primary education	27	7	0.45 (0.19, 1.05)	0.44 (0.14, 1.35)
Grade 7-8 education	25	8	0.55 (0.24, 1.26)	2.83 (0.93, 8.58)
Secondary and above education	213	124	Ref	Ref
Age				
25–30 yrs	54	62	Ref	Ref
31–35 yrs	129	68	1.66 (1.03, 2.69)	0.34 (0.16, 0.71)**
>35 yrs	94	65	0.76 (0.50, 1.17)	1.46 (0.63, 3.37)
Residency during medical school				
Dormitory	223	146	Ref	Ref
Nondormitory	54	49	1.39 (0.89, 2.15)	2.49 (1.39, 4.46)**
Marital status				
Unmarried	152	71	Ref	Ref
Divorced	84	31	0.79 (0.48, 1.30)	0.85 (0.47, 1.53)
Married	41	93	4.86 (3.06, 7.72)	4.32 (2.43, 7.68)***
Monthly allowance				
<10	47	74	3.73 (2.20, 6.31)	2.64 (1.31, 5.34)**
10–24.99	61	44	1.71 (0.99, 2.94)	3.58 (1.70, 7.56)**
25–50	79	39	1.17 (0.68, 2.01)	0.54 (0.24, 1.21)
>50	90	38	Ref	Ref
First degree educational background				
Agriculture	88	147	8.05 (4.74, 13.67)	9.58 (4.51, 20.36)***
Computational science	83	26	1.51 (0.80, 2.85)	3.06 (1.29, 7.27)*
Health science	106	22	Ref	Ref
Performance in former first degree, CGPA				
2.7–3.2	82	86	2.15 (1.34, 3.45)	3.07 (1.62, 5.81)**
3.3–3.6	107	66	1.26 (0.78, 2.03)	2.08 (1.11, 3.89)*
>3.6	88	43	Ref	Ref
History of stress				
No	213	124	Ref	Ref
Yes	64	71	1.98 (1.31, 2.99)	1.78 (1.04, 3.05)*

* $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.

predictor of medical school academic performance, but that predictive value decreased as students progressed through the academic years. This is because prior academic achievement demonstrates that the student has a minimum level of competence and the basic knowledge on which to build and integrate new knowledge [23]. Moreover, students age >35 years old were another variable associated with poor academic performance in this study. This study is in line with a study done in Hawassa University [10], even if the effect of student's age on academic performance at medical school is a controversial issue. According to several studies, as the students get older, scientific reasoning became less well and graded with lower scores in their medical studies [24, 25]. On the other hand, recent studies show that older and more mature medical students performed better than their younger counterparts [26].

The risk of poor academic performance was found to be significantly higher in those students who were nondormitory than those students who were dormitories. This may be related to the poor time management of nondormitory students such as spend more time in extracurricular activities, engage

in social and familial duties. Lastly, a history of stress was another personal factor significantly associated with poor academic performance. Students who had stress during medical school were more likely to score poor academic performance as compared with nonstressed students. The current finding is supported by findings from Hawassa University [10] and Jimma University [11]. The possible rationalization could be that medical students are overloaded with a tremendous amount of reading materials, especially during preclinical encounters. They have limited time to internalize all the information studied. The overload information creates a feeling of distress and disappointments because they do not handle all topics covered and, therefore, are not successful during the examination period [27]. The other justification could be that an excessive amount of stress in medical training predisposes students to have difficulties in solving problems, reduced concentration, and that results in excessive secretion of a stress hormone cortisol that causes a decrement in memory retrieval functions of hippocampus and amygdala due to complete blockage of glucocorticoid receptors [28, 29].

5. Conclusion and Recommendation

First-degree educational background, marital status, maternal educational status, first-degree academic performance, age of the student, monthly allowance, residency during medical school, and history of stress were significant predictors of NMEI students' academic performance. Thus, it is recommended that special attention should be given to the admission criteria and financial support of the students.

6. Limitation of the Study

Since the study was done on all the available and eligible students without sampling, the result might lack generalizability to the entire population in the catchment area.

Abbreviations

NMEI: New medical education initiative
 CGPA: Cumulative grade point average
 GPA: Grade point average
 PBL: Problem-based learning
 PCD: Professional competency development
 OR: Adjusted odds ratio
 CI: Confidence interval
 SPSS: Statistical Package for Social Science
 SNNPR: Southern Nation and Nationalities People's Region.

Data Availability

The data upon which the result is based could be accessed from the corresponding author upon request.

Conflicts of Interest

The authors report no conflicts of interest work.

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