SHORT THESIS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY (PHD)

Examining the Impact of Roma Ethnicity and Socioeconomic Segregation on Healthcare Access and Expenditure in Hungary

By Feras Kasabji

Supervisor: Prof. Dr. Sándor János

UNIVERSITY OF DEBRECEN
DOCTORAL SCHOOL OF HEALTH SCIENCE

DEBRECEN, 2024

Examining the Impact of Roma Ethnicity and Socioeconomic Segregation on Healthcare Access and Expenditure in Hungary

By Feras Kasabji, MPH

Supervisor: Prof. Dr. Sándor János, MD, PhD

Department of Public Health and Epidemiology, University of Debrecen Faculty of Medicine.

Head of the defence board:

Prof. Dr. György Paragh MD, PhD, DSc

Reviewers: Dr. Katalin Zsófia Kollányi, PhD

Dr. Goolesorkhi Kia, PhD

Members of the defence board:

Prof. Dr. Edit Paulik, PhD

Dr. Viktor Dombrádi, PhD

The **PhD defence** takes place at Lecture Hall of the Department of Internal Medicine**, Building 'A"**, Faculty of Medicine, University of Debrecen on **December 17th, 2024, at 10:00**.

1 Introduction

Adequate healthcare and equitable healthcare spending remain a pressing concern for policy makers in the European Union (EU) and Hungary, where disparities persist despite efforts to address them. According to the Health Systems in Transition report on Hungary [1], a key problem is the continuing lack of an overarching, evidence-based strategy for mobilizing resources for health, which leaves the health system vulnerable to broader economic policy objectives and makes good governance hard to achieve. Healthcare expenditure in Hungary has been rising steadily in the last decade, where in 2022, the country spent $2840 per capita on healthcare in terms of purchase power parity PPP, compared to the average of $4986 in countries within the Organization for Economic Co-operation Development (OECD),This expenditure equates to a total healthcare spending of 6.7% of the country's Gros Domestic Product (GDP) [2] still below the average of 9.2% for countries within the Organization for Economic Co-operation Development (OECD). Some of the main reasons driving healthcare costs include ageing populations, rising levels of chronic disease prevalence, technological advances and most importantly socio economic inequality. As new technologies, facilities, and increased spending improve overall health outcomes, they also impose a risk of raising inequalities within disadvantaged groups. This unequal distribution of healthcare resources is a serious cause for concern requiring further research.

Perceived access to quality healthcare is also lower in Hungary where only 44% of the population were satisfied with access to quality healthcare compared to the 67% OECD average. Another persistent pattern for Hungary is particularly high hospital based care use revealing a dangerous weakness in healthcare access. This exacerbates the need for emergency care and underscores the importance of examining the reasons behind unequal access to care, that heavily impacts poor communities.

This apparent dissimilarity has many contributing factors. However Socioeconomic status (SES) emerges as a significant determinant of healthcare access and expenditure, individuals with lower education, and employment, living in rural areas or being a segregated minority face greater barriers to quality healthcare. These factors can potentially be the focus of interventions aimed at diminishing inequalities in healthcare access and spending.

Ethnicity further complicates the landscape of healthcare access and expenditure, as ethnic minorities are often disproportionately impacted by socioeconomic disadvantages, one such group are the Roma, the largest ethnic minority in Europe (EU) and Hungary where they constitute around 94% segregated inhabitants. Specific data on Roma health status is scarce, however their life expectancy is estimated to be 10 years shorter, with higher risk of coronary, chronic, and communicable diseases. Making them one of the more pressing health equity concern in the EU and Hungary prompting investigations on Roma access or misuse of healthcare services.

However, any Roma centered study often faces two key challenges, the first being whether to include ethnicity as an indicator of social deprivation and a predictor of health status. The literature on this topic is highly inconclusive, some studies advocate for including ethnicity as a main predictor of health due to genetic or cultural reasons, while others argued ethnicity only impacts health through a social pathway that could get fully mitigated when accounting for SES. Moreover, using ethnicity as a main predictor could increase division and stigmatization. In many cases it seems that SES may be the critical factor that needs addressing in order to implement policies successfully, ultimately reducing inequality and achieving better health outcomes for Roma. The second obstacle is the inability to accurately identify Roma in localized demographics leading to difficulties in monitoring their health statistics, mainly attributable to ethical and methodological barriers. These limitations are clearly evident in the minimal impact of Roma-specific health policies on the widening Roma health gap.

Confronting these issues is one of the main goals of this thesis, by developing comprehensive analyses using a wide range of data and methodologies to explore the role of Roma ethnicity in healthcare. Furthermore, to bypass the constraints of Roma identification, the thesis employed inclusion criteria similar to those used by some EU countries, such as Hungary. These criteria target segregated areas regardless of ethnicity, where Roma and non-Roma populations live in similar socioeconomic deprivation, in accordance with Hungarian national social inclusion strategies. This approach caters to the sensitive needs of local communities and ultimately help inform more effective polices to reduce health inequality and achieve better outcomes for people within deprived communities.

A key organization for healthcare polices in Hungary is the National Institute of Health Insurance Fund management (NIHIFM) which organizes the country's official health insurance and health monitoring systems, by collecting performance indicators evaluating General Medical Practices (GMPs) which influence their pay for performance, however a significant amount of data on primary healthcare (PHC) operation are collected but not utilised by the NIHIFM, creating an untapped reservoir of valuable research material.

2 Objectives

The overall goal of this study was to uncover the effect of Roma and socioeconomic factors on the apparent disparity in healthcare reimbursement among Hungarian GMPs. Moreover, the study aimed to investigate variations in health status, access and reimbursement, differentiating between segregated and non-segregated communities, in order to explore inequalities and reveal potential intervention targets. The specific objectives were as follows:

1. To identify the role of Roma ethnicity in predicting healthcare reimbursement inequalities by controlling for other socioeconomic factors.

2. To examine the differences between patients living in segregated communities with those living in neighboring non-segregated areas in regards to healthcare status, access, and reimbursement.

3 Material and Methods

3.1 Study 1: Self-declared Roma ethnicity and health insurance reimbursement: a nationwide cross-sectional investigation at the general medical practice level in Hungary

A comprehensive nationwide cross-sectional study encompassed all General Medical Practices (GMPs) in Hungary, totalling 4818, catering to adults aged 18 years and above. Data specific to GMPs' adult health expenditures from 2012 to 2016 and their structural attributes in 2012 were sourced from the National Health Insurance Fund (NHIF). Socioeconomic status indicators were derived from the latest census conducted by the Hungarian Central Statistical Office in 2011.

The study focused on multiple socioeconomic indicators that were standardized for each GMP by age and sex depending on the national average, these included, Roma proportion (rRP), education level in years of schooling (srEDU), employment rates (srEMP) and finally housing density (rHD). Multiple indicators were established for each GMP, including categories based on the number of insured individuals, urban or rural classification, and the demographic served being adult only or not. Additionally, general practitioners were categorized by age and by county. The average per capita expenditure per year for GMPs was calculated by aggregating expenditure recorded by the NHIF over a five-year investigation period then standardized to get the standardized relative expenditure (srEXP). Furthermore, standardized indicators were normalized according to the two-step Box-Cox method to be used in further analyses.

Pearson correlation , one-way ANOVA tests, and a mixed two-level multivariable linear regression model were employed to explore the impact of GMP-specific socioeconomic indicators srEMP, srEDU, rHD, srRP and structural indicators. Three regression models were constructed to explore the correlation between rRP and srEXP: a bivariate linear regression analysis (Model A), a multivariable model incorporating GMP structural characteristics (Model B), and a full model supplemented with socioeconomic status indicators (Model C). The standardized linear regression coefficient (β) for Model C was computed to ascertain the relative effect size of each independent variable. Significance was determined at $p<0.05$ in this analysis. The data analysis was conducted using SPSS version 20.

3.2 Study 2: Cross-sectional comparison of health care delivery and reimbursement between segregated and nonsegregated communities in Hungary

The NIHIFM supplied data from 2020 for secondary analysis concerning healthcare utilization, reimbursement, and health status indicators of adult patients associated with a total of 4359 Hungarian GMPs. A cross-sectional investigation was conducted on segregated areas (SAs) defined by a governmental decree as clusters within settlements where adults with low levels of education and income reside. GMPs without patients residing in SAs were excluded from the analysis. To compare between SA patients and their counterparts living in complementary areas (CAs), the 2020 indicators included 1) general practitioner visits, 2) outpatient services excluding computed tomography or magnetic resonance imaging (CT/MRI), 3) CT/MRI services, 4) hospitalizations, 5) medication reimbursement, and 6) premature mortality.

Standardized risk ratios for SAs (SRsa) and CAs (SRca) were obtained by dividing GMP-level observed values by expected values for each indicator which were obtained using the national average as a benchmark. These data were further aggregated to generate country-level standardized measures for SAs and CAs. The relative performance in SAs was characterized by the risk ratio (RR), calculated as the SRsa/SRca ratio nationally for each GMP , along with

the corresponding 95% confidence intervals (95% CIs). Additional impact measures such as excess cases in SAs, percentage of risk attributable to segregation in SA populations (attributable risk), and percentage of risk attributable to segregation in the entire country's population (population attributable risk) were computed using nationally and locally adjusted standardized ratios.

4 Results

4.1 Study 1: Self-declared Roma ethnicity and health insurance reimbursement: a nationwide cross-sectional investigation at the general medical practice level in Hungary

The total adult population within the examined GMPs amounted to 7,506,059 individuals. The total expenditure reached 873,797,515,655 Hungarian Forints (HUF) annually, translating to a national average per-capita expenditure of 116,412 HUF per year. Notably, per-capita expenses exhibited significant variation across different demographic strata The average yearly GMP-specific per-capita expenditures followed a normal distribution pattern. Specifically, the mean (± standard deviation) of the GMP-specific standardized expenditure (srEXP) was calculated at 1 ± 0.15. The GMP-specific srEDU, srEMP, rHD, and rRP exhibited medians (Interquartile Ranges: IQR) of 0.91 (0.1), 0.92 (0.22), 1.01 (0.20), and 0.37 (0.75) respectively. Pearson's correlation analysis revealed that rRP displayed negative correlations with both srEDU ($r = -0.55$; $p < 0.001$) and srEMP ($r = -0.71$; $p < 0.001$), indicating that Roma populations tended to have lower levels of education and employment. Furthermore, srEDU and srEMP demonstrated a strong positive correlation with each other ($r = 0.80$; $p < 0.001$), suggesting a link between higher education levels and increased employment rates. Notably, rHD showed no significant correlation with any of the other socioeconomic indicators examined in the analysis.

The two-level bivariate mixed linear regression model A as well as Model B revealed a significant positive association between the relative Roma proportion (rRP) and standardized expenditure (srEXP) with a coefficient of (b= 0.011, 95%CI: 0.008; 0.013). and (b= 0.005, 95%CI: 0.002; 0.007) respectively. However, upon incorporating additional socioeconomic status indicators in model C, the impact of rRP on srEXP became nonsignificant with a coefficient of (b= 0.002, 95%CI: -0.001; 0.005).

Based on the standardized linear regression coefficients in Model C, standardized employment (srEMP) exhibited the most substantial negative impact on spending with a coefficient of β = -0.219. This was followed by being situated in Győr-Moson-Sopron County (β = -0.140) and Veszprém County (β = -0.097), both contributing negatively to expenditures. Conversely, the most significant positive effect on spending was observed in Baranya County (β = 0.159), followed by standardized education (srEDU) with a coefficient of β = 0.13. The lack of significant impact from the Roma population proportion was reflected in a minimal standardized linear regression coefficient of β = -0.023.

4.2 Study 2: Cross-sectional comparison of health care delivery and reimbursement between segregated and nonsegregated communities in Hungary

The studied population encompassed 7,385,641 adults, comprising 3,456,560 men and 3,929,081 women. Within the 2,071 identified SAs, there were 283,876 adults (139,507 men; 144,369 women). The distribution of segregated patients within a General Medical Practice (GMP) exhibited substantial variability across standardized healthcare delivery, healthcare reimbursement, and premature mortality indicators. The standardized relative indicators aggregated for the entire country, revealed that segregated groups exhibited a significantly higher rate of healthcare service utilization compared to their complementary counterparts (RR=1.222, 95%CI: 1.220;1.223). Specifically, higher rates of GP visits per person per year (RR=1.251, 95%CI: 1.249;1.253) and hospital admissions per year (RR=1.250, 95%CI:

1.237;1.264) in comparison to complementary patients Conversely, segregated patients experienced a reduced number of treatments per year in outpatient service centers (RR=0.948, 95%CI: 0.943;0.953) and imaging examinations (RR=0.935, 95%CI: 0.920;0.950) relative to their counterparts. On the other hand, total health services reimbursement for a General Medical Practice was significantly lower for SA patients (RR=0.938, 95%CI: 0.927;0.950). Specifically, GMPs received lower reimbursement per year for outpatient services provided to SA patients (RR=0.878, 95%CI: 0.848;0.908), MRI/CT examinations (RR=0.815, 95%CI: 0.752;0.883), and medications (RR=0.869, 95%CI: 0.854;0.884)). While receiving higher rates of reimbursements for hospital services provided for segregated groups (RR=1.063, 95%CI: 1.043;1.083). Consequently, age- and sex-standardized premature mortality among the Segregated Area population was significantly higher than that in the Complementary Area population (RR=1.092, 95%CI: 1.030;1.157).

5 Discussion

5.1 Main findings and implications

This thesis extensively investigated the underlying factors influencing healthcare access and expenditure disparities within Hungarian GMPs, as well as the implications for health outcomes in segregated, and deprived populations. Two comprehensive cross-sectional studies were conducted using NIHIFM data, each shedding light on different aspects of the issue. The first study examined the variability in per-capita expenditure among GMPs, revealing significant associations with geographic location, GP structural indicators, and socioeconomic status. Notably, socioeconomic factors emerged as primary determinants of healthcare spending disparities, negating the influence of Roma ethnicity. Underscoring the critical role of education level and employment status in shaping health expenditure patterns, aligning with

broader SDGs that advocate for addressing socio-economic barriers to enhance healthcare access.

While the second study investigated healthcare utilization and spending patterns for patients within segregated areas compared to patients in non-segregated areas across Hungarian GMPs, revealing a potential weakness in healthcare delivery pathways, highlighting the delicate interaction between socioeconomic status and healthcare disparities.

5.2 Study 1: Self-declared Roma ethnicity and health insurance reimbursement: a nationwide cross-sectional investigation at the general medical practice level in Hungary

Wide variability in the 5 year average per-capita expenditure among Hungarian GMPs was found in our results, further corroborating the variability of other GMP performance indicators detected in other Hungary based research. Although our linear regression model controlled for GMP structural indicators, patients' demographic composition and socioeconomic status, it explained 14.7% of detected variability, emphasizing the extremely complex nature of healthcare inequalities.

According to our basic regression models, Roma relative proportion or rRP was significantly associated with age and sex standardized health expenditure, however this association diminished into non-significant when controlling for socioeconomic indicators with a well-known and thoroughly researched effect on health and health expenditure such as level of education and employment status. Specifically, Roma ethnicity demonstrated a negligible role in predicting health expenditure when compared to socioeconomic status indicated by education and employment. This result corresponds with other studies in Hungary that investigated the correlation between ethnicity , health and socio economic factors where it was found that SES is a stronger determiner of health of people living in Roma settlements and has

higher impact on the prevalence of unhealthy habits such as smoking. Moreover, the quality of primary care represented by GP structural indicators in our comprehensive model, demonstrated a significant impact on healthcare expenditure contrary to the observed Roma effect. While no studies were specifically conducted on the difference impact between GP structural indicators and Roma on healthcare, GP indicators were proven to have a significant impact on health provision and quality in international and Hungarian studies where GP's gender, list size, and vacancy had a profound effect on various aspects of healthcare including medication adherence.

In regards to SES, our investigation further revealed a positive correlation between a patient's educational attainment and health insurance spending, the avenues of this association are complex and interlaced. However, this finding might be an indication that healthy behaviours and high health literacy among educated individuals enable them to be more attentive to their health, recognize sickness and symptoms more easily, as well as having better social, interpersonal relationships, and better connections to their healthcare providers, all of which lead to higher healthcare utilization and specifically preventive care which increases healthcare costs. Corroborated by this comprehensive empirical study on the influence of education and health covering OECD countries. In contrast, our multivariable regression analysis displayed a significant reduction in healthcare expenditure associated with employment, seemingly caused by the well documented impaired health status of unemployed patients resulting in an increase in healthcare utilization and costs particularly attributable to GP visits and mental healthcare. However, while unemployment and low job insecurity clearly impact wellbeing, the effect on healthcare utilisation is inconsistent, sometimes even within the same country as evidenced by these two German studies that reported opposing results on the association between unemployment and hospital admissions. The observed pattern regarding the inverse impact of education and employment on health spending, suggests that employed individuals may face

time constraints hindering their healthcare access, while those with higher education prioritize preventive care, leading to greater spending. Notably in our correlation analysis, Roma were negatively correlated with both SES factors as is in most of Europe. Meaning in our study in the case of Roma, the opposite influences of employment and education on reimbursement counterbalance each other.

As for GPs' structural indicators, Smaller GP list sizes led to a reduction in per capita health reimbursement, however it noteworthy that in Hungary each GMP consists of one GP and one nurse, this small team means the variation in health reimbursement is not due to increased number of patients but instead could be attributable to the fact that patients with complex needs have the freedom to change their GP, shifting to a GPs that offers more intensive care making them eligible for higher reimbursement. Furthermore, according to our results GP age higher than 65 was associated with a decrease in spending, evidence on the direct effect of physician age on health spending is scarce however some studies suggest that older GPs have more experience, while also having outdated scientific knowledge, and are less likely to adhere to standard preventive treatment and diagnosis lowering overall spending on these services however this is still debated. Conversely more specialized GPs serving adult only patients in our model, were positively associated with spending which is in good concordance with published articles as more specialized care is often more expensive.

Lastly, health expenditure significantly varied according to geographical location, this impact could be caused by county level disparity in available healthcare services, social conditions, and environmental circumstances with conclusive evidence from diverse sources around the world further research is needed to elaborate on the details for this observed associations in Hungarian counties.

Considering the implications, this ecological investigation suggests that in Hungary, the proportion of self-declared Roma within GMPs' patients has no association with the amount of funding he receives from the NIHIFM when controlling for education and employment, two strong socioeconomic determinants of health. It underlines the uncertainties in polices targeting ethnicity regardless of SES. The urgency of the matter the inefficacy of former interventions, as evident in the statistically critical health and wellbeing of Roma populations across the EU, the mechanisms translating Roma ethnicity into health loss are complex with many interrelated parts. Our study suggests adopting systems similar to deprivation indices such as the Scottish index of multiple deprivation (SIMD) and Indices of deprivation 2007 (ID 2007) used in National Health Service in the United Kingdom where instead of ethnicity, SES factors such as education and employment are incorporated as measures of deprivation in geographically defined populations. Accordingly, the Hungarian health reimbursement system employs area level deprivation by type of settlement, a practice that could be improved by integrating SES factors into the financing policy.

5.3 Study 2: Cross-sectional comparison of health care delivery and reimbursement between segregated and nonsegregated communities in Hungary

Expanding on the previous investigation, this study utilized geographical segregation where mostly under educated and employment populations live, as a measure of both deprivation and a tool for health monitoring. It uncovered wide variation and significant dissimilarity between segregated areas SAs and their complementary counterparts CAs, in both healthcare utilization and reimbursement, as well as premature mortality across the studied Hungarian GMPs. Highlighting potential factors contributing to the apparent health gap between the two groups.

A distinct healthcare utilization pattern was observed among adults residing in SAs, where individuals tend to access healthcare services more frequently compared to those in CAs. However, the reimbursement for their care expenses is significantly lower, stipulating

disparities in the quality of care provided. Marginalized groups receiving lower quality care is firmly established in global research leading to higher cardiovascular and maternal mortality rates and increasing health inequalities.

Concerning primary care, crude indicators in our study show that segregated patients frequented their GPs significantly more, other studies in the EU found similar results among deprived patients with chronic diseases and minorities with low health literacy. It can be hypothesized that this can attributed to their poorer health status combined with low "consultation efficacy" which is typically lower among low SES patients, necessitating more frequent GP visits than their high SES counterparts to achieve comparable goals. Conversely, specialized services such as outpatient care and imaging diagnosis were notably underutilized by segregated groups, this trend has been noted in other research where it was observed that compared with high SES communities, low SES was associated with lower access to specialized care. Which in our study also correlated with significantly reduced GMP reimbursement for these services for segregated patients. Revealing an alarming practice further aggravating the poor health and health services needs of these groups. Since these services are essential for diagnosing, reversing, or halting the progression of chronic diseases, underutilization may escalate undiagnosed conditions until hospitalization is needed for more severe prognoses. A possible direct manifestation of these shortcomings was the observed higher hospitalization rates among SA patients in our study, paralleled by higher reimbursement rates for their GMPs. This finding aligns with previous research from the EU, US and Australia which consistently reported increased hospital admission among deprived patients. Additionally, adults living in segregation demonstrated predictably poorer health status, and health outcomes as evidenced by their significantly elevated premature mortality rate compared with adults residing in CAs as illustrated in our results and corroborated by

research showing a clear link between social inequality and higher mortality rates, referable not only to their aforementioned healthcare use pattern, but also to their unhealthy lifestyles.

Based on the presented results, the country level aggregated relative risk measures demonstrated a significant association between segregation and serious healthcare inequalities, notably these issues appear to stem from a local setting as evidenced by the varying inequality of investigated indicators at the GMP level. While some GMP exhibited a substantial gap in services rendered, others showed no such disparity (Supplementary table A4). This investigation implies that a monitoring system could distinguish between GMPs with and without local bias and could monitor temporal trends in country level healthcare inequality, as currently in, Hungary at least, there is no such monitoring system informing stakeholders on local nor country level data that also bypasses ethnicity related challenges. Therefore, a pressing need for a SA specific monitoring system. Our results not only showcase the feasibility of a segregation-oriented health monitoring system, but also proposes suitable indicators for this purpose. After adjusting for, and adding indicators that reflect the intricacies of the observed disparities in mortality as well as healthcare use and expenditure, this monitoring system could support the National Social Inclusion Strategy of the Hungarian government, and considering the overrepresentation of Roma in SAs, it could contribute to programs aimed at improving the health status of the Roma population.

6 Strengths and Limitations

6.1 Study 1: Self-declared Roma ethnicity and health insurance reimbursement: a nationwide cross-sectional investigation at the general medical practice level in Hungary

One of the key strengths of this study is its comprehensive coverage of the entire population of Hungary, leveraging compulsory census data participation, and the inclusion of all GMPs in the country effectively controlling for any potential selection bias. This nationwide design led to satisfactory statistical power, further increased by aggregating expenditures through the period of 5 years. Making the observed results on the influence of rRP fairly convincing. However, the cross-sectional nature of the investigation could restrict interpretations of this association. Nonetheless, these issues are mitigated by the stability of the used explanatory variables such as SES and GMP structural factors which remain consistent over time. Clients' health needs represented by health status and disease profile are missing from our analysis. Further investigations are required to control for these factors. Moreover, our ecological design utilizes group level data on GMPs and Roma, necessitating caution when interpreting the results, as they highlight the effect of the proportion of Roma within a GMP and the average per capita health expenditure, rather than directly addressing factors influencing individual Roma utilization of healthcare services. Measurement bias was negligible in the study due to the standardized protocols for data collection and processing employed by the NIHIFM and the Hungarian Central Statistical Office. On the other hand, Roma were identified by self-declaration during the 2011 census which resulted in notable underreporting. Our results should therefore be interpreted for self-declared Roma and not for the whole population of the Hungarian Roma within a GMP's list.

6.2 Study 2: Cross-sectional comparison of health care delivery and reimbursement between segregated and nonsegregated communities in Hungary

The quality of the data used in this investigation was guaranteed by the standardized protocols of data collection implemented by the NIHIFM. Additionally, it is mandatory for each GMP to contract with the NIHIFM, which facilitates access to comprehensive reimbursement and health data covering all Hungarian adults living in SAs or CAs. Effectively eliminating any selection bias. However, the data encompassed health information from the year 2020, and was heavily impacted by the COVID-19 pandemic. The first case detected in Hungary was in 04/03/2020, followed by epidemiological measures that impacted healthcare operations. Consequently, it can be said that our results reflect heath care inequality during the epidemic, which holds true to some extent, especially since Covid19 vaccination coverage was lower in Sas, which can contribute to some of the observed differences, however it is also mitigated by the fact that SA and CA patients share the same environment, access to care and GP who is ultimately the gatekeeper of treatment. Moreover, due to the ecological nature of the study, caution is necessary when assuming living and health conditions of Roma and non-Roma inhabitants of SAs. Lastly, the results of this investigation do not clarify the mechanisms behind the identified disparities but calls for more detailed pathway analyses that could help conceptualizing interventions aimed at reducing health inequalities.

7 Conclusions

Overall, this thesis highlights the substantial challenges in achieving equality by revealing the extent of disparity in healthcare access, treatment and insurance expenditure within the Hungarian healthcare system. Particularly, concerning the impact of ethnicity and socioeconomic deprivation on primary healthcare expenditure, in addition to their influence on healthcare utilization patterns. The initial analysis showed wide disparities in per-capita

healthcare spending across Hungarian GMPs, with education and employment having the strongest impact on the observed variation, increasing it and decreasing it respectively, making them favorable targets for interventions. Moreover, after controlling for these socioeconomic indicators, the significant association of self-reported Roma ethnicity with health spending disappeared, suggesting the inefficiency of ethnicity-specific funding polices. Further research and data collection are warranted to comprehensively analyze the full impact of non-declared Hungarian Roma Moreover, the second analysis in the thesis demonstrated that residence within a deprived area was a strong risk factor impairing healthcare services, as evidenced by their increased mortality rates, and the dissimilarity in healthcare utilization and reimbursement in comparison with their counterparts in non-segregated areas. This varying degree of healthcare provision among Hungarian GMPs is worrying, where some provided adequate care to all patients, others showed varying levels of inequality. To address these disparities, it seems crucial to integrate a multifaceted approach based on the WHO's health systems governance principles, especially those related to ensuring fair distribution of healthcare resources and access to services across different populations, ensuring accountability and inclusivity. This approach aligns with the WHO's commitment to achieving Universal Health Coverage and the Sustainable Development Goals, particularly those related to health equity (SDG 3) and reduced inequalities (SDG 10). Integrating comparative and community-focused approaches could substantially enrich future research. Such methodologies would allow a deeper understanding of the multifactorial influences on health disparities. More research is recommended to investigate the contrasts in healthcare provision and the local factors involved in the quality of care provided to underprivileged patients. Future studies could benefit from exploring these dimensions, potentially leading to more nuanced and effective health policy interventions. The thesis suggests that interventions regarding health equality should take the

local GMP environment into serious consideration, emphasizing the importance of tailoring strategies to the specific needs and circumstances of each community.

8 New contributions to academic knowledge

8.1 Study 1: Self-declared Roma ethnicity and health insurance reimbursement: a nationwide cross-sectional investigation at the general medical practice level in Hungary

- ***High variation in performance based GMP per-capita reimbursement was uncovered.***

  The 5-year average GMP-specific expenditure srEXP mean (±SD) was 1±0.15.

- ***The relation between self-declared Roma ethnicity and GMP expenditure disappeared after controlling for education and employment.***

  Higher education was significantly associated with more spending (P < 0.001, srEDU: b = 0.199, 95%CI: 0.128; - 0.271), whereas employment reduced spending (P<0.001, srEMP: b=-0.282, 95%CI: -0.359; -0.204), Roma proportion had no significant influence on expenditure (P= 0.250, rRP: b=0.002, 95%CI: -0.001; 0.005).

- ***The reimbursement received by GMPs showed a close link with the location of Hungarian counties.***

  According to the linear regression standardized coefficients, Győr-Moson-Sopron County demonstrated the highest reduction in primary health insurance spending (β=-0.140), while Baranya County had the greatest increase (β=0.159).

- ***Employment and education emerged as the most influential factors associated with healthcare expenditure.***

  Employment greatly reduced it srEMP (β=-0.219), contrasting with the elevating effect of education (β=0.13).

8.2 Study 2: Cross-sectional comparison of health care delivery and reimbursement between segregated and nonsegregated communities in Hungary

- ***Overall healthcare service utilization was higher among segregated patients, despite reduced access to specialized care.***

  According to the country level standardized relative indicators, patients living in segregated areas exhibited limited use of specialized services such as outpatient services and imaging, (RR=0.948, 95%CI: 0.943;0.953) and (RR=0.935, 95%CI: 0.920;0.950) respectively. However, the total use of healthcare services was higher compared to patients in non-segregated areas (RR=1.222, 95%CI: 1.220;1.223). Mainly attributed to excessive GP visits (RR=1.251, 95%CI: 1.249;1.253) and hospitalization rates (RR= 1.250, 95%CI: 1.237;1.264).

- ***Total health service reimbursements were significantly lower for patients living in segregation.***

  Aggregated relative indicators showed that living in segregated areas posed a risk factor for lower total health insurance reimbursement (RR=0.938, 95%CI: 0.927;0.950), even with the increased spending on hospital care for segregated groups (RR=1.063, 95%CI: 1.043;1.083). This contrast was largely due to the significantly lower reimbursement rates in comparison to their counterparts for outpatient service (RR=0.878, 95%CI: 0.848;0.908), MRI/CT imaging (RR=0.815, 95%CI: 0.752;0.883), and medications (RR=0.869, 95%CI: 0.854;0.884).

9 Summary

The thesis delves into the disparities within the Hungarian healthcare system, in respect to health provision, funding, and outcomes. It explores the socioeconomical, geographical, and structural determinants linked to GMP insurance reimbursement with a focus on Roma ethnicity as a potential driving factor of observed variations. Studying these elements not only sheds light on the complex connection between ethnicity, SES, and healthcare but also offers insights crucial for designing targeted interventions aimed at reducing healthcare inequalities. Additionally, this thesis investigates the differences in healthcare utilization trends between segregated and non-segregated communities, providing findings valuable in improving overall health outcomes for marginalized populations.

The thesis was based on two cross-sectional studies based on data collected by the NIHIFM, first of which employed a comprehensive regression analysis covering 4818 Hungarian GMPs providing care to adults and investigated the association between Roma ethnicity and GMP 5-year average per-capita insurance reimbursement, controlling for SES indicators including education, employment, and housing density, as well as GP structural factors such as GP age, location, and type. Self-declared Roma ethnicity demonstrated a non-significant association ($P=0.250$) with insurance spending after introducing education and employment as confounding factors, both exhibiting a significant relation ($P<0.001$). Furthermore, among the studied variables, these SES factors had the biggest impact on change in GMP reimbursement according to the standardized linear regression coefficients, with srEMP ($\beta=-0.219$) and srEDU ($\beta=0.13$) for employment and education respectively. The second research included in the thesis involved a secondary analysis using 2020 data provided by the NIHIFM on healthcare utilization, reimbursement, and premature mortality. It implemented person-level health records to compare GMP-level-aggregated indicators for 4359 Hungarian GMPs serving

segregated and complementary areas. Distinct trends in engagement with healthcare services were observed for SA and CA patients. According to the aggregated relative ratios, patients in SAs had higher total healthcare utilization rates compared with their non-segregated counterparts (RR=1.222, 95%CI: 1.220;1.223), with emphasis on GP visits and hospitalizations (RR=1.251, 95%CI: 1.249;1.253 and RR= 1.250, 95%CI: 1.237;1.264, respectively), despite having reduced access to outpatient specialized services (RR=0.948, 95%CI: 0.943;0.953) and imaging examinations (RR=0.935, 95%CI: 0.920;0.950). In contrast, this higher utilization was accompanied by significantly lower total insurance reimbursement on patients residing in SA (RR=0.938, 95%CI: 0.927;0.950), due to the reduced outpatient (RR=0.878, 95%CI: 0.848;0.908), imaging (RR=0.815, 95%CI: 0.752;0.883), and medication (RR=0.869, 95%CI: 0.854;0.884) insurance spending for these populations. Hospitalization reimbursement, on the other hand, showed higher spending on segregated groups (RR=1.063, 95%CI: 1.043;1.083).

Our first analysis reveals substantial variation in GMP per-capita insurance reimbursement, associated with SES and GP specific indicators. Notably, Roma ethnicity had no influence when controlling these for these factors. The lack of effect from self-declared Roma underscores the importance of SES targeted polices in addressing health inequalities, irrespective of ethnicity. Moreover, the second study provides a valuable comparison of healthcare use, reimbursement and mortality trends between deprived segregated patients and their counterparts. Highlighting important gaps in healthcare provision and funding within the Hungarian healthcare system, suggesting areas for targeted interventions to enhance equality and the well-being of disadvantaged communities. Addressing these challenges requires general and local evaluation and intervention including, restructuring of institutions, infrastructure, staffing, and legal frameworks.

10 Acknowledgments

First and foremost, I extend my deepest gratitude to **Prof**. **Dr. Sándor János**, my supervisor and mentor for his unwavering support and guidance throughout my Ph.D. journey. His insights, patience, and trust have been instrumental in shaping me as a researcher.

I also extended my sincere appreciation to all my co-authors and PhD colleagues at the Department of Public Health and Epidemiology, Faculty of Medicine it was an honor working with you all.

My heartfelt appreciation goes to ***my parents, brothers, and sister*** for their support during my studies. Their constant encouragement has been instrumental in my academic pursuits.

I am profoundly grateful for the unwavering support of my loving **fiancé,** whose patience, and encouragement have been fundamental to my research career. Your presence in my life is a constant reminder that anything is possible. Thank you for being my pillar of strength, my confidant, and my greatest source of support.

Furthermore, I would like to acknowledge the support received from ***Tempus Public Foundation***, without which my research endeavours would not have been possible.

11 Funding

The funding for the studies included in this thesis had various sources, and was part of multiple frameworks including the framework of the “Public Health-Focused Model Program for Organizing Primary Care Services Backed by a Virtual Care Service Center” (SH/8/1). The Model Program is funded by the Swiss Government via the Swiss Contribution Program (SH/8/1) in agreement with the government of Hungary. Additional funding was from the GINOP-2.3.2-15-2016-00005 project, co-financed by the European Union and the European Regional Development Fund. Studies were also part of The framework of the “Routine

monitoring for the health status and healthcare use in the Hungarian segregated colonies" program (BM/6327-3/2021, FEIF/951/2021-ITM), supported by the Deputy State Secretariat for Social Inclusion, Ministry of Interior. (https://2010-2014.kormany.hu/en/ministry-of-interior), The project was co-financed by the Eötvös Loránd Research Network (TKCS-2021/32). Finally, from the Stipendium Hungaricum Scholarship Program (grant SHE-26763-004/2020 to F

UNIVERSITY AND NATIONAL LIBRARY
UNIVERSITY OF DEBRECEN
H-4002 Egyetem tér 1, Debrecen
Phone: +3652/410-443, email: publikaciok@lib.unideb.hu

Registry number: DEENK/80/2024.PL
Subject: PhD Publication List

Candidate: Feras Kasabji
Doctoral School: Doctoral School of Health Sciences

List of publications related to the dissertation

1. **Kasabji, F.**, Vincze, F., Lakatos, K., Pálinkás, A., Kőrösi, L., Ulicska, L., Kósa, K., Ádány, R., Sándor, J.: Cross-sectional comparison of health care delivery and reimbursement between segregated and nonsegregated communities in Hungary.
   Front. Public Health. 12, 1-9, 2024.
   DOI: http://dx.doi.org/10.3389/fpubh.2024.1152555
   IF: 5.2 (2022)
2. **Kasabji, F.**, Alrajo, A., Vincze, F., Kőrösi, L., Ádány, R., Sándor, J.: Self-Declared Roma Ethnicity and Health Insurance Expenditures: a Nationwide Cross-Sectional Investigation at the General Medical Practice Level in Hungary.
   Int. J. Environ. Res. Public Health. 17, 1-17, 2020.
   DOI: http://dx.doi.org/10.3390/ijerph17238998
   IF: 3.39

UNIVERSITY AND NATIONAL LIBRARY
UNIVERSITY OF DEBRECEN
H-4002 Egyetem tér 1, Debrecen
Phone: +3652/410-443, email: publikaciok@lib.unideb.hu

List of other publications

3. Carneiro, V. M. d. A., Gomes, A. M. S., Marinho, M. U., de Melo, G. S., **Kasabji, F.**, An, T. L., Stefani, C. M., Guimarães, M. d. C. M., Andrade, C. A. S.: Dental and periodontal dimensions stability after esthetic clinical crown lengthening surgery: a 12-month clinical study.
Clin. Oral Investig. 28 (1), 1-16, 2024.
DOI: http://dx.doi.org/10.1007/s00784-023-05458-5
IF: 3.4 (2022)

Total IF of journals (all publications): 11,99
Total IF of journals (publications related to the dissertation): 8,59

The Candidate's publication data submitted to the iDEa Tudóstér have been validated by DEENK on the basis of the Journal Citation Report (Impact Factor) database.

11 March, 2024

DEBRECENI EGYETEM * Egyetemi és Nemzeti Könyvtár *