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Enduring Legacies of Forced Migration: Refugees and Health Behavior in 21st - Century Greece

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Abstract

This paper investigates the long-term impact of the 1920s forced displacement of Asia Minor refugees on contemporary health behaviors in Greece. Using regionally representative data from the 2019 Greek Health Survey and historical refugee settlement patterns, we find that individuals living in areas with higher historical shares of refugees are significantly more likely to engage in preventive health care, consult medical professionals, participate in physical activity, and maintain healthy dietary habits. These effects persist after controlling for socioeconomic, demographic, and geographic factors, and are robust to various specifications, including the exclusion of Attica, the main internal migration hub, and age-stratified analyses. To explain these findings, we discuss four plausible mechanisms: the relatively higher human capital and educational attainment of the refugee population, their early exposure to adverse health conditions, large-scale public infrastructure investments prompted by the resettlement effort, and the cultural diffusion of health-conscious norms and practices. Together, our results suggest that historical episodes of forced migration can have durable effects on public health behavior through intergenerational transmission of norms and institutional legacies, with implications for both migration policy and health inequality.

Keywords Forced migration; Refugees; Health behavior; Preventive care; Cultural persistence; Historical legacies; Human capital; Public health infrastructure; Intergenerational transmission; Greece; Asia Minor refugees;

JEL Classification C24, I20, I12, N34, N44, N64, N74

1. Introduction

Forced migration, driven by wars, civil conflicts, or natural disasters, has significant implications for both native and refugee populations ([Ruiz and Vargas-Silva, 2016](#); [Becker and Ferrara, 2019](#)). Each year, millions of people are forced to leave their homelands due to violence, conflict, or oppression, making such movements a persistent and large-scale global phenomenon ([Ruiz and Vargas-Silva, 2016](#)). Because

forced migration arises from circumstances beyond the control of the displaced, it may be either temporary, when refugees seek short-term safety, or permanent, as in the population movements following World War II (Becker and Ferrara, 2019). In both cases, the consequences are long-lasting. A growing body of research documents these enduring effects for both host and refugee populations across domains such as education, labor market outcomes, social integration, and political attitudes (e.g., Bauer et al., 2013; Becker et al., 2020; Bharadwaj et al., 2015). However, despite this expanding literature, the long-run implications of forced displacement for health-related attitudes and behaviors remain largely unexplored, particularly for the native populations of receiving regions. Our study addresses this gap by examining how historical exposure to refugees influenced the formation of health-conscious norms in the very long run.

Our research examines the long-run implications of forced displacement on individual health attitudes, using the 1923 population exchange between Greece and Turkey as a natural experiment. We find that regions with a higher share of refugees exhibit significantly stronger health-conscious behavior today. Individuals in these areas are more likely to engage in preventive care, make healthier dietary choices, and participate in regular physical activity, suggesting a lasting shift in norms around self-care and health responsibility. These patterns may be driven by multiple reinforcing mechanisms. First, the refugee population arrived with relatively higher levels of education and placed greater emphasis on hygiene and health awareness, traits that were transmitted across generations and gradually reshaped local norms. Second, many refugees faced extremely poor hygienic conditions upon arrival, making self-care a matter of survival. These practices, though initially basic and improvised, evolved over time into more structured health behaviors. Third, institutional responses to the refugee crisis, such as investments in schools and health infrastructure, likely benefited both native and refugee populations and reinforced the diffusion of new norms around well-being.

To give an overview of the historical framework, on the 30th of January 1923, a bilateral agreement was signed between Greece and Turkey, to settle the exchange of approximately 1.5 million Greeks displaced from Turkey, and 500,000 Muslims who were living in Greece. Despite being the result of an international agreement, it was nevertheless considered and implemented as a forced displacement practice which affected millions of people in both sides of the border and imposed enormous social and economic costs on the then Greek government.

Methodologically, we partly rely on the quasi-random allocation of refugees across Greek provinces following the 1923 population exchange, and we also draw on the growing literature that documents the long shadow of historical events on cultural attitudes and behaviors (e.g., Nunn, 2009; Grosjean, 2014). While the displacement itself was not unanticipated, the settlement of refugees across regions was largely exogenous to pre-existing socioeconomic or cultural characteristics of the host areas. Refugees were not allocated based on education, skills, or occupational background, but rather on agricultural needs and availability of land, primarily to replace departing Muslim and Bulgarian populations. We use this feature to construct a variable that captures the share across provinces after the exchange. This variation, driven by

administrative and logistical factors rather than endogenous demand, serves as the basis for our identification strategy. It allows us to assess how differences in historical exposure to forced displacement shape long-run health-related attitudes and behaviors among the native population.

To examine the long-run effects of forced displacement on individual health attitudes, we construct a novel multilevel dataset that links historical and contemporary sources. We begin by collecting detailed data from the 1920 and 1928 Censuses of the Hellenic Statistical Authority, covering all 136 Greek provinces during the period of the population exchange. This allows us to calculate the refugee share in each province before and after the 1923 exchange, capturing the intensity of refugee settlement across regions. We then merge these historical data with micro-level individual responses from the 2019 Health Survey of the Hellenic Statistical Authority (ELSTAT), which includes approximately 8,000 individuals distributed across NUTS 2 regions. This linkage enables us to assign to each respondent the historical refugee share of their current region of residence, creating a unique setting for multilevel analysis that connects province-level historical shocks to individual-level health behaviors.

Our outcome variables cover four domains: use of health services, use of prevention services, physical activity, and healthy eating habits, each captured through multiple survey items. To isolate the causal impact of historical refugee exposure, we control for a wide array of individual-level characteristics including age, gender, education, and employment status. We also account for pre-displacement health conditions using the province-level mortality rate for the year 1921, and we further adjust for regional migration patterns and the presence of descendants of refugees using variables from the 2001 Census. Finally, we include fixed effects at the NUTS 1 level to capture time-invariant regional heterogeneity. This approach allows us to explore if a major historical shock continues to shape health attitudes across generations, and how local exposure to refugee inflows contributed to the emergence of distinct patterns of health-related behavior.

Our findings reveal a strong and consistent association between historical refugee exposure and contemporary health attitudes and behaviors. Individuals residing in regions with a higher share of refugees in the 1920s are significantly more likely to engage in health-conscious behavior nearly a century later. This pattern emerges across multiple domains: use of health services, uptake of preventive care, physical activity, and dietary habits. The effects are particularly pronounced for visits to general practitioners and specialists, engagement in preventive screenings such as colonoscopy, mammograms, and Pap tests, and participation in physical activity and healthy eating practices. For instance, a one-unit increase in refugee share is associated with a 10 to 15 percentage point increase in the likelihood of consulting a general practitioner, a 15 to 20 percentage point increase in visiting psychological services, and a 5 to 6 percentage point increase in the frequency of fruit and vegetable consumption. These results are robust across multiple specifications and remain significant even after controlling for a rich set of individual-level demographic and socioeconomic factors, as well as region-level historical and geographic controls. Taken together, the evidence suggests that exposure to a historically displaced

population has left a durable imprint on local norms of self-care and long-term health behavior.

Several mechanisms may explain the lasting impact of refugee inflows on contemporary health attitudes, and one of the most important channels is human capital. According to 1928 census data, refugees arriving in Greece in the early 1920s had higher educational attainment than the native population. Literacy rates were markedly higher among refugee women (41.1%) compared to native women (32.7%), and slightly higher among men (63.9% vs. 61.5%). This educational advantage stemmed largely from the urban and cosmopolitan backgrounds of many refugees, particularly those from cities such as Smyrna and Constantinople, where Western-style and missionary-led schooling systems had long flourished. Ottoman censuses and more recent scholarship (e.g., [Arbatlı and Gokmen, 2023](#)) confirm that many refugees brought with them not only formal education but also professional and artisanal skills that were readily transferable to their new environment. This human capital advantage likely enhanced their ability to navigate institutions, prioritize health and hygiene, and promote practices related to self-care and long-term well-being.

Moreover, the educational gap between refugees and natives had broader social consequences. On one hand, the superior educational and cultural profile of refugees generated pressure on native populations to catch up, thus creating competitive incentives to invest more in education and modern health practices to maintain socioeconomic status.

Importantly, the emphasis on self-care among refugees may also have originated as a direct response to the extremely poor hygienic and living conditions they encountered upon arrival. In many cases, self-care and preventive behavior were not driven by cultural preferences but emerged as basic survival strategies under conditions of overcrowding, malnutrition, and inadequate sanitation. While such practices may have initially taken rudimentary or improvised forms, such as reliance on home remedies, communal care, or informal health knowledge, they likely evolved over time, embedding themselves in local norms and eventually aligning with more institutionalized and modern understandings of health behavior.

On the other hand, the close cohabitation and integration between refugees and natives facilitated significant learning externalities. Refugees brought with them distinct norms regarding cleanliness, childrearing, diet, and preventive healthcare, which diffused through local communities over time via social interaction, schooling, and shared public spaces. These spillovers were not confined to the refugee population but gradually transformed the behaviors and attitudes of the wider host society. In this way, the refugee inflow did not simply introduce a temporary demographic shift, but acted as a vehicle for cultural and behavioral change, with long-term implications for how health is perceived and practiced across generations in Greece.

These behavioral norms may have been transmitted intergenerationally, reinforcing a culture of self-care and preventive health. Several studies suggest that the children and grandchildren of refugees tend to exhibit stronger performance in education and long-term planning (e.g., [Bauer et al., 2013](#)), potentially extending to

health behavior. Institutional factors may also have played a role: the influx of refugees prompted public investment in education, housing, and basic health infrastructure. The expansion of schools, clinics, and social services to accommodate displaced populations likely benefited native communities as well, improving access and shaping expectations around public health.

To assess the robustness of our findings, we conduct two complementary exercises. First, we exclude the Attica region, Greece's primary destination for internal migration during the 20th century, to ensure that our results are not driven by population mobility and spatial redistribution that occurred after the initial refugee settlement. The results remain qualitatively and quantitatively similar, and in some cases even stronger, suggesting that the observed associations are not artifacts of subsequent demographic shifts. Second, we explore heterogeneity by age, introducing interaction terms between the refugee share and age dummies for individuals aged 50, 70, and 80 and above. These specifications allow us to test whether the estimated effects differ among older cohorts, some of whom may be first- or second-generation refugees. Across all thresholds, the interaction terms are stable and closely aligned with the baseline coefficients, providing further evidence that the legacy of refugee settlement exerts a broad and persistent influence on health behavior across age groups. Together, these checks bolster the internal validity of our empirical results.

The remainder of the paper is structured as follows. Section 2 discusses the related literature. Section 3 provides the historical background. Section 4 discusses the compilation of the data. Section 5 elaborates on the empirical approach and methodology and discusses about the elements that render this historical event a "natural experiment". Section 6 reports the benchmark results. Section 7 conducts some robustness checks whereas in Section 8 we discuss the associated mechanisms which could explain this reduced form effect. Section 9 concludes.

2. Related Literature

History is abundant of instances of forced displacement. Examples include the mass expulsion of millions of Germans from Eastern Europe to West Germany during and after World War II ([Bauer et al., 2013](#)) and the displacement of 2 million Poles from the Kresy territories of eastern Poland who resettled (primarily) in the newly acquired Western Territories, from which the Germans were expelled ([Becker et al., 2020](#)). In the Asian continent, the partition of India in 1947, in which approximately 17 million people were displaced within four years into the countries of India, Pakistan, and what became Bangladesh ([Bharadwaj et al., 2015](#)), and the forced displacement of Syrian refugees into several neighbours (e.g., Turkey, Lebanon, Iraq, and Jordan) ([Tumen, 2016](#)) as the result of the civil conflict in Syria, which ignited in mid-2011.

Such a massive, forced displacement is the one that we study, i.e., the refugee inflow in the Greek territory after the Greco-Turkish war of 1919–1922, where the Greek Orthodox population of the Ottoman Empire was forcibly resettled from their homeland in Turkey to Greece, increasing the host population by more than 20%

within a few months. This historic episode also offers a natural experiment because it is easier to argue that displacement is exogenous, therefore it is less prone to identification problems than voluntary migration events. Finally, it provides the opportunity to study long-run consequences, whereas it is too early to investigate them in modern events.

2.1 Implications of Forced Displacement

Forced displacement due to war or natural disasters has both immediate and long-term consequences ([Becker, 2022](#)). Our research focuses on the latter. Unlike voluntary migration, which typically reflects cost–benefit decisions by individuals, forced migration results from circumstances beyond their control. As such, it often constitutes a deeply disruptive and transformative experience, with potential for lasting behavioral change ([Becker et al., 2020](#)). Examining the long-run effects of forced displacement provides valuable insight into how such historical shocks shape outcomes for both displaced populations and host communities across generations. We see our findings as relevant to several strands of research.

First, they contribute to the literature on the broader impacts of forced displacement on both natives and refugees. Second, they speak to debates on the long-run determinants of health behavior. Finally, they offer new evidence to the historical and economic study of modern Greece and the social legacy of one of its most defining demographic events.

More importantly, this is the first paper to our knowledge, to shed light on the long-lasting implications of forced displacement on the formation of health-conscious norms.

Implications of Forced Displacement for the Host Population

We can distinguish between two interesting questions, one that focuses on the implications for the displaced population and one that elaborates on the implications for the native population. Starting with the latter, which is more closely related to our approach, forced migration has been argued to cause significant short-term and long-term costs but also benefits for receiving communities. Mass refugee influxes affect labour market, education, health and other outcomes of host regions.

Focusing on physical health, [Ibáñez et al. \(2021\)](#) investigate the impact of Venezuelan forced migration on the spread of 15 infectious diseases in Colombia. The findings show that increased refugee inflows are linked to higher incidence of vaccine-preventable diseases, such as chickenpox and tuberculosis, as well as sexually transmitted infections like syphilis. However, no significant effects are found on the spread of vector-borne diseases. The principal transmission mechanism seems to be direct contact with infected migrants upon arrival. [Baez \(2011\)](#) finds that forced migration caused by civil wars increases the spread of malaria, diarrhea, and fever in hosting locations. [Montalvo and Reynal-Querol \(2007\)](#) find evidence of a large increase in malaria prevalence in response to social disruption and forced migration due to civil wars. Refugees coming from a country with a high incidence of malaria have an important effect on the malaria incidence in the refugee-receiving country.

Concerning mental health, forced migration may affect it in various ways, e.g. inducing depression and anxiety, due to cultural conflict and discrepancy between aspiration and achievement ([Bhugra, 2004](#))

Implications of Forced Displacement for the Displaced Population

Forced displacement, unlike voluntary migration, severely disrupts the lives of affected individuals and often leads to serious health challenges. Refugees and displaced populations generally lack autonomy over their relocation and face uncertainty regarding their social and economic status in host countries. This involuntary nature of movement exposes them to unique vulnerabilities, including trauma, poor living conditions, and accessibility problems to essential services. The psychological and physical impacts of civil war, expulsion, or natural disasters can be profound and long-lasting, shaping the life outcomes of displaced populations in negative ways.

One of the most immediate health consequences of forced migration is the spread of diseases and the deterioration of physical health ([Becker, 2022](#)). Refugee camps often foster conditions conducive to infectious diseases due to overcrowding, poor sanitation, and limited nutrition ([Columbia University et al, 2022](#)). Malnutrition, especially among children, and diseases such as anemia, heart disease, and malaria are prevalent ([Kalipeni and Oppong, 1998](#)). Mental health issues, though widespread, are frequently overlooked. Stigma, cultural norms, and lack of access to mental health services contribute to undiagnosed and untreated conditions such as PTSD, depression, and psychosomatic illnesses ([Carroll et al., 2023](#)). These health burdens are exacerbated by structural issues like incomplete integration into host societies, discrimination, and limited employment opportunities.

Numerous studies underscore the long-term negative health effects of forced displacement. For example, research on displaced Germans and Finns after WWII links forced migration with increased mortality, especially from heart disease and stress-related illnesses ([Bauer et al., 2013](#); [Haukka et al., 2017](#); [Kuvert et al., 2019](#); [Saarela and Finnäs, 2009](#); [Freitag et al., 2013](#)). Similarly, studies on populations displaced by conflicts in Sri Lanka, Croatia, and Angola demonstrate higher disease burdens, including mental disorders and child mortality ([Siriwardhana and Wickramage, 2014](#); [Zilic, 2018](#); [Porter and Haslam, 2005](#); [Avogo and Agadjanian, 2010](#)). Findings suggest that the trauma of displacement, combined with prolonged socioeconomic disadvantage, leads to cumulative health issues that persist for decades. In some cases, even second-generation outcomes, such as educational performance of children of refugees, are affected by earlier exposure to inadequate prenatal care due to displacement.

Overall, displaced populations face risk factors affecting every aspect of health, physical, mental, and social ([Cuadrado et al., 2023](#)). Economic hardship, legal barriers, and poor integration into health systems leave refugees more vulnerable than host populations. They often suffer from a higher prevalence of both communicable and non-communicable diseases, the most vulnerable being women, older adults, and those with pre-existing mental health conditions. The combination of status-related marginalization, poor environmental conditions, and weak institutional support

systems implies that refugee health outcomes are often far worse compared to those of even the most disadvantaged groups within host countries ([Thomas and Thomas, 2004](#); [O'Donnell et al., 2016](#)). Addressing these disparities requires targeted interventions that consider both short-term humanitarian needs and long-term health integration.

Our study contributes to this literature by exploring similar questions in the Greek context with a focus on the health behaviour dimension, after the Greco-Turkish war of 1919–1922. This historical forced migration led to substantial territorial adjustments and large-scale population movements in the wider region. We exploit a quasi-natural experiment and focus on the impact of refugee inflows for the *local* population. Our results show that forced displacement was a critical determinant of health-related behavior even in the very long-run. Given the scale of adversity and exposure to poor sanitary conditions, self-care may have emerged as a survival strategy among the displaced. What began as a necessity in harsh conditions may have evolved into a durable norm, shaping long-run patterns of health-conscious behavior.

2.2 Long-run Determinants of Health Attitudes

A growing body of evidence supports the notion that early-life trauma, especially in the form of war, forced migration, and large-scale societal disruptions, can shape not only immediate outcomes but also enduring behavioral and cultural norms around health. [Becker et al. \(2020\)](#) examine the long-term consequences of forced migration by studying the population transfers of ethnic Germans from Eastern Europe to West Germany following World War II. They find that displaced children, despite facing major disadvantages, eventually attained higher levels of human capital and income compared to non-displaced peers, an outcome the authors attribute to increased parental investment, stronger preferences for education, and a long-lasting orientation toward self-reliance and improvement. Although the focus is on educational and economic outcomes, the study suggests a broader cultural transmission of values, including those related to health and self-care, particularly through intergenerational mechanisms.

[Akbulut-Yuksel \(2014\)](#) extends this line of research by investigating the long-run impact of exposure to large-scale WWII bombing in Germany on children's health decades later. Her results show that those exposed to severe physical destruction in early life have significantly worse health outcomes in adulthood, including higher rates of obesity, hypertension, and diabetes, as well as lower self-reported satisfaction with their health. The paper emphasizes that wartime exposure damaged health infrastructure and nutrition during critical developmental stages, laying the foundation for long-lasting health vulnerabilities and possibly altered norms about self-preservation and bodily care. Similarly, [Cassar et al. \(2013\)](#) explore how the traumatic legacy of the Soviet Gulag system influenced trust, social capital, and civic behavior in Russia, showing that areas more heavily exposed to forced labor camps still display weaker interpersonal trust and engagement today. This work highlights how deeply rooted historical shocks can leave durable imprints on behaviors and values transmitted across generations.

These studies point to a consistent mechanism: major collective traumas, whether forced displacement, physical destruction, or prolonged repression, can generate long-term changes in how individuals and communities approach education, well-being, and self-care. In contexts where survival was precarious and institutions weak, the development of strong internal norms around self-reliance, health maintenance, and resilience may have been both adaptive and enduring, eventually becoming embedded in local cultures and transmitted to subsequent generations.

2.3 Long-run Determinants of Health

Health outcomes are influenced by several factors over an individual's life and across generations. These include income, education, employment and socioeconomic status, which have been demonstrated to affect health directly and indirectly ([Marmot and Wilkinson, 2005](#); [Adler and Newman, 2002](#)). Individuals with higher education level and more stable employment generally exhibit better health outcomes, partly due to better access and use of information, monetary resources, and healthcare services ([Cutler and Lleras-Muney, 2006](#)). Conversely, poverty and low educational attainment are strongly associated with poor health, greater exposure to health risks, and limited access to preventive care. These determinants are interconnected and reinforce each other over time, contributing to persistent health disparities within and across generations. For instance, highly educated people tend to have high income, more stable employment trajectory and higher socioeconomic status, which are usually transmitted to their offspring.

Access to healthcare is another key long-run factor. This incorporates availability, affordability, and quality of health services, as well as the ability to use health systems efficiently. Populations with consistent access to primary and preventive care are more likely to diagnose and manage health problems early, improving long-term outcomes ([Starfield et al., 2005](#)). On the contrary, people facing barriers, such as high cost, geographic isolation, lack of insurance, or systemic discrimination, are less likely to enjoy timely care, typically resulting in deteriorating health conditions and higher mortality ([Gulliford et al., 2002](#)). Health literacy also affects the potency of care, as individuals must understand and comply with medical advice to gain fully from available services.

Living and environmental conditions are also very crucial for long-term health outcomes. Clean water, good air quality, safe housing, and access to nutritious food are of utmost importance for health. Communities with inadequate infrastructure, overcrowding, air and water pollution, and food insecurity typically experience higher rates of chronic diseases such as asthma, diabetes, and cardiovascular diseases ([WHO, 2016](#); [Evans and Kantrowitz, 2002](#)). These environmental determinants are usually related to social inequality, because marginalized populations are more likely to live in suboptimal conditions. Long-term exposure to such environments not only increases risks for physical health but also contributes to psychological strain and mental health disorders, further aggravating negative health outcomes.

Finally, social and cultural factors such as family structure, community support, and social norms may have an important impact on long-run health. Strong social networks are beneficial, offering psychological support, lowering stress, and promoting healthy

habits ([Berkman et al., 2000](#)). On the contrary, social isolation, discrimination, and chronic stress due to inequality and marginalization have been associated to an array of poor health outcomes, including cardiovascular diseases and depression ([Williams and Mohammed, 2009](#)). Cultural attitudes toward health, diet, physical exercise, and utilization of health services can either support or impede health improvement efforts. Over time, the above long-run determinants of health interact with each other, forming individual and population health dynamics and reinforcing health inequalities which tend to persist across generations.

2.4 The Evolution of Greek Society and Economy

Lastly our paper contributes to the literature that sheds light on the impact of a major historical event that shaped the Greek economy and society, which has nevertheless been undergoing continuous transformation since the late 19th century.

[Kammas et al. \(2021\)](#) analyse the transformation of the agricultural Greek economy following the historical exogenous shock of the increased demand for currants in the second half of the 19th century. During this period Greece was a typical agrarian economy with more than 76% of the workforce employed in agriculture, faced a rise in the international demand for currants. Their findings support that higher exposure of the agricultural population in the shock had a negative effect on the formation of human capital. [Kammas and Sarantides \(2020\)](#) explore whether the extension of the voting franchise in the Greek agrarian economy was the driving force behind the shift in the implemented tax policy.

[Michalopoulos et al. \(2025\)](#) argue that though initially lagging, refugees from Asia Minor in 1922-1924 eventually performed better than natives in terms of educational attainment at the host country. Also, refugees tended to choose university degrees transferable in the international labor market, such as engineering and medicine, while natives specialized in law and other fields suitable to the domestic production structure. A more recent event is analysed by [Efthyvoulou et al. \(2020\)](#) who explores gender political differences during the transition from a rural economy to an industrial economy between 1953 and 1954. They identify the causal relationship between women's enfranchisement and party vote shares. During the decades of 1950s and 1960s, a large share of population moved from the countryside to the cities and as a result there was an increase in the number of small and medium-sized firms in the industrial sector. On the other hand, female labour force participation was affected negatively by this increase in urbanization.

3. Historical Background

3.1 The Turkish-Greek War of 1919–1922

The Turkish-Greek War of 1919–1922 marked the last phase of the historical confrontation between the two nations and ended a long history of substantial territorial adjustments and large-scale population movements in the wider region. It followed the Macedonian struggle (1904-1907), the two Balkan Wars (1912-1913) and the First World War (1914-1918).

The chronology of events leading to the mass refugee inflow to Greece commences with the Greek military defeat in August 1922 and the subsequent population displacement of Anatolian Greeks in autumn 1922, from Minor Asia and Eastern Thrace to Greece. Also, earlier violent conflicts that took place mainly in Bulgaria had resulted in smaller population movements towards Greek territories – for example around 40,000 Greeks living in Bulgaria were forced to migrate in 1907 ([Gounaris, 1989](#)).

The final stage of the population movement between the two territories was agreed in the Convention of Lausanne (24-7-1923), outlining the first compulsory exchange of populations in world history. It signaled the arrival of almost a million and a half refugees in Greece¹ and 400,000 Muslims who resided in former Ottoman provinces annexed by Greece in the Balkan Wars of 1912-1913 in Turkey.² According to the General Population Census of 1928, the total number of refugees was 1,221,849 persons, of which 673,025 were urban refugees and 578,824 rural. As a result, the population of Greece, which was around 2,530,000 at the beginning of the first Balkan War (1912) more than doubled, reaching 6,199,826 after the mass refugee inflow and the annexation of new Territories during 1913-1920 ([Pallis, 1928](#)).

The most controversial aspect of the Lausanne Convention was the fact that the exchange of populations was made compulsory. This compulsory transfer of populations was a novelty introduced to solve a challenging ‘minority’ problem in areas where the population was ethnically mixed. According to Charles Howland, Chairman of the Refugee Settlement Commission, it was also ‘unique’ due to: first, its compulsory obligation and military occurrence; second, lack of economic motives; third, the uprooting of indigenous population and finally, its unprecedented scale. The resettlement was also unique in terms of speed, as the largest part of the refugee resettlement was accomplished in three years (1923-1926) ([Mavrogordatos, 1983](#)).

Ultimately, the Lausanne Treaty and its obligatory terms for the population exchange were seen as a means to secure and reorganize the territories of Greece and Turkey aiming at achieving ethnic and religious homogeneity, social integration and future prosperity, under the umbrella of the League of Nations.

3.2 Refugees: Conditions on Arrival and Allocation in Greece

The wave of refugees fleeing Turkey and landing in Greece at the end of 1922 caused extraordinary pressure on the local economy and, given the end of an almost 20-year period of military conflicts, the country’s needs for housing, feeding and medical care immediately skyrocketed. The shortage of financial resources, the lack of public infrastructure and the enormous number of refugees were the main issues to be addressed, in an era of rather conservative political sentiment in Greece. The

¹ Refugees were divided into four distinct categories (see Article 124 of the Convention) , in accordance with the Geneva Protocol: (1) Refugees from Turkey who sought refuge in Greece after the Asia Minor Catastrophe of 1922 (Lausanne, 24 July 1923; Articles 2 & 4); (2) ‘Immigrants’ or ‘exchanges’ (antallaximoi) from Turkey who came in under the Convention of Exchange of Populations (Lausanne, 30 January 1923; Article 1); (3) Immigrants from Bulgaria under the Convention of Neuilly (1919); (4) Refugees from Russia (mainly the Caucasus) and Turkey, who came before 1922.

² The precise number of the Orthodox refugees who entered Greece is difficult to estimate because reliable statistical records do not exist ([Kontogiorgi, 2006](#)).

immediate needs of the refugees were tackled by the Hellenic Ministry of Health and Social Protection and foreign NGOs (American Red Cross, American Near East Relief, Swedish Red Cross, YMCA, Union de Secours aux Enfants among others) (Pentzopoulos, 2021).

Most of the refugee settlement was accomplished through the work of the *Refugee Settlement Commission (RSC)*, which in exchange of securing a large loan was given significant powers by the Greek government. The purpose of the settlement program was to help refugees to become self-supporting in the minimum required time (Kontogiorgi, 2006). The work of the Commission can be divided into two main categories, agricultural colonization and urban settlement (Krimpas, 1999; Pentzopoulos, 2021). The settlement of refugees depended on a number of factors, namely the availability of land, the supply of housing and the associated need for occupancy and employment opportunities in agriculture in rural areas – mainly Macedonia and Thrace. The emphasis on agriculture was first due to the perception that this sector was the main engine of development of the Greek economy (Chatziiosif, 1993). Second, the settlement of massive refugee inflows was feasible only in abandoned villages and land, mainly in Northern Greece. Third, this policy would achieve ethnic homogenization of Northern Greece, minimizing the possibility of future claims by Serbia and Bulgaria in the region. For the above reasons, uncultivated but cultivable and fertile land areas in Macedonia and Thrace were chosen as the main settlement locations for refugees. Thus, refugee characteristics such as education level and previous employment status were not taken into account in their allocation process.

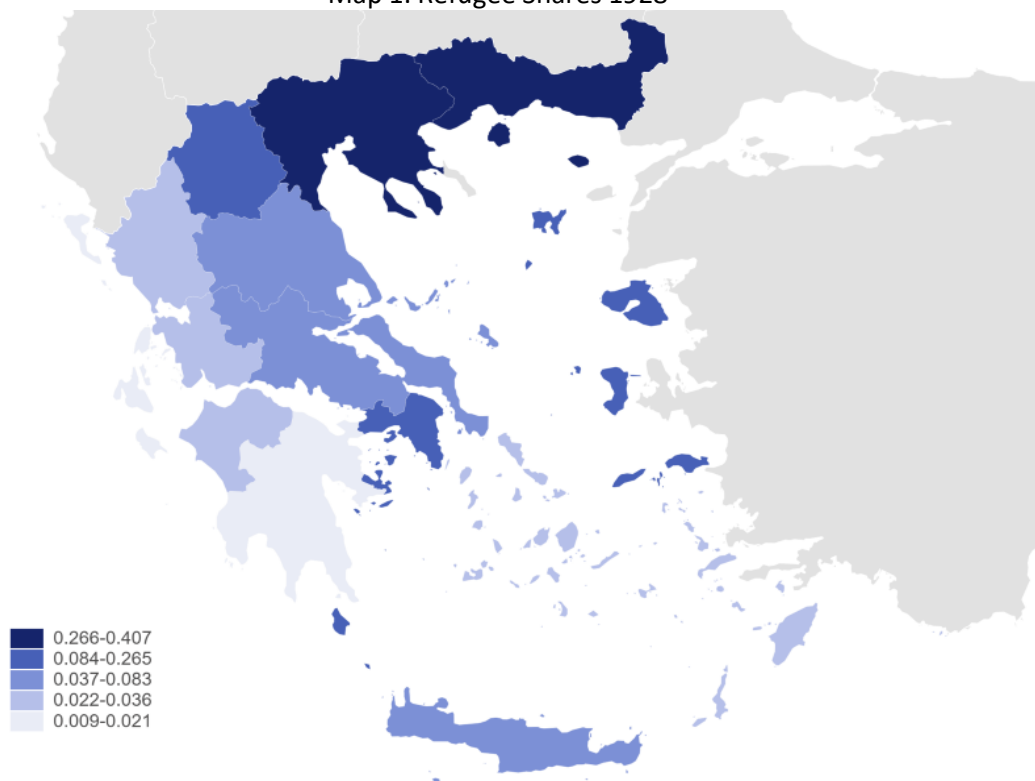
The Refugee Settlement Commission considered the settlement of the population in rural areas of primary importance for two reasons: *a) to increase agricultural production as rapidly as possible so as to satisfy the needs of incoming refugees; b) to avoid the congregation in towns of large segments of the refugee population, which would rapidly become assimilated with the native urban population and would find it difficult to leave the towns for the countryside afterwards.* In this framework, 90% of the loan was allocated to rural and only 10% to urban settlement. The relocation of refugees to agricultural regions was massive and challenging. *The settlement of the refugees in vacant rural areas was crucial because: first, it would help them to become self-supporting very quickly; second, it would fill the demographic vacuum which emerged as a result of the departure of Muslims and Bulgarians especially from Macedonia and Thrace; third, it would increase agricultural productivity and contribute to the recovery of the economy of the region, which was impaired by the departure of Muslim and Bulgarian farmers (Kontogiorgi, 2006).* Finally, *Macedonia and Thrace were lagging in terms of economic development and a successful plan of exploiting their natural resources could sustain the mass inflow of refugees.*

Therefore, refugees were disproportionately allocated in previously thinly populated rural areas, many of which were filled with extensive marshes, where malaria was widespread among the local population. Thus, many refugees got sick and finally died. Overall, the Greek state allocated to the Commission 8.4 million acres of land, originating mainly from properties of Muslims and Bulgarians that had left the

country, land expropriated by agricultural reform and monasteries and empty areas close to urban centers. Almost 2,000 refugee settlements were created, either completely new or attached to already existing villages in Macedonia and Thrace. The land size allocated to each household depended on crop type and soil quality.

Finally, for Greek political authorities the concentration of refugees in urban centers was perceived negatively, because they were afraid that refugee masses living in harsh conditions would create social and political instability, particularly given the revolutionary atmosphere of the post WWI era. Despite this, around 27,000 housing units were built in 118 suburban communities ([Giannakopoulos, 2003](#)). The respective urban centers that refugees were settled included Athens, Piraeus, Thessaloniki (cumulatively reaching almost 60% of the refugees settled in urban centers), Volos (Nea Ionia) and, to a smaller extent Ioannina, Corfu and Patras.

Map 1: Refugee Shares 1928



Source: Hellenic Statistical Authority, 1928 Census.

3.3 Composition of the Refugee Population

As a result of the mass losses in Greek male population in Anatolia, especially in the productive ages of 18-45, the refugees from Asia Minor and Pontus were principally women, children and old men. Thus, many refugee families lacked their male companions and had even greater difficulty sustaining themselves and consequently surviving ([Klapisis, 2014](#)). This is supported by data related to the family

status of the refugee population, where the percentage of widowed refugee women was almost 50% higher in comparison to that of the general population in Greece (17.5% versus 12.1%). This disequilibrium was even more severe in the 25-39 age group since the male population of these ages had been most severely affected by the Turkish persecutions: for example, among those aged 25–29, 30–34 and 35–39 the percentage of widowhood among refugee women was more than double in comparison to that of the general population in Greece (6% vs 2.8%; 12.9% vs 6.3% and 19% vs 10.5%, respectively). In addition, the refugee population experienced high mortality rates as the result of poor living conditions. Estimates suggest that about 75,000 persons died in Greece between 1922 and 1928 because of extreme deprivation and illness ([Kitromilides and Alexandris, 1984](#)).

3.4 Health conditions of refugees on arrival

The arrival of more than 1.2 million refugees from Asia Minor between 1922 and 1924 initiated one of the most severe public health crises in modern Greek history. Physically and mentally devastated, most refugees arrived in Greece packed by the hundreds aboard overcrowded ships after exhausting and perilous journeys, suffering extreme physical hardship that further weakened their condition ([Katsapis, 2003](#); [Liakos, 1993](#)). Many of them appeared, in contemporary descriptions, as “living corpses, or rather moving cadavers” ([Kopanaris, 1933](#)). Their diet was very insufficient in terms of both quantity and quality. The lack of clean drinking water was an even more serious problem: available water sources were often contaminated, causing frequent outbreaks of dysentery and typhus. Typhus, malaria, dysentery, tuberculosis, and smallpox spread rapidly in camps at Piraeus, Thessaloniki, Kavala, Volos, and other ports of entry, where thousands of people were accommodated in temporary shelters or army barracks with inadequate food, water, and sanitation.³

An additional aggravating factor was that many refugees originated from regions that were already endemic with malaria and other infectious diseases, such as Aydin and Amisos in Pontus, and were resettled in equally unhealthy, swampy areas of northern Greece ([RSC, 1929](#)). Their weakened immune systems and inability to adapt to new climatic conditions made them especially vulnerable to infection. Epidemic typhus became the first major hardship for those who had survived the voyage and earlier outbreaks.

In rural refugee settlements, living conditions were hard, with malaria representing the most serious problem causing 70% of refugee deaths during the second half of 1923 in Macedonia. In 1924, refugee communities in Halkidiki, Serres, Giannitsa, Pieria, and Kilkis lost nearly 20% of their population to malaria, typhus, and dysentery, mainly due to contaminated water. For every birth, there were three refugee deaths. This was due to both high mortality but also physical and emotional suffering that led to thousands of premature births and miscarriages ([RSC, 1929](#)).

Poor quality and insufficient food left refugees unable to cope with daily hardship, while physically demanding work under unsanitary conditions further

³ Figures A1-A7 in the Appendix illustrate the plots of the evolution of total deaths and deaths from diseases from 1921 to 1938 by Nuts 2 regions.

undermined their already precarious health. In cities, housing conditions were an even more serious problem: refugees lived on city outskirts, in makeshift huts without light or ventilation for decades, creating ideal conditions for tuberculosis (Oikonomopoulos, 1930). In 1933 alone, about 150,000 people contracted tuberculosis, and over 8,000 died. Mortality rates, especially among children and the elderly, were exceptionally high during the first years after arrival.

The absence of basic public-health infrastructure, such as clean water and sewage systems, aggravated the crisis. Many refugee villages in Macedonia lacked safe water, and in urban areas water was often contaminated, sold by private vendors or fetched from communal fountains (Liakos, 1993). In Athens and Piraeus, open drains carried waste through unpaved streets, while refuse collection was irregular. These conditions made typhoid, dysentery, and other intestinal diseases widespread among refugee populations.

4. The Data

Our research investigates the long-run effects of the 1923 population exchange between Greece and Turkey on contemporary health attitudes and behaviors of the native Greek population. To do this, we conduct a multilevel analysis that links historical regional-level data with individual-level data from the present. Specifically, we combine information from the 1928 Census of the Hellenic Statistical Authority, providing the share of refugees settled in each province (aggregated at the NUTS 2 regional level), with micro-level health data from the 2019 Health Survey conducted by the same authority. Each individual in the 2019 dataset is geolocated to their corresponding NUTS 2 region, enabling us to match their personal health outcomes with the historical concentration of refugees in their area. This approach allows us to trace the influence of early 20th-century forced displacement on individual health behavior nearly a century later.

The richness of the data permits a detailed exploration of health-related behavior across spatial and demographic dimensions. The individual-level dataset includes approximately 8,000 respondents and covers a wide range of health-related outcomes, including use of health services (e.g., visits to doctors or therapists), preventive care (e.g., vaccinations, screenings), physical activity, and dietary habits. It also contains detailed demographic controls, such as age, gender, education level, and employment status. By merging these micro-level indicators with historical refugee settlement patterns at the macro level, we explore whether living in regions historically exposed to large refugee inflows is associated with systematically different health behaviors today. This multilevel design provides a framework to investigate the long-term cultural imprint of forced migration on public health behavior.

Outcome Variables

To investigate the long-run impact of forced displacement on health-related behavior, we focus on outcomes that reflect everyday health habits and routines rather than sporadic or one-time events. All variables used in our analysis capture individual-level practices that require conscious and repeated engagement, whether through the regular use of healthcare services, preventive checkups, physical activity, or dietary choices. We extract four distinct groups of outcome variables from the 2019

Health Survey of the Hellenic Statistical Authority at the NUTS 2 regional level, covering approximately 8,000 respondents. These variables offer a comprehensive view of health-related habits that reflect how individuals manage their well-being on a daily, weekly, or annual basis. Our analysis categorizes these into: (i) use of health services; (ii) engagement in preventive care; (iii) physical activity patterns; and (iv) healthy eating practices. This structure allows us to assess the extent to which distant-past exposure to forced displacement correlates with present-day behavior in domains that reflect personal responsibility, awareness, and cultural norms related to health.

Use of Health Services

First, we examine the effect of the refugee population share on the long-term use of health services. Specifically, we look into different dimensions of health services, with respondents answering six different questions regarding their use of health services. The questions are as follows:

- “Last visit to/advice from a general doctor, pathologist or family doctor (for your own health problem)”, measured on a scale from 1 (never) to 3 (within the last twelve months).
- “Number of advice from/visits to general doctors, pathologists, family doctor during the last 4 weeks”, with a total number ranging from 0 to 16.
- “Last visit to/advice from another doctor’s specialty or surgeon (for your own health problem)”, measured on a scale from 1 (never) to 3 (within the last twelve months).
- “Visit to a physiotherapist, kinesiotherapist, chiropractor or osteopath, during the last 12 months (for your own health problem)”, the value of 1 indicates No and the value of 2 indicates Yes.
- “Visit to a psychologist, psychiatrist or psychotherapist for your own health problem”, the value of 1 indicates No and the value of 2 indicates Yes.
- “Use of care services (nursing or other) at home (for your own health problem)”, the value of 1 indicates No and the value of 2 indicates Yes.

Prevention Services

Our second set of outcome variables focuses on health prevention services. Respondents are given six different questions about use of health prevention services, which are as follows:

- “Last flu vaccination”
- “Last blood pressure measurement by a healthcare professional”
- “Last blood cholesterol measurement by a healthcare professional”
- “Last colonoscopy”
- “Last mammogram”
- “Last Pap test”

All of these prevention service variables are measured on a scale between 1 (never) and 5 (within the last twelve months), except for the flu vaccination, which is measured on a scale between 1 (never) and 3 (after 2017).

Physical Activity

Regarding physical activity, we derive five different outcome variables based

on the following questions asked for the sample:

- “Days in a typical week you walk continuously for at least 10 minutes to get somewhere and/or back”, responses range from 0 days to 7 days.
- “Time you walk to get somewhere and/or back during the day”, measured on a scale from 1 (10-29 minutes/day) to 5 (3 or more hours/day).
- “Days in a typical week you ride a bike continuously for at least 10 minutes to get somewhere and/or back”, responses range from 0 days to 7 days.
- “Time you ride a bike to get somewhere and/or back during the day”, measured on a scale from 1 (10-29 minutes/day) to 5 (3 or more hours/day).
- “Days in a typical week you engage in sports, exercise or recreational exercises continuously for at least 10 minutes, resulting in at least shortness of breath”, responses range from 0 days to 7 days.

Healthy Eating Habits

The final set of outcome variables focuses on healthy eating habits. We use five different variables related to respondents’ eating habits, based on the following questions:

- “Frequency of fruit consumption”
- “Servings of fruit consumed daily”
- “Frequency of vegetables or salad consumption”
- “Servings of vegetables or salad consumed daily”
- “Frequency of consumption of 100% natural fruit or vegetable juices”

For the frequency of consumption variables, responses are measured on a scale from 1, indicating no consumption at all to 5, indicating one or more per day. The variable related to the number of servings of fruit are measured on a scale from 1 serving to 12 servings and the variable related to the number of servings of vegetables or salad are measured on a scale from 1 serving to 20 servings.

Table 1 presents summary statistics for all variables used in the analysis. Respondents report relatively frequent contact with general practitioners and frequent use of specialist services, while visits to psychologists or physiotherapists remain rare. Blood pressure and cholesterol measurements are widespread, but rates of colonoscopy and flu vaccination are relatively low. Physical activity levels are moderate, with an average of 4.4 days of walking per week and very limited participation in cycling or other forms of exercise. Eating habits appear relatively healthy, as most respondents consume fruits and vegetables almost daily.

Table 1: Summary Statistics

	nb	mean	s	min	max
Outcome Variables					
Use of Health Services					
Last visit to/Advice from a general doctor/pathologist/family doctor		8,094			
Number of advice from/visits to general doctors/pathologists/family doctor		5,014			

during the last 4 weeks					
Last visit to/advice from another doctor's specialty/surgeon	8,078				
Visit to a physiotherapist/kinesiotherapist/chiropractor/osteopath during the last 12 months	8,118				
Visit to a psychologist/psychiatrist/psychotherapist	8,119				
Use of care services at home	8,118				
Prevention Services					
Last flu vaccination	7,803				
Last blood pressure measurement by a healthcare professional	7,822				
Last blood cholesterol measurement by a healthcare professional	7,829				
Last colonoscopy	7,725				
Last mammogram	4,118				
Last Pap test	4,101				
Physical Activity					
Days in a typical week you walk continuously for at least 10 minutes	7,767				
Time you walk to get somewhere and/or back during the day	6,161				
Days in a typical week you ride a bike continuously for at least 10 minutes	7,815				
Time you ride a bike to get somewhere and/or back during the day	815				
Days in a typical week you engage in sports/exercise/recreational exercises continuously for at least 10 minutes, resulting in at least shortness of breath	7,809				
Healthy Eating Habits					
Frequency of fruit consumption	7,840				
Servings of fruit consumed daily	3,807				1
Frequency of vegetables or salad consumption	7,847				
Servings of vegetables or salad consumed daily	4,044				2
Frequency of consumption of 100% natural fruit or vegetable juices	7,821				
Explanatory Variable					
Refugee Share	8,125				
Control Variables					
Age	8,125	5	1	1	8
Sex	8,125				
Educational Attainment	8,125				
Employment Status	8,125	2	1	1	8
Mortality Rate	8,125				
Citizenship	8,125				
Refugee Descendants	8,125				

Explanatory Variable

Our main explanatory variable is the share of refugees in the total population, which is derived from the 1928 Census of the Hellenic Statistical Authority. Our testable hypothesis is that the massive refugee inflow during the 1922-1923 period induces significant impact on the health related habits of the native population in the long run. The key factor that enables us to make causal inferences about this impact is the random allocation of refugees, which serves as one of the critical blocks for our identification strategy (to be elaborated below).⁴ The refugee share averages 17%, ranging from 1% to 41% across regions.

Control Variables

Our analysis includes a comprehensive set of control variables at both the micro and regional levels, in order to account for individual characteristics as well as broader contextual factors that may confound the relationship between historical refugee inflows and present-day health behavior. Controlling for both levels is essential to isolate the long-run effects of forced displacement from other contemporaneous determinants of health habits.

⁴Refugees constituted around 20% of the overall Greek population in 1928 and their spatial allocation was very skewed towards Macedonia, Thrace and Attica, where approximately 87% of them settled.

At the micro level, we include individual-level demographic and socioeconomic characteristics that are likely to influence health-related behavior. These are drawn from the 2019 Health Survey of the Hellenic Statistical Authority, which includes approximately 8,000 respondents. The variables we use are: i) age and age squared, to capture non-linear effects of age on health behavior, ranging from 15 to 85 years and older; ii) gender, coded as 1 for male and 2 for female; iii) educational attainment, ranging from 0 (no formal education or some primary school classes) to 8 (PhD); and iv) employment status, ranging from 10 (employed individuals) to 80 (other statuses such as unemployed, students, retirees, etc.). These controls allow us to account for key individual differences in life stage, socioeconomic status, and labor market attachment, all of which are relevant predictors of health habits. The average respondent is 56 years old, with women slightly overrepresented. Educational attainment averages around 3, suggesting that most respondents have finished secondary school, while fewer have gone on to higher education and employment status varies widely across the sample.

At the regional level, we introduce controls that capture baseline health and demographic conditions prior to the refugee inflow, what we refer to as “initial conditions.” One of the most critical variables in this respect is the death rate in 1921, calculated using data from the Hellenic Statistical Authority's Statistics on Causes of Death. We construct this variable by dividing the total number of recorded deaths in each region by its total population in 1921. Including this pre-treatment mortality rate allows us to control for potential regional disparities in public health, disease burden, or healthcare infrastructure that existed before the 1922–1923 refugee arrival. This, in turn, helps to disentangle the long-run effects of refugee inflows from existing regional trends in population health, ensuring that our findings are not driven by prior differences in morbidity or mortality patterns across space.

We further enrich our set of regional-level controls by aggregating micro-level data from the 2001 Census, conducted by the Hellenic Statistical Authority and comprising approximately 1,000,000 respondents. These variables are constructed at the NUTS 2 level and help capture long-term regional characteristics related to mobility and historical displacement. The first variable concerns citizenship composition and is calculated as the share of respondents in each region who report a place of residence in a different prefecture, relative to the total number of respondents in that region. This measure serves as a proxy for internal migration patterns and long-term regional openness, capturing both mobility dynamics and the demographic fluidity of a region. Regions with higher shares of individuals originating from other areas are likely to have experienced more diverse social interactions, greater population turnover, and possibly more adaptive or responsive health infrastructure. Such diversity may influence the availability and accessibility of health services, as well as shape prevailing attitudes toward health-seeking behavior. Moreover, individuals who have migrated internally, or live in regions with a high presence of such populations, may exhibit different health habits, cultural practices, or awareness levels regarding healthcare, which in turn could affect how communities engage with prevention, treatment, and self-care practices.

The second variable relates to displacement lineage and captures the historical presence of refugee descendants within each region. It is constructed by aggregating

individuals who were (i) born in Turkey before 1923 and (ii) those whose mother's place of residence at the time of their birth was Turkey but who were themselves born after 1923. This composite measure provides a direct link to the 1923 population exchange and serves as a proxy for the enduring demographic imprint of this forced displacement. By capturing both first-generation refugees and their descendants, the variable enables us to isolate regions with a higher historical concentration of refugee-origin populations. These areas likely experienced distinct socio-economic dynamics, including challenges related to integration, property redistribution, and cultural assimilation. The inclusion of this variable allows us to examine whether long-run patterns of health behavior, such as preventive care, self-care habits, or health service utilization, can be partially attributed to the legacy of refugee presence. Furthermore, it sheds light on persistent health disparities and behavioral norms that may have emerged from the trauma of displacement, constrained access to services, and intergenerational transmission of survival-oriented health practices, offering a nuanced view of how historical shocks shape contemporary outcomes. Regional controls show low historical mortality rates (around 1%) and moderate internal mobility (11% of residents born in another prefecture). Refugee descendants represent about 1% of the population.

Lastly, our analysis incorporates fixed effects at the NUTS 1 regional level to account for unobserved heterogeneity across broader geographical units. These fixed effects absorb all time-invariant characteristics specific to each NUTS 1 region, such as historical infrastructure development, long-standing cultural attitudes toward health, deep-rooted institutional differences, or persistent disparities in regional governance and policy implementation. By doing so, we ensure that the estimated effects are not confounded by structural or historical features that differ across regions but remain stable over time. This allows us to isolate more accurately the impact of the 1923 refugee inflows on contemporary health behaviors and reduces the risk of omitted variable bias due to unobserved regional factors that could otherwise distort our findings.

5. Empirical specification

Our empirical analysis aims to identify the long-run effect of the 1923 forced refugee inflow on contemporary health-related habits of the native population. Specifically, we examine whether regions that received a larger share of refugees following the Greco-Turkish population exchange exhibit today more health-conscious behavior, captured through indicators related to preventive care, healthcare use, physical activity, and healthy dietary habits.

To do this, we employ a multilevel framework that links historical regional-level variation in refugee settlement (measured at the NUTS 2 level from the 1928 Census) with individual-level health behavior outcomes from the 2019 Hellenic Statistical Authority health survey. This approach enables us to exploit spatial variation and demographic heterogeneity within regions, while accounting for both micro- and macro-level controls. A key identifying assumption behind our empirical strategy is the quasi-random allocation of refugees across Greek territory. Historical evidence

suggests that the assignment of refugees to provinces was largely exogenous to local characteristics, driven primarily by administrative necessities and capacity constraints, rather than selective placement based on health or socioeconomic factors. This exogeneity strengthens the causal interpretation of our findings by allowing us to treat variation in refugee share as plausibly independent of pre-existing regional health behavior trends.

5.1 Forced Displacement as a Natural Experiment and Identification Concerns

Below we list a number of characteristics of this event that render the expulsion of Anatolian Greeks from Turkey and their relocation in Greece a “natural experiment” ideal to study the economic implications of forced displacement.

Sudden and Unexpected Event

The refugee inflow was not a predetermined event, but followed the defeat of Greek army by the Turks in Anatolia in September 1922. The mutual agreement for population exchange was agreed between Greece and Turkey shortly afterwards, on January 30, 1923. Despite the military developments and the mass expulsion of Anatolian Greeks from Turkey, there was still widespread belief among the refugee population that they would return to their homeland in the near future. The above treaty was the first officially agreed and signed of its kind in world history, which enforced the obligatory resettlement of approximately 2,000,000 people.

Random Allocation of Refugees

At the core of our identification strategy lies not only the fact that the event was sudden, but more importantly the fact that the allocation of refugees to various places all over Greece was unrelated to any their educational and professional skills, as well as their social norms (including health related attitudes). Most of the work related to the settlement of the refugees was accomplished through the Refugee Settlement Commission (RSC). This Commission was given significant powers from the Greek government in exchange of securing a large loan. Its purpose was to help refugees to become self-supporting in the minimum required time ([Kontogiorgi, 2006](#)). The population of refugees was very high and constituted around 20% of Greek population in 1928. The inflow was so massive and the associated expenses to sustain the incoming population so immense that the then Greek government allocated refugees primarily to places where either past settlement from departing population (as part of the population exchange) existed or where refugee population could be employed in agricultural activities. As a result, their spatial allocation was very skewed towards Macedonia, Thrace and Attica, where approximately 87% of them settled.

Specifically, the RSC had the following aims and considerations: a) to increase agricultural production as rapidly as possible to accommodate new population; b) to avoid the congregation of refugees in towns, where they would rapidly become assimilated with urban population, and find it difficult to leave towns for countryside; c) settling and compensating large numbers of refugees was feasible only in remote villages and abandoned land in Northern Greece; d) agriculture was a sector that could lead the Greek economy into the future ([Chatziiosif, 1993](#)); e) the goal was to

ethnically homogenize Northern Greece, minimizing future claims by Serbia and Bulgaria in the region.

Limited Movement across Provinces

During the first years after refugee settlement under the auspices of the RSC, there was very limited movement of either refugees or natives. It was mostly very few natives who occasionally moved from rural to urban areas, in search of better employment opportunities in manufacturing and services due to limited opportunities in places with high refugee concentration (Riginos, 1987).

5.2 Specification

We estimate the following equation:

$$Y_{ij} = a_0 + a_1 * Refshare_{ij} + a_2 * X_i + a_3 * AC_j + a_4 I_k + e_{ij}$$

where i indexes individuals, j refers to regions at the NUTS 2 level, and Y_{ij} denotes the health outcome of individual i in region j . **Refshare** is the historical share of refugees in region j as recorded in the 1928 Census. X_i is a vector of individual-level controls (e.g., age, gender, education, employment status). AC_j is a vector of historical aggregate regional-level controls (e.g., mortality rate, displacement lineage, internal migration patterns). Last, we include Nuts 1 fixed effects (denoted by I_k) to capture a large number of unobservables and e_{ij} is the error term, clustered at the NUTS 2 (province) level to account for spatial correlation in unobserved factors within regions. This multilevel specification allows us to combine detailed individual-level data with historical regional variation to estimate the long-run effect of refugee inflows on contemporary health behaviors. The exogenous and quasi-random allocation of refugees across regions following the 1923 population exchange supports the identification strategy. Henceforth, we refer to this as our **benchmark specification**.

6. Results

Table 2 presents the benchmark results examining the long-run association between the historical share of refugees in a region and individual health service use today. Each column corresponds to a different health-related outcome, all estimated using ordered logit models. All models control for individual-level characteristics (e.g., age, gender, education, employment status), regional historical conditions (e.g., 1921 death rate, internal migration, displacement lineage), and include fixed effects at the NUTS 1 level. Standard errors are clustered at the NUTS 2 level and are robust throughout.

We find consistent and statistically significant evidence suggesting that a higher historical refugee share in a region is positively associated with more health-conscious behavior among today's native population. Specifically, **Column (1)** shows that individuals residing in areas with a higher refugee share are significantly more likely to have visited or received advice from a general practitioner, pathologist, or family doctor for their own health problem. The coefficient on the refugee share is **10.83** and is statistically significant at the **1% level**. This is not only a precise estimate but also quantitatively meaningful, suggesting a sizable behavioral shift toward more regular contact with general health providers. **Column (2)** is the only exception in the

table, where the coefficient on refugee share is negative (-1.758) and not statistically significant. This refers to the *number of visits* to general practitioners in the last 4 weeks. The absence of a relationship here could be due to the short recall period, which may capture acute health issues or seasonal factors rather than entrenched health-seeking habits. This variable likely reflects short-run needs rather than habitual or preventive care. **Column (3)** indicates that residents of high-refugee-share regions are more likely to have visited a medical specialist or surgeon. The coefficient of **6.826** is statistically significant at the **1% level**, confirming that the positive effect extends beyond basic care to include more specialized medical interactions. **Column (4)** reports a positive and significant effect of refugee share on the likelihood of having visited a physiotherapist, chiropractor, or osteopath during the past 12 months. The coefficient is **6.786** and statistically significant at the **5% level**, suggesting greater attention to musculoskeletal or rehabilitative health. This may reflect a norm of proactive physical well-being and maintenance rather than reactive care. **Column (5)** reveals the **largest effect in magnitude**, with a coefficient of **17.72**, statistically significant at the **1% level**, for visits to mental health professionals (psychologist, psychiatrist, or psychotherapist). This is particularly striking and suggests that in regions with higher historical refugee shares, individuals today are more open to or engaged with mental health care. This could be interpreted as a deep-rooted cultural shift toward destigmatizing psychological services, potentially driven by the trauma-aware legacy of displacement. **Column (6)** shows a large and positive effect (coefficient **8.184**) for the use of home care services. Although the coefficient is not statistically significant at conventional levels, the positive sign and magnitude are noteworthy, suggesting a potentially meaningful trend toward in-home health support, though estimates here are less precise.

To aid interpretation, we note that the refugee share varies between 0 and approximately 0.35 across Greek regions. The outcome variable in column (1) of Table 2 measures the timing of the **last visit to or advice from a general doctor**, coded on an ordinal scale where higher values reflect **more recent medical contact** (1 = never, 2 = more than 12 months ago, 3 = within the last 12 months). The coefficient of 10.83 from the ordered logit model implies that a **10 percentage point increase in refugee share**, for example, from 10% to 20%, raises the **log-odds of being in a higher category** of medical engagement by about **1.08 units**⁵. Translating this into predicted probabilities, this corresponds approximately to a **10 to 15 percentage point increase in the probability** that an individual reports having **seen a general doctor within the last 12 months**, rather than more than a year ago or never.

The effects are even stronger in the case of mental health service use (column 5), where the coefficient on refugee share is 17.72. This implies that the same 10 percentage point increase in refugee share leads to a roughly **15 to 20 percentage point increase** in the likelihood that an individual **has visited a psychologist, psychiatrist, or psychotherapist**, as opposed to not using such services at all. These results indicate that individuals residing in areas with historically higher refugee presence are significantly more likely to engage with both general and specialized healthcare services. The magnitudes suggest that the legacy of forced displacement

⁵ This range reflects the non-linear nature of the ordered logit model, where the marginal effect of refugee share on the probability of a given outcome varies depending on individual characteristics and baseline probabilities, resulting in different predicted impacts across population subgroups.

has shaped long-run behavioral norms around self-care and help-seeking behavior in ways that persist across generations.

Taken together, these results suggest a robust and multi-dimensional relationship between historical refugee presence and the health-seeking behavior of the contemporary population. Importantly, these are not just occasional or short-term visits: the pattern holds for various forms of medical engagement, general practitioners, specialists, physiotherapists, mental health professionals, and even home care, suggesting that what we are observing is not merely health system access or need, but an embedded **health culture**.

The strength of these associations, especially for general and mental health services, lends support to the hypothesis that **cultural transmission of health habits** may be at play. The findings also corroborate the idea that early exposure to trauma and poor hygienic conditions may have instilled stronger norms of self-care and proactive medical behavior, which became embedded across generations.

These findings persist despite the inclusion of rich controls and fixed effects, underscoring the robustness of the refugee share as a long-run determinant of health-seeking norms.

Table 2: Benchmark analysis: Use of Health Services and Refugee Share

	(1) Ordered Logit	(2) Ordered Logit	(3) Ordered Logit	(4) Ordered Logit	(5) Ordered Logit	(6) Ordered Logit
	Last visit to/advice from a general doctor, pathologist or family doctor (for your own health problem)	Number of advice from/visits to general doctors, pathologists, family doctor during the last 4 weeks	Last visit to/advice from another doctor's specialty or surgeon (for your own health problem)	Visit to a physiotherapist, kinesiotherapist, chiropractor or osteopath, during the last 12 months (for your own health problem)	Visit to a psychologist, psychiatrist or psychotherapist for your own health problem	Use of care services (nursing or other) at home (for your own health problem)
Refugee Share	10.83*** (2.049)	-1.758 (2.555)	6.826*** (1.782)	6.786** (3.172)	17.72*** (5.076)	8.184 (5.676)
Observations	8,094	5,014	8,078	8,118	8,119	8,118
Nuts 2 Controls	Yes	Yes	Yes	Yes	Yes	Yes
Nuts 1 Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Robust SE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: This table establishes the effect of refugee share on the use of health services of native population in Nuts 2 Greek regions. The analysis controls for age and age squared, gender, educational attainment, employment status, death rate, citizenship, place of birth and residence as well as Nuts 1 fixed effects. Robust standard errors are shown in parenthesis. *** denotes statistical significance at 1% level, ** at 5% level, and * at 10% confidence level.

The results presented in Table 3 offer robust evidence that the historical presence of refugees continues to shape preventive health behaviors among the native population nearly a century later. Each column reports the coefficient from an ordered logit regression of a different preventive health service on the refugee share in 1928 at the NUTS 2 regional level, controlling for a wide set of individual and regional covariates as well as fixed effects at the NUTS 1 level. Column 1 presents the results for Flu Vaccination (Col. 1). The coefficient of 4.875 is statistically significant at the 5% level and indicates a strong positive relationship between the historical refugee share and the likelihood of having had a flu vaccination. Using average marginal effects, a 10-percentage point increase in refugee share is associated with approximately a 7–10 percentage point increase in the probability that an individual reports a more recent flu vaccination. This is a meaningful increase,

especially for a preventive behavior often marked by inertia and low uptake in some demographic groups. Concerning Blood Pressure Measurement (Col. 2), the coefficient is -2.974 and statistically insignificant, suggesting no interplay between refugee share and this particular preventive service. Similarly, for Cholesterol Measurement (Col. 3) the coefficient is small (-0.435) and statistically insignificant. This may again reflect limited variation in practice or a more medically-driven rather than behaviorally-driven uptake, consistent across regions. The indicator for Colonoscopy (Col. 4) shows the strongest positive effect. The refugee share coefficient is 11.53 and statistically significant at the 1% level. This means that a 10-percentage point increase in the refugee share is associated with a 15–20 percentage point increase in the probability that an individual underwent a recent colonoscopy. Given that colonoscopies are invasive and often avoided due to discomfort, this large effect suggests that the underlying behavioral norms around proactive, long-term health care may have been profoundly shaped in high-refugee-share areas. Mammogram and Pap Test are presented in Columns 5 and 6. Both coefficients are large and significant (5.324 and 6.488, respectively, both at the 5% level). These results indicate that refugee legacy regions are significantly more likely to report recent preventive screening among women. A 10-percentage point increase in refugee share predicts a 10–15 percentage point increase in the probability of having undertaken these screenings, pointing to deep-rooted differences in health-seeking behavior across regions. Given the time and resource demands of such screenings, and potential stigma or discomfort, they reflect meaningful behavioral shifts.

Overall, the magnitude and consistency of results across invasive and gender-specific preventive services (e.g., colonoscopy, mammogram, Pap test) suggest that the presence of refugees in the past reshaped local attitudes toward preventive care, early detection, and long-term health maintenance. These effects are not uniform across all services, indicating that where medical behavior is more voluntary or preference-sensitive, the long-run impact of cultural transmission of health norms is more visible.

Table 3: Benchmark analysis: Prevention Services and Refugee Share

	(1)	(2)	(3)	(4)	(5)	(6)
	Ordered Logit	Ordered Logit	Ordered Logit	Ordered Logit	Ordered Logit	Ordered Logit
	Last flu vaccination	Last blood pressure measurement by a healthcare professional	Last blood cholesterol measurement by a healthcare professional	Last colonoscopy	Last mammogram	Last Pap test
Refugee Share	4.875** (2.293)	-2.974 (2.129)	-0.435 (2.151)	11.53*** (2.844)	5.324** (2.571)	6.488** (2.544)
Observations	7,803	7,822	7,829	7,725	4,118	4,101
Nuts 2 Controls	Yes	Yes	Yes	Yes	Yes	Yes
Nuts 1 Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Robust SE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: This table establishes the effect of refugee share on the use of prevention services of native population in Nuts 2 Greek regions. The analysis controls for the age and age squared, gender, educational attainment, employment status, death rate, citizenship, place of birth and residence as well as Nuts 1 fixed effects. Robust standard errors are shown in parenthesis. *** denotes statistical significance at 1% level, ** at 5% level, and * at 10% confidence level.

Table 4 presents the benchmark analysis of how the historical share of refugees is associated with contemporary physical activity patterns in Greece. The results suggest that the refugee legacy manifests not only in healthcare utilization and

preventive care but also in health-conscious behavior related to physical exercise. Out of the five indicators of physical activity, three show statistically significant and positive associations with refugee share.

The most striking result is in column (4), which captures the time spent riding a bicycle to reach destinations. The coefficient of 19.25 is both large and statistically significant, implying that individuals in regions with a higher refugee share in 1928 are considerably more likely to engage in extended durations of biking. Since biking involves higher effort and often requires either infrastructure or cultural acceptance, this result indicates a persistent norm of active mobility. Similarly, in column (2), the time spent walking to reach places is also positively associated with refugee share, suggesting that individuals in historically refugee-dense areas spend more time walking during the day, which reflects a lifestyle of physical engagement embedded in routine activities. The fifth column shows that engagement in sports, exercise, or recreational activities for at least 10 minutes to the point of shortness of breath also increases significantly with refugee share, further reinforcing the argument that historical exposure to adversity may have instilled a lasting norm of physical self-care and resilience.

Interestingly, columns (1) and (3), which reflect more basic or habitual measures of activity, such as frequency of walking or days of bike usage, do not show statistically significant associations. This suggests that it is not merely the frequency of light activity, but the intensity or duration of activity that distinguishes health behavior in refugee legacy regions. One possible interpretation is that descendants in these regions are not simply more active in a routine sense, but may have internalized stronger norms about purposeful or health-oriented exercise, consistent with a cultural shift toward valuing physical well-being.

In terms of interpretation, considering all columns, a 10 percentage point increase in the refugee share, say, from 10% to 20%, is associated with large and meaningful changes in contemporary physical activity outcomes. For instance, such an increase corresponds to a substantial rise in the likelihood that individuals engage in longer durations of walking or biking, and more vigorous forms of exercise such as sports or recreational physical activity that induce shortness of breath. Specifically, this increase predicts roughly a 10–20 percentage point higher probability of engaging in these more demanding activities, depending on the outcome. These magnitudes suggest that the refugee legacy is not limited to occasional or light movement, but extends to consistent and effortful physical activity, indicating a deeper cultural embedding of health-oriented routines linked to the historical experience of forced displacement.

Together, the findings in Table 4 provide further evidence that past displacement shaped regional differences in health behavior, extending beyond medical service use into everyday lifestyle choices. These differences may reflect a form of adaptive cultural transmission, where physical activity became both a survival strategy and a means of self-preservation in challenging post-displacement environments. The fact that effects are stronger for more demanding forms of activity supports the view that self-discipline and resilience may have become ingrained health norms in refugee-dense regions.

Table 4: Benchmark analysis: Physical Activity and Refugee Share

	(1)	(2)	(3)	(4)	(5)
	Ordered Logit	Ordered Logit	Ordered Logit	Ordered Logit	Ordered Logit
	Days in a typical week you walk continuously for at least 10 minutes to get somewhere and/or back	Time you walk to get somewhere and/or back during the day	Days in a typical week you ride a bike continuously for at least 10 minutes to get somewhere and/or back	Time you ride a bike to get somewhere and/or back during the day	Days in a typical week you engage in sports, exercise or recreational exercises continuously for at least 10 minutes, resulting in at least shortness of breath
Refugee Share	-0.105 (1.826)	7.637*** (2.360)	4.802 (3.151)	19.25*** (6.273)	7.267*** (2.444)
Observations	7,767	6,161	7,815	815	7,809
Nuts 2 Controls	Yes	Yes	Yes	Yes	Yes
Nuts 1 Fixed Effects	Yes	Yes	Yes	Yes	Yes
Robust SE	Yes	Yes	Yes	Yes	Yes

Notes: This table establishes the effect of refugee share on the physical activity of native population in Nuts 2 Greek regions. The analysis controls for the age and age squared, gender, educational attainment, employment status, death rate, citizenship, place of birth and residence as well as Nuts 1 fixed effects. Robust standard errors are shown in parenthesis. *** denotes statistical significance at 1% level, ** at 5% level, and * at 10% confidence level.

Table 5 investigates whether historical exposure to refugee inflows influences present-day dietary habits. The findings suggest that some aspects of healthy eating, particularly related to the frequency of fruit and vegetable consumption, are positively and significantly associated with the historical refugee share. In column (1), the refugee share exhibits a strong and statistically significant effect on the frequency of fruit consumption, suggesting that individuals in regions with higher refugee concentrations are more likely to consume fruit more regularly. Similarly, column (3) shows a positive and significant coefficient (5.323), indicating more frequent consumption of vegetables or salad in those regions. These patterns imply that regions with higher historical refugee presence have developed dietary norms that emphasize routine consumption of fresh produce, possibly passed down intergenerationally as part of broader health-conscious behavior.

By contrast, the coefficients in columns (2), (4), and (5), which capture quantity of consumption and juice intake, are positive but not statistically significant. This distinction suggests that the observed effects pertain more to frequency rather than volume, meaning that individuals in refugee legacy regions are more likely to maintain regular habits of eating fruits and vegetables rather than consuming large quantities at once. Moreover, the lack of significance for natural juice consumption (column 5) may indicate that the behavior transmitted over time is more traditional and less processed, consistent with historical access to raw, unprocessed food rather than packaged alternatives.

In terms of how sizeable the effect is, a 10-percentage point increase in the historical refugee share is associated with a sizeable shift in present-day dietary behavior, particularly in the frequency of consuming fruits and vegetables. Based on the ordered logit estimates in columns (1) and (3), such an increase predicts approximately a 10–15 percentage point higher probability that individuals consume fruits and vegetables more frequently in their weekly diets. These effects are notable given that they pertain to everyday choices, suggesting that dietary discipline became

culturally embedded in refugee legacy regions. Importantly, the fact that frequency rather than quantity is affected implies that what was transmitted intergenerationally may be a norm of routine, balanced eating, likely shaped by past conditions of resource scarcity, where regular access to small portions of unprocessed food was key to survival. This behavioral legacy highlights how historical shocks can influence even subtle dimensions of modern health behavior, such as eating patterns.

Overall, the results in Table 5 point to the possibility that refugee populations introduced or reinforced dietary patterns centered on simple, frequent consumption of fresh products. Such practices may have originated as coping strategies under conditions of scarcity and limited medical access, where self-care through nutrition became an essential survival strategy. Over time, these habits could have solidified into cultural norms, helping explain the regional variation in dietary patterns observed nearly a century later. These findings add yet another dimension to the evidence that past displacement influenced not only institutional and economic outcomes but also deeply embedded aspects of daily health behavior.

Table 5: Benchmark analysis: Healthy Eating Habits and Refugee Share

	(1)	(2)	(3)	(4)	(5)
	Ordered Logit	Ordered Logit	Ordered Logit	Ordered Logit	Ordered Logit
	Frequency of fruit consumption	Servings of fruit consumed daily	Frequency of vegetable or salad consumption	Servings of vegetables or salad consumed daily	Frequency of consumption of 100% natural fruit or vegetable juices
Refugee Share	8.707*** (1.681)	2.488 (2.730)	5.323*** (1.666)	1.062 (2.675)	-0.970 (1.618)
Observations	7,840	3,807	7,847	4,044	7,821
Nuts 2 Controls	Yes	Yes	Yes	Yes	Yes
Nuts 1 Fixed Effects	Yes	Yes	Yes	Yes	Yes
Robust SE	Yes	Yes	Yes	Yes	Yes

Notes: This table establishes the effect of refugee share on healthy eating habits of native population in Nuts 2 Greek regions. The analysis controls for the age and age squared, gender, educational attainment, employment status, death rate, citizenship, place of birth and residence as well as Nuts 1 fixed effects. Robust standard errors are shown in parenthesis. *** denotes statistical significance at 1% level, ** at 5% level, and * at 10% confidence level.

7. Discussion

To assess the robustness of our baseline findings, we conduct two complementary exercises. First, we exclude the NUTS 2 region of Attica, Greece's most populous area and primary destination of internal migration throughout the 20th century, to ensure that our results are not driven by the exceptional demographic dynamics of the capital region. Second, we explore whether the relationship between historical refugee settlement and present-day health behaviors varies with age. By introducing sequential age thresholds (50, 70, and 80 years) and interacting them with refugee share, we examine whether individuals who are more likely to have direct or familial ties to the refugee population exhibit different patterns of health-related behavior. Both exercises affirm the consistency and strength of our core results.

7.1 Excluding the NUTS 2 Region of Attica

To assess the robustness of our main findings, we re-estimate our benchmark specification after excluding the NUTS 2 region of Attica from the sample. This region represents the country's largest urban area and a key destination for internal migration throughout the 20th century. Given the scale of population movements toward Attica in the decades following the refugee influx, there is a legitimate concern that internal mobility may have diluted the long-run effects of historical refugee settlement in that area. Removing Attica allows us to isolate whether the patterns we observe are driven by broader regional dynamics or remain consistent even outside the country's principal urban hub.

Figure A8 in the Appendix presents the results of this robustness exercise. The evidence indicates that the association between historical refugee share and contemporary use of health services not only persists but becomes even more pronounced. In four out of six outcome variables, the coefficient on refugee share remains positive and statistically significant, compared to four significant associations in the baseline estimates that included Attica. This suggests that the refugee legacy is not merely an urban phenomenon but rather a broader regional pattern.

Specifically, the refugee share continues to be a strong predictor of whether individuals report recent contact with general doctors or specialists, visits to physiotherapists or mental health professionals. The magnitudes of these effects are also notable: for example, the estimated coefficient for general practitioner visits remains above 10, indicating a substantial increase in the likelihood of such visits with higher refugee shares. The coefficient for mental health visits remains particularly large, reinforcing our earlier conclusion that the refugee legacy may have shaped norms around both physical and psychological care.

The only outcomes that remain uncorrelated with refugee share is the number of general practitioner visits in the last four weeks and use of care (nursing or other) home services. As in the main results, this may reflect the more transient or short-term nature of this variable, which is less likely to capture deep-rooted behavioral patterns shaped by intergenerational transmission.

Overall, excluding Attica strengthens the case that the observed health behavior differences are not an artifact of urban bias or internal migration patterns. Rather, they appear to reflect enduring regional differences linked to historical refugee settlement patterns that persist even in less mobile or more rural populations.

The findings for prevention services remain robust and consistent when we exclude the NUTS 2 region of Attica, both qualitatively and quantitatively. As shown in Figure A9 in the Appendix, refugee share continues to be positively and significantly associated with the use of key preventive health services. Specifically, individuals residing in regions with higher historical refugee concentrations are more likely to have recently received a flu vaccination, undergone a colonoscopy, a mammogram, or a Pap test. These associations are not only statistically significant but also substantively large: a 10 percentage point increase in refugee share is associated with a 7–12 percentage point increase in the likelihood of having engaged in each of these preventive actions, depending on the outcome.

The fact that these patterns hold even when excluding Attica, Greece's most urbanized and demographically mobile region, strengthens the interpretation that these behaviors reflect durable regional norms rather than urban access effects. In particular, the colonoscopy result continues to stand out with a sizeable coefficient,

reinforcing our interpretation that refugee legacies may have promoted proactive health-seeking behavior and a strong orientation toward preventive care. In contrast, measures such as blood pressure and cholesterol checks remain statistically insignificant, mirroring the baseline results and confirming that not all forms of prevention are equally shaped by historical displacement.

Taken together, the robustness of these results underscores the long-term influence of refugee settlement on ingrained health habits. It suggests that preventive care became a socially transmitted strategy of self-preservation in refugee-dense regions, likely shaped by past adversity and limited access to curative medicine during the resettlement period.

Moreover, the evidence on physical activity remains robust both quantitatively and qualitatively when the Attica region is excluded from the analysis. The positive associations between refugee share in the 1920s and present-day physical activity patterns persist across key indicators. As shown in Figure A10 in the Appendix, individuals residing in regions with historically higher refugee populations continue to show significantly greater likelihood of walking, biking, and engaging in sports or exercise activities. The coefficients are not only statistically significant but also substantial in magnitude. For example, the coefficient for time spent biking during the day (column 4 in the previous table) remains above 19, indicating that a 10 percentage point increase in refugee share is associated with nearly a two-category shift in biking frequency (e.g., from ‘occasionally’ to ‘frequently’). Likewise, the refugee share predicts a 7–8 percentage point increase in engagement with structured or effortful physical activities such as exercise and sports.

These sizable effects reinforce the argument that descendants in refugee-dense regions have internalized a norm of physical self-discipline and resilience, which continues to manifest in their daily routines. The findings also suggest that the relationship is not confined to light or passive activity, but extends to more structured or demanding forms of movement, indicating a deeper cultural transmission of health-conscious behavior. The persistence of these patterns after removing Attica, a region historically marked by high population mobility and urban sprawl, confirms that these associations are not driven by outlier regions but reflect widespread, long-term behavioral imprints tied to the legacy of displacement.

Furthermore, the results concerning healthy eating habits remain consistent both qualitatively and quantitatively when the NUTS 2 region of Attica is excluded from the analysis. As shown in Figure A11 in the Appendix, the historical share of refugees continues to be positively and significantly associated with the frequency of fruit and vegetable or salad consumption. The coefficient on fruit consumption remains large, around 8.7, implying that a 10 percentage point increase in refugee share is associated with a considerable increase in the probability that individuals frequently consume fruit. Similarly, the frequency of vegetable or salad consumption shows a robust positive effect, indicating that such dietary norms are deeply rooted and not dependent on specific regions like Attica. These magnitudes are substantial, reflecting a shift of roughly one full category in the ordered response scale (e.g., from ‘occasionally’ to ‘almost every day’), suggesting meaningful behavioral differences.

By contrast, the effects on quantity-related measures, such as servings consumed daily, and on the consumption of natural juices remain statistically insignificant, replicating the pattern observed in the full-sample analysis. This

reinforces the interpretation that refugee legacy regions are more likely to adopt frequent and routine healthy eating habits, rather than consuming large volumes or processed food.

Overall, the robustness of these findings to the exclusion of Attica, the primary destination of internal migration throughout the 20th century, strengthens the credibility of our results. It confirms that the patterns we document are not driven by the population redistribution that occurred after the refugee influx, but reflect persistent, spatially embedded health behaviors rooted in historical displacement and adaptation.

7.2 Age dummies as interaction terms with refugee share

We now turn to an exploration of heterogeneity by age to assess whether the effect of historical refugee presence on health-related behaviors varies across different age groups. The motivation behind this analysis is that the association between the 1920s refugee share and present-day health behaviors might differ depending on whether individuals were born closer to the post-displacement period, potentially reflecting stronger intergenerational transmission of norms or greater exposure to the immediate consequences of displacement. To examine this, we sequentially introduce dummy variables indicating whether an individual was aged 50, 70, or 80 or older at the time of the 2019 health survey, and interact these with the regional refugee share.

7.2.1 Heterogeneous Effects by Age: Individuals Aged 50 and Above

To investigate whether the effects of historical refugee presence on health-related behaviors vary across age groups, we conduct a heterogeneity analysis by introducing a dummy variable indicating whether an individual is aged 50 or older at the time of the health survey (i.e., born in or before 1969). This age threshold is intended to capture potential generational differences in the intergenerational transmission of norms, as older individuals may be closer, either directly or through their immediate family, to the historical period of refugee resettlement. We interact this age dummy with the refugee share variable and assess its effect across four health behavior domains: use of health services, prevention services, physical activity, and healthy eating.

The results reveal no heterogeneity with respect to age, since the age dummies are always insignificant (Figure A12 in the Appendix). In terms of health service utilization, the age dummy itself does not significantly affect outcomes, except for a marginal increase in visits to physiotherapists and related professionals, an expected result given age-related mobility concerns. The interaction terms between the refugee share and the age dummy remain qualitatively and quantitatively consistent with the baseline estimates, suggesting that the legacy effects of refugee presence on service use do not differ meaningfully by age.

A similar pattern is observed for preventive services (Figure A13 in the Appendix) as the age dummy only does not seem to confer any statistically significant effect. The interaction terms are mostly similar to the baseline coefficients, indicating that the association between refugee share and preventive care behaviors holds uniformly across the age spectrum.

Regarding physical activity (Figure A14 in the Appendix), the age dummy slightly raises the number of days individuals walk, which aligns with expected age-related routines, but it has no impact on other activity types. Crucially, the interaction terms are stable and similar in magnitude and significance to the original refugee share estimates, indicating no significant age-based variation in the link between refugee legacy and physical engagement.

Finally, in the domain of healthy eating (Figure A15 in the Appendix), the age dummy does not show any meaningful effect. The refugee share continues to exhibit a strong and significant association with the frequency of fruit and vegetable consumption, and this relationship is unchanged when accounting for age.

7.2.2 Heterogeneous Effects by Age: Individuals Aged 70 and Above

Introducing an age dummy for individuals aged 70 or older, those likely to be first- or second-generation refugees, yields results that closely mirror the baseline estimates. The dummy variable itself does not significantly affect health service usage, preventive care, physical activity, or dietary habits. Likewise, the interaction terms between refugee share and age are consistently similar to the baseline coefficients in both sign and magnitude across all outcomes, with only a marginal increase in the likelihood of visiting mobility-related health professionals. Overall, these findings suggest that the observed long-term effects of refugee settlement on health-related behaviors are not driven by the oldest segments of the population but are instead stable across age cohorts, reinforcing the idea of persistent, intergenerational transmission of norms (Figures A16-A19 in the Appendix).

7.2.3 Heterogeneous Effects by Age: Individuals Aged 80 and Above

Finally, we consider individuals aged 80 or above at the time of the health survey, those most likely belonging to the first generation directly exposed to the 1920s refugee inflow. Similar to the previous thresholds, the age dummy itself has very limited impact as it does not significantly influence the use of health services. In the domain of prevention, it slightly increases the probability of undergoing a mammogram or Pap test, while marginally decreasing the likelihood of receiving a flu vaccination or colonoscopy. Regarding physical activity, being 80 years or older is associated with a small reduction in walking frequency, likely due to age-related mobility constraints. Eating habits are also affected, with marginal reduction in fruit consumption. Importantly, in all four dimensions, health services, prevention, physical activity, and diet, the interaction terms between refugee share and the age dummy remain qualitatively and quantitatively close to the baseline coefficients. These results reinforce the robustness of our findings and suggest that the positive relationship between refugee presence in the 1920s and contemporary health-related behaviors persists uniformly across age groups, even among the very elderly (Figures A20-A23 in the Appendix).

Overall, the heterogeneity analysis suggests that the influence of historical refugee exposure on contemporary health behaviors is remarkably stable across age groups. The persistence of these associations across both younger and older individuals implies that the norms introduced or reinforced by refugee populations

have been broadly transmitted within regions, shaping behavioral patterns in a way that transcends specific age cohorts.

8. Potential Mechanisms

To understand why the refugee share in the 1920s continues to predict contemporary health behaviors nearly a century later, this section explores the underlying mechanisms that may have driven this persistence. We focus on four mutually reinforcing pathways through which the refugee experience likely shaped local health norms and practices: (i) human capital investment, particularly in education, as a tool of upward mobility; (ii) the traumatic exposure to adverse health conditions upon arrival; (iii) public health infrastructure investments catalyzed by the refugee crisis; and (iv) cultural and behavioral diffusion through intergroup contact. Each of these mechanisms may have contributed to the intergenerational transmission of health-conscious norms and behaviors, helping explain the lasting regional imprint of forced displacement in Greece.

8.1 The Channel of Education

One plausible mechanism through which the legacy of forced displacement has influenced contemporary health behaviors is through improved education outcomes, which are known to foster greater engagement in health-conscious practices. A rich body of research shows that health is shaped by a wide range of social determinants over the life course and across generations, including income, education, employment, and broader socioeconomic conditions ([Marmot and Wilkinson, 2005](#); [Adler and Newman, 2002](#)). Individuals with higher levels of education and more stable employment are more likely to enjoy better health, partly due to their enhanced access to health information, medical services, and preventive care ([Cutler and Lleras-Muney, 2006](#)). In contrast, poverty and low educational attainment correlate with worse health outcomes, increased exposure to risk factors, and lower use of healthcare services. These inequalities tend to be persistent and are often reproduced across generations, as health-related advantages are transmitted through economic, educational, and social channels.

In our case, historical evidence suggests that the refugee population arriving in Greece in the early 1920s had on average higher levels of education compared to the native population, particularly in urban areas. Despite facing initial hardship, these communities placed significant value on human capital, which likely facilitated their economic and social integration over time.

Until the major reform of 1929, the Greek education system remained largely centralized, theoretical, and disconnected from the labor market ([Kalafati, 1988](#)). While Ioannis Kapodistrias had laid the groundwork for a more vocationally oriented system in the early 19th century, subsequent administrations shifted focus toward a classical curriculum using archaic language, aiming to prepare students for higher education rather than professional life. This system disproportionately benefited urban elites, leaving much of the rural and female population underserved. Access to education was further constrained by local funding mechanisms and the geographic dispersion of schools. In the late 19th century, over 76% of the population lived in settlements with fewer than 2,000 inhabitants, and 70% of these settlements had no

school (Kalafati, 1988). Gender disparities were stark: in 1870, 28.7% of men were literate compared to only 6.3% of women. By 1907, school attendance reached 75% for boys but only 33% for girls, with female education mainly concentrated in urban areas like Attica, Siros, and Corfu, where private or missionary-led schools were more accessible (Kalafati, 1988; Stefanidis, 2006). Despite the 1913 mandate for universal primary education, literacy in 1920 was still only 27.4% for women and 56.2% for men (Kalafati, 1988).

Refugees arriving after the Asia Minor catastrophe (1922–1924) brought with them relatively high levels of educational attainment, especially among women. Drawing on traditions from urban, cosmopolitan centers like Smyrna and Constantinople, where education was often organized along Western and missionary lines, refugee communities exhibited stronger literacy outcomes than the native population. According to 1928 data (see e.g., Maps A1 and A2 in the Appendix), literacy rates for refugee and native males were similar (63.5% vs. 60.9%), but refugee women were significantly more literate (40.5%) than native women (32.2%) (see also Kalafati, 1988). This initial educational advantage not only facilitated their integration into Greek society but also appears to have shaped long-term outcomes, including investments in human capital across generations. This aligns with recent literature showing that forced migrants often display greater emphasis on educational mobility as a means of socioeconomic advancement (Akbulut-Yuksel, 2014; Becker et al., 2020). Such patterns may help explain the enduring differences in health-conscious behavior observed in regions with historically high refugee concentrations.

This is consistent with broader findings from the literature showing that forcibly displaced populations often exhibit high levels of resilience and strong preferences for investing in education, particularly as a strategy for upward mobility and long-term security. For instance, Becker et al. (2020) document that post-WWII refugees in Eastern Europe displayed higher educational attainment over time, while Akresh and de Walque (2008) find that displacement during the Rwandan genocide led to increased schooling among refugee children. These long-term investments in human capital can have cascading effects, not only improving economic outcomes but also embedding norms of self-care, forward-looking behavior, and responsible health practices that are observable generations later.

8.2 The Channel of Adverse Health Conditions Upon Arrival

A central mechanism through which the legacy of the 1922–1924 refugee influx may have shaped contemporary health behavior is the initial exposure of refugees to adverse health conditions upon their arrival. Historical evidence suggests that the refugee population faced dire sanitary conditions, limited access to clean water, overcrowding, food shortages, and outbreaks of infectious diseases. These conditions created an environment where health vulnerabilities were acute and immediate survival often depended on adopting proactive health and hygiene practices.

According to archival records and contemporaneous accounts, the first years following resettlement were marked by widespread illness, including malaria, tuberculosis, and typhoid, as well as high infant and maternal mortality rates. Refugees were settled in makeshift camps, abandoned military barracks, and

overcrowded urban neighborhoods, especially in port cities like Thessaloniki and Piraeus. The Greek state, overwhelmed by the scale of the crisis, struggled to provide adequate healthcare infrastructure, leading many refugees to develop their own informal systems of care, mutual assistance, and emphasis on preventive hygiene (Hirschon, 1989; Pentzopoulos, 2021). Figures A24-A29 in the Appendix correlate average deaths and average deaths by main diseases with the refugee share in the region. Though clearly not illustrating a causal effect, they suggest a strong positive correlation.

This prolonged experience of health-related insecurity likely had long-lasting cultural and behavioral consequences. First-generation refugees, having internalized the importance of health vigilance, may have transmitted these values intergenerationally. Such transmission could occur through everyday practices, dietary norms, frequent health checkups, or heightened sensitivity to symptoms. In contexts of trauma, literature shows that coping strategies often become embedded in group identity and persist beyond the resolution of the original crisis (Bisin and Verdier, 2001; Almond et al., 2009).

Therefore, the adverse health conditions during the early refugee experience may have acted as a formative shock, fostering a cultural norm of health-consciousness that became rooted in family life and passed down to successive generations. This would help explain the persistent patterns observed in our data: higher rates of preventive care usage, more frequent engagement with health services, and stronger habits related to physical activity and nutrition in historically refugee-dense areas. Rather than a short-term adaptation, these behaviors may represent an adaptive response to trauma, one that has been culturally transmitted over the past century.

8.3 The Channel of Public Infrastructure Development

A key mechanism through which the refugee inflow of the 1920s may have shaped long-term health behaviors and outcomes is the large-scale development of public health infrastructure that followed their arrival. The arrival of over 1.2 million refugees from Asia Minor placed enormous pressure on the Greek state, which was already struggling with limited institutional capacity and resources. Faced with a severe public health crisis, the Greek governments created institutions capable of ensuring a minimum standard of health for the population. Addressing the crisis required measures that went beyond the refugee population and encompassed the entire society, as the massive settlement of Asia Minor refugees had intensified pre-existing health and sanitation problems, raising fears of epidemics and social unrest. In response to the humanitarian crisis, the Greek government, supported heavily by international organizations such as the League of Nations and the Refugee Settlement Commission (RSC), embarked on an ambitious program of public investment in health, housing, and sanitation. Hospitals, municipal doctors, and charity clinics formed the main framework of care, with the addition of “refugee doctors” who provided medical services within the new settlements (Metalinos, 1932). Widespread drainage and quinine distribution programs were developed, particularly in Macedonia and Thessaly, where many refugees were resettled. The Refugee Settlement Commission (RSC) conducted vaccination campaigns, and malaria control programs (RSC, 1929). These interventions concerned both rural and urban areas. New hospitals, clinics,

public health dispensaries, and maternity centers were constructed, often for the first time in previously underserved regions. Simultaneously, major efforts were undertaken to develop basic sanitation systems, such as clean water supply, sewage networks, and waste disposal facilities, essential for containing the spread of infectious diseases that had become rampant in densely populated refugee neighborhoods ([Kontogiorgi, 2006](#); [Mazower, 2000](#)).

While these investments were originally designed to address the immediate needs of the refugee population, their impact extended far beyond the emergency response phase. Once established, this infrastructure became accessible to the broader population, including native Greeks living in or near refugee-dense regions. Over time, this resulted in more equitable access to health services and improvements in the overall standard of public health provision. The legacy of these early investments may have contributed to the development of localized cultures of healthcare access and preventive service usage that persist to this day.

Furthermore, the initial presence of institutional actors like the League of Nations helped shape governance models and introduced international best practices in health planning and disease control. The early establishment of localized healthcare hubs also created employment opportunities and cultivated medical expertise in areas that had previously lacked such facilities.

In this context, the long-term effects we observe, such as higher rates of medical consultation, preventive screening, and health-conscious behavior in regions with a high historical share of refugees, may in part be attributable to the lasting footprint of these public infrastructure investments. The refugee crisis thus acted not only as a demographic shock, but also as a catalyst for institutional modernization and infrastructure expansion, with enduring consequences for regional health behavior and access to care.

8.4 The Channel of Cultural Diffusion

Another key mechanism through which the 1920s refugee inflow may have shaped contemporary health behavior is cultural and behavioral diffusion. Refugees from Asia Minor brought with them a distinct set of practices related to hygiene, health maintenance, and diet, many of which contrasted with those of the local Greek population at the time. These included urban hygiene routines, personal cleanliness habits, and dietary patterns consistent with what is now recognized as the Mediterranean diet: frequent consumption of legumes, fresh vegetables, olive oil, and fish, as well as a culture of moderate eating and home-prepared meals ([Zografou, 2012](#); [Trichopoulou et al., 2003](#)).

Historical and ethnographic accounts emphasize how Asia Minor refugee women were often referred to as *παστρικές*, i.e., a colloquial term denoting exceptional cleanliness and domestic orderliness ([Alexandris, 1992](#)). This reflected both their urban background and a heightened concern for hygiene that was reinforced by the need to maintain health in overcrowded or unsanitary refugee housing. For many refugees, personal and environmental hygiene became a form of survival strategy in the face of limited medical access and public health threats ([Hirschon, 1989](#)).

Over time, these behaviors likely diffused into the broader native population through sustained social interaction, cohabitation, intermarriage, and shared institutions. Refugees and hosts were not permanently segregated; rather, integration occurred at multiple levels, socially, culturally, and economically, which facilitated the transfer of practices (Hirschon, 2003). Cultural transmission, both explicit (through direct socialization) and implicit (via emulation and gradual normalization), likely contributed to embedding these norms in the everyday routines of the local population. Research in cultural economics has shown that historical shocks can lead to persistent behavioral differences across regions through such intergenerational mechanisms (Giuliano and Nunn, 2021; Spolaore and Wacziarg, 2013).

This process of diffusion may partly explain the regional variation in contemporary Greece with respect to health-related habits. Areas with a higher historical concentration of refugees continue to show stronger patterns of preventive health behavior, physical activity, and frequent consumption of fruits and vegetables. These enduring patterns are not the result of institutional differences but of social transmission and the persistence of cultural traits shaped by the early refugee experience.

In this sense, the refugee inflow of the 1920s did not only restructure the population and urban landscape of Greece, it also introduced durable behavioral norms around hygiene, diet, and self-care. These norms, shaped by both prior urban experience and adversity, have become embedded in the cultural fabric of the regions where refugees settled and continue to influence health behaviors nearly a century later.

9. Conclusions

This paper has examined the long-term effects of the 1920s forced displacement of Asia Minor refugees on contemporary health behaviors in Greece. Combining rich micro-data from the 2019 national health survey and detailed historical records on refugee settlement, we have shown that regions which received larger shares of refugees in 1922–1924 exhibit systematically different health behavior profiles nearly a century later. Specifically, individuals in these areas are more likely to use preventive health services, consult medical professionals, engage in physical activity, and maintain healthy dietary habits.

Our identification strategy rests on the largely exogenous allocation of refugees across the Greek territory, combined with extensive controls at the individual and regional levels. The findings are robust to a battery of specifications, including the exclusion of major internal migration destinations such as Attica, and are consistent across multiple outcome dimensions. Importantly, the estimated effects are not confined to older cohorts with a direct connection to the refugee generation, suggesting that behavioral norms established in the aftermath of displacement have diffused through intergenerational and community-level mechanisms.

To understand the channels behind this persistence, we have explored several possible pathways. We discussed how the educational and health investments made in refugee communities, often supported by international actors, may have laid the groundwork for improved human capital and heightened health awareness. We also highlighted the role of adverse health experiences and cultural transmission, as refugee populations brought with them distinct practices around hygiene, self-care,

and nutrition that gradually became embedded in local norms. The persistence of these behaviors underscores how past collective shocks can reshape long-term health trajectories, not only through material changes but also via the diffusion of values and habits.

Our findings contribute to a growing literature on the lasting effects of forced migration and historical trauma. Unlike most work that focuses on short- or medium-term impacts, this study provides evidence of century-long behavioral imprints, especially in domains as vital as health. From a policy perspective, the results suggest that targeted investment in human capital, even under crisis conditions, can yield enduring benefits, not just for displaced populations but for the broader host society as well. Moreover, recognizing the cultural dimension of health behavior may enhance the design of public health interventions by aligning them with historically rooted norms and practices.

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Appendix A-Plots and Figures

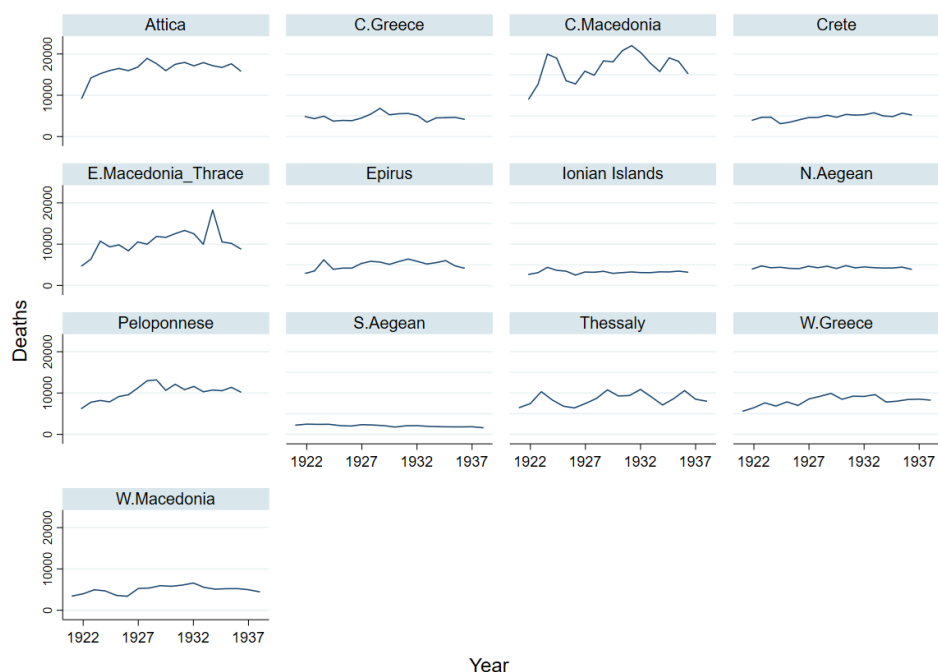


Figure A1: Yearly evolution of deaths of the total population (1921–1938) by NUTS 2 region. Source: Hellenic Statistical Authority, *Statistics of Causes of Deaths*, annual data for the years 1921–193.

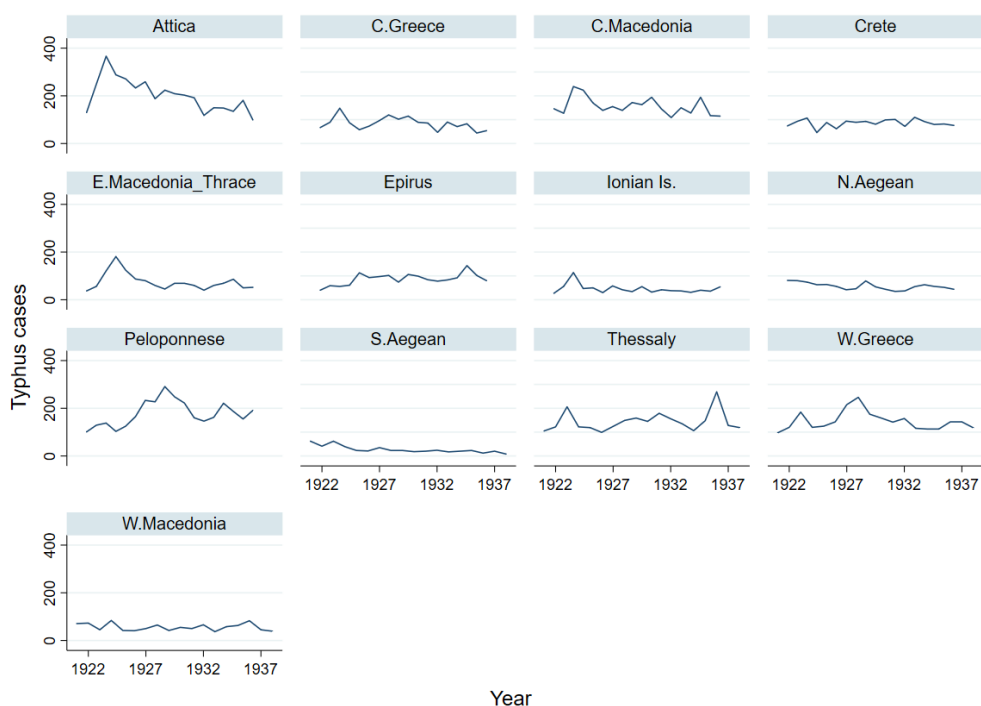


Figure A2: Yearly evolution of deaths from typhus cases in the total population (1921–1938) by NUTS 2 region. Source: Hellenic Statistical Authority, *Statistics of Causes of Deaths*, annual data for the years 1921–1938.

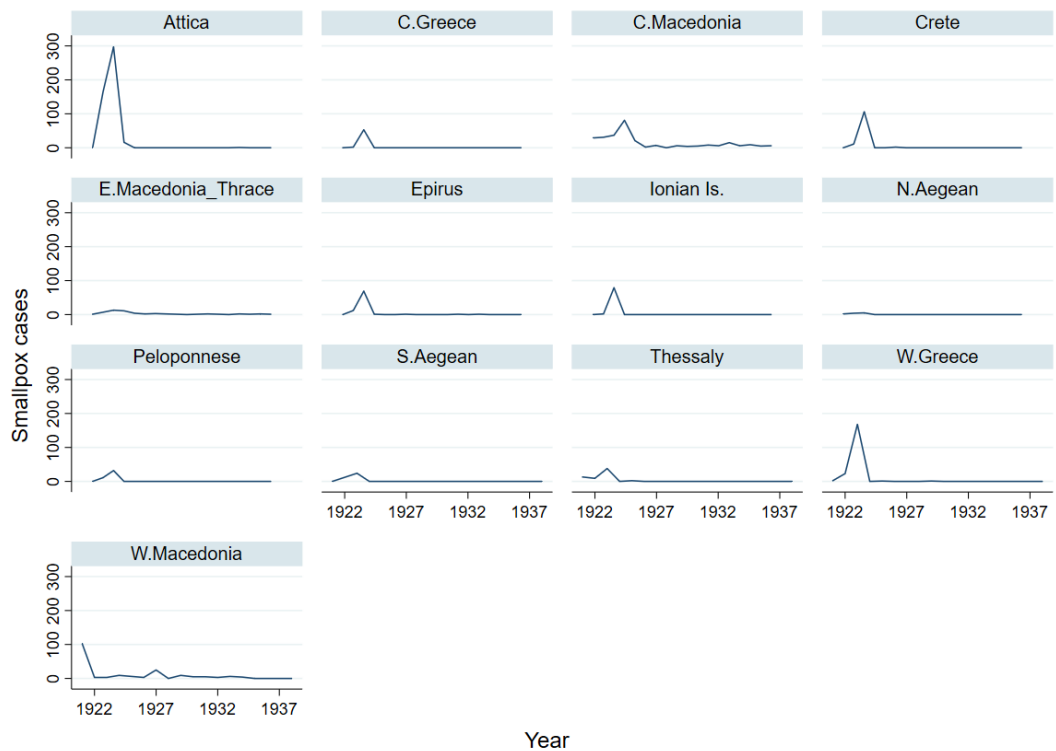


Figure A3: Yearly evolution of deaths from smallpox cases in the total population (1921–1938) by NUTS 2 region. Source: Hellenic Statistical Authority, *Statistics of Causes of Deaths*, annual data for the years 1921–1938.

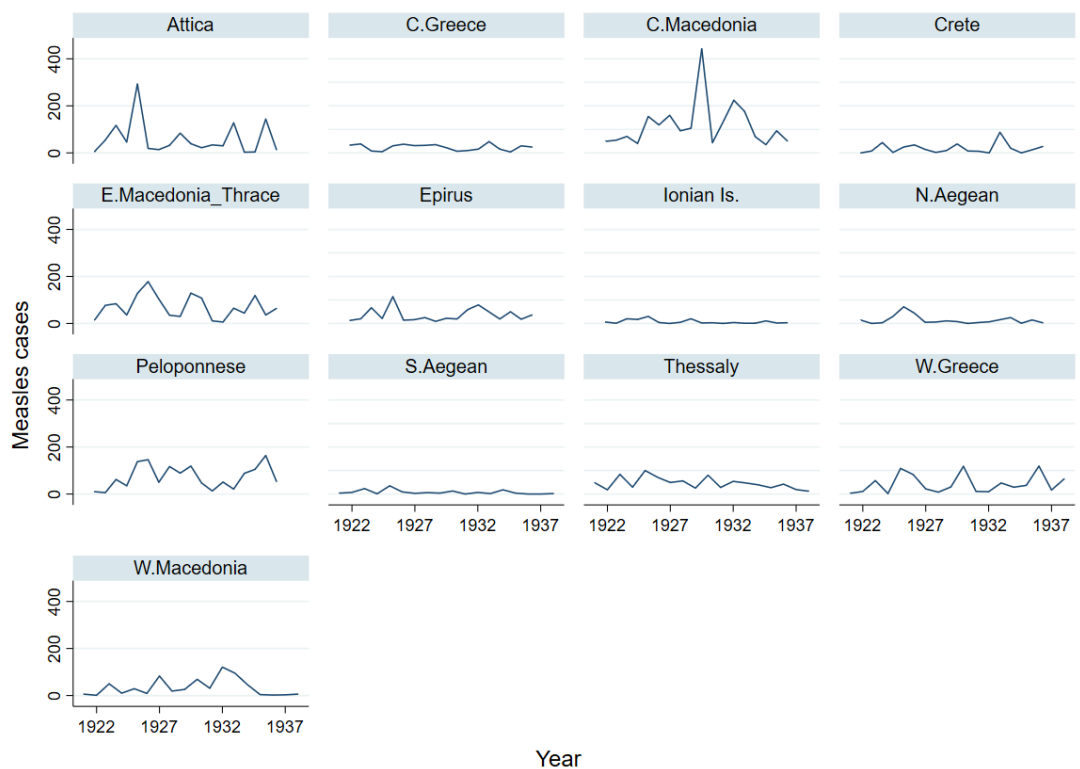


Figure A4: Yearly evolution of deaths from measles cases in the total population (1921–1938) by NUTS 2 region. Source: Hellenic Statistical Authority, *Statistics of Causes of Deaths*, annual data for the years 1921–1938.

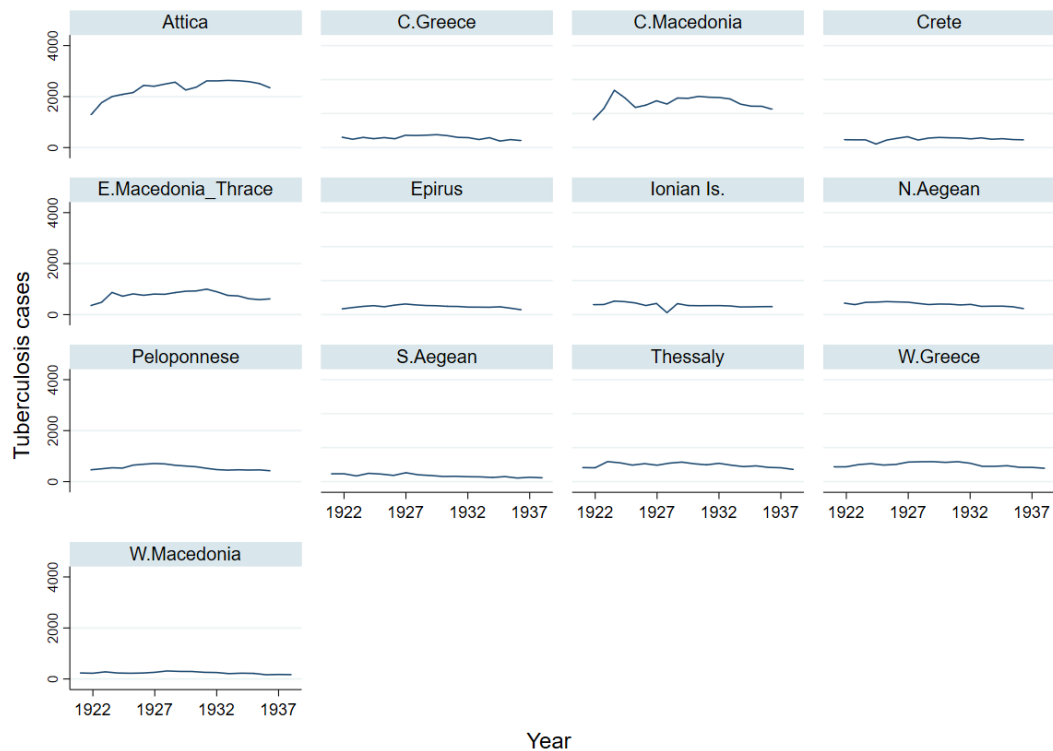


Figure A5: Yearly evolution of deaths from tuberculosis cases in the total population (1921–1938) by NUTS 2 region. Source: Hellenic Statistical Authority, *Statistics of Causes of Deaths*, annual data for the years 1921–1938.

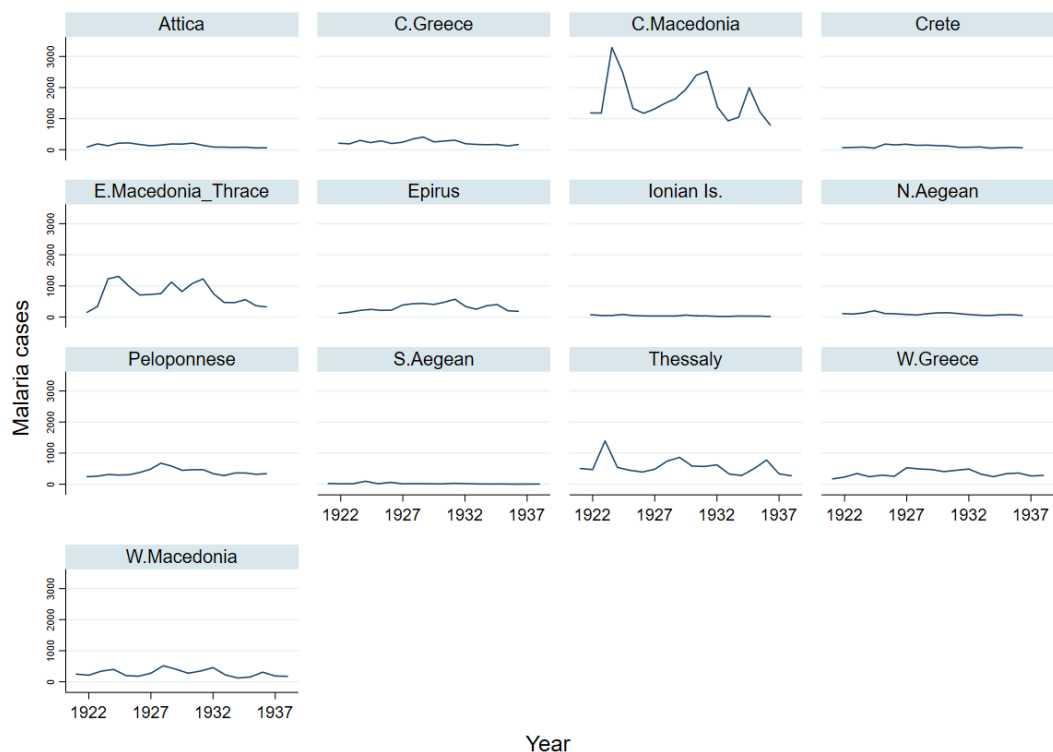


Figure A6: Yearly evolution of deaths from malaria cases in the total population (1921–1938) by NUTS 2 region. Source: Hellenic Statistical Authority, *Statistics of Causes of Deaths*, annual data for the years 1921–1938.

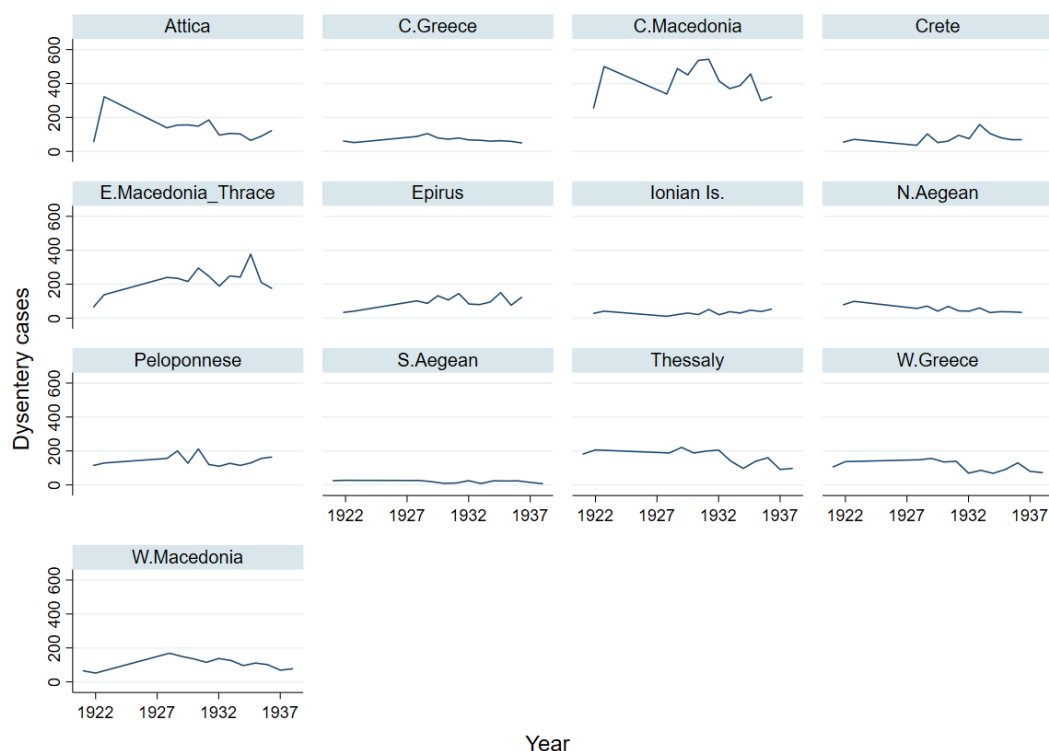


Figure A7: Yearly evolution of deaths from dysentery cases in the total population (1921–1938) by NUTS 2 region. Source: Hellenic Statistical Authority, Statistics of Causes of Deaths, annual data for the years 1921–1938.

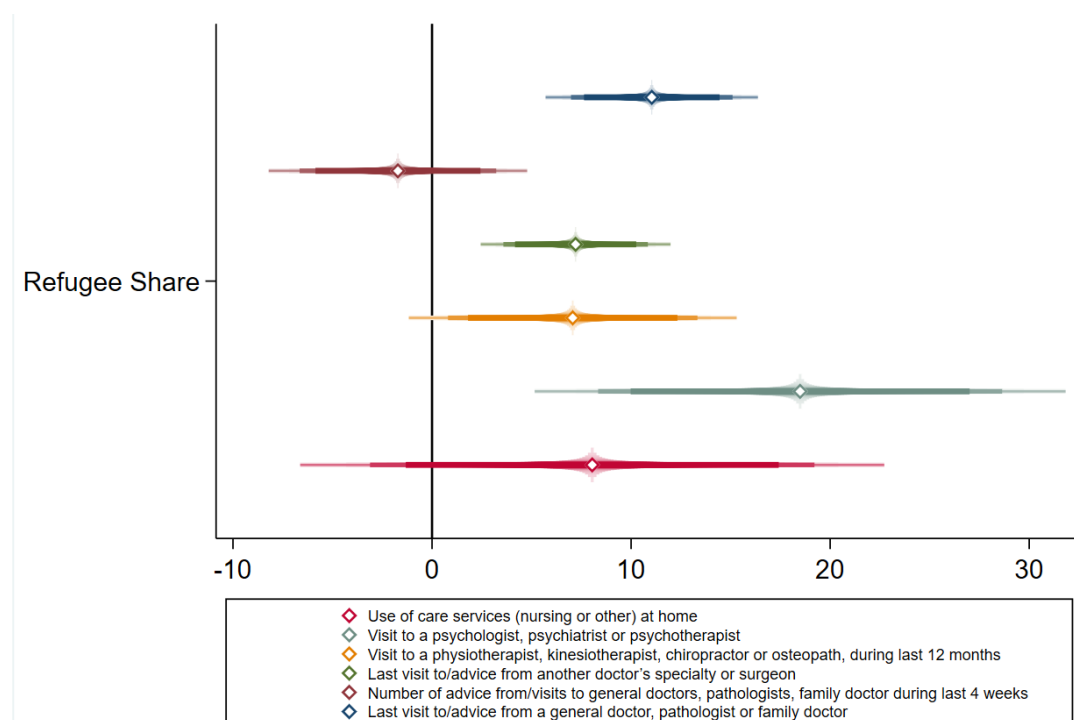


Figure A8: Use of Health Services and Refugee Share without Nuts 2 Region of Attica

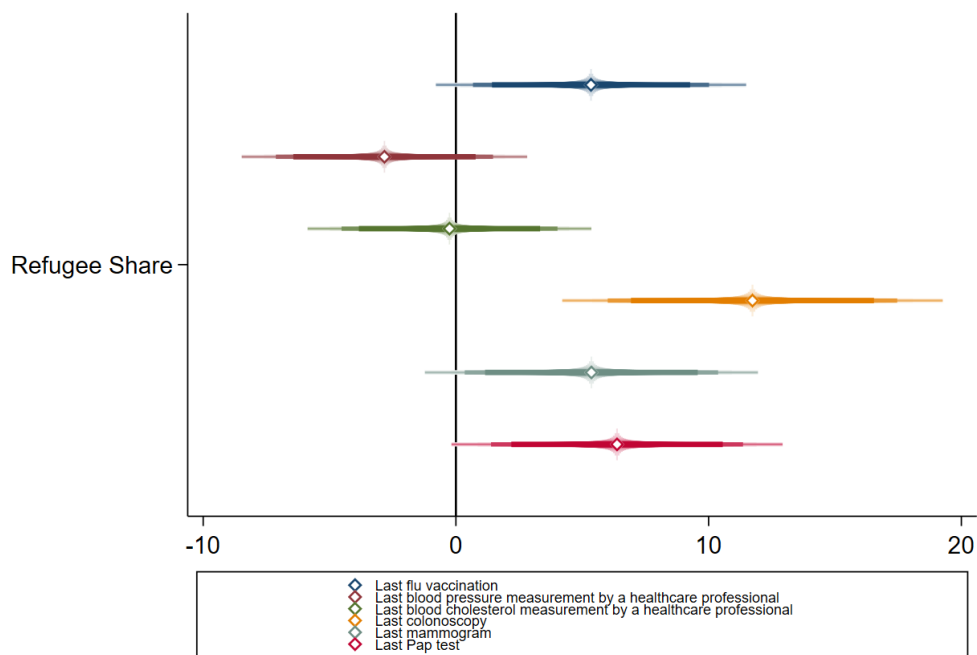


Figure A9: Prevention Services and Refugee Share without Nuts 2 Region of Attica

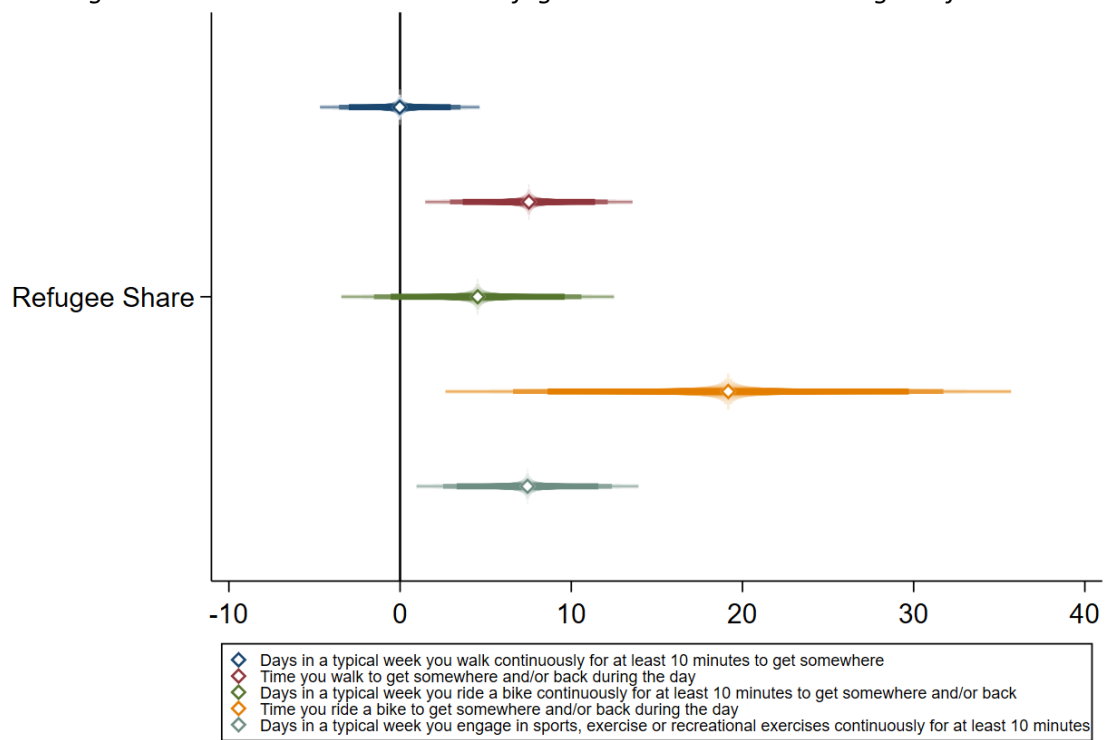


Figure A10: Physical Activity and Refugee Share without Nuts 2 Region of Attica

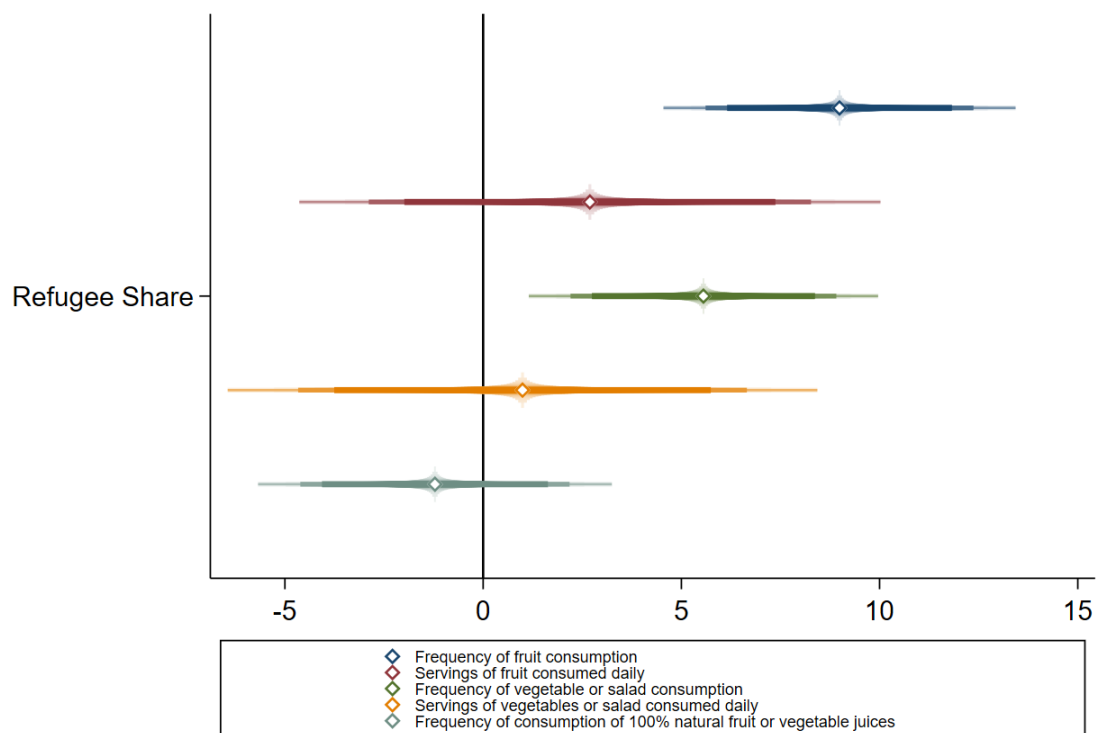


Figure A11: Healthy Eating Habits and Refugee Share without Nuts 2 Region of Attica

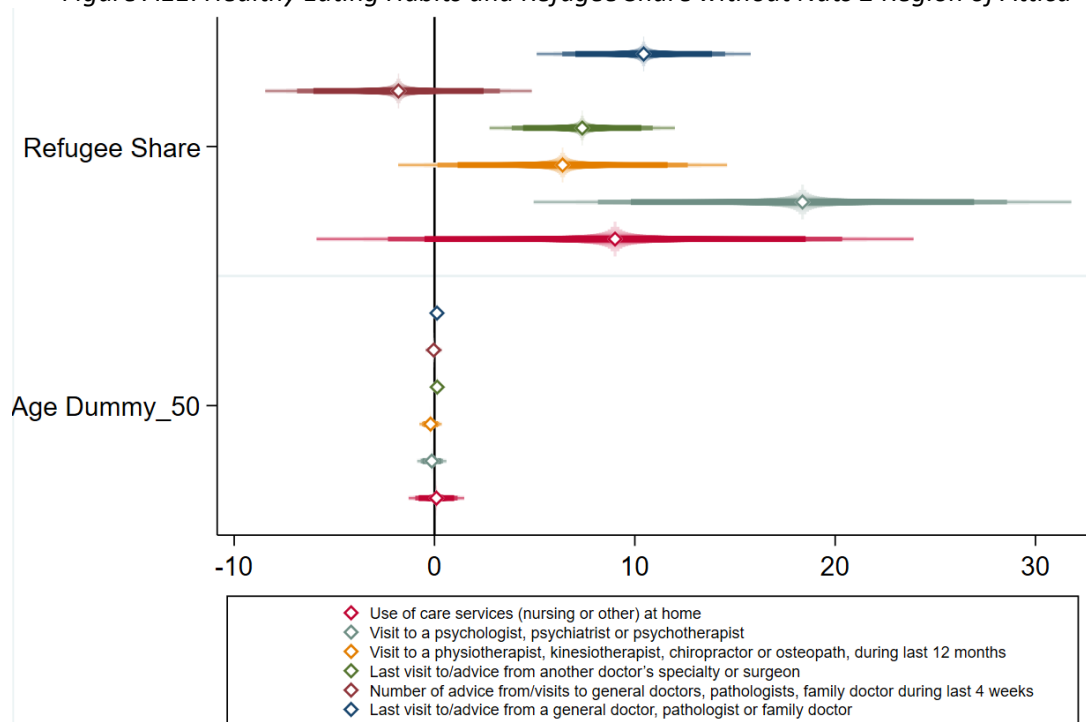


Figure A12: Use of Health Services and Refugee Share with Age Dummy 50 plus years old

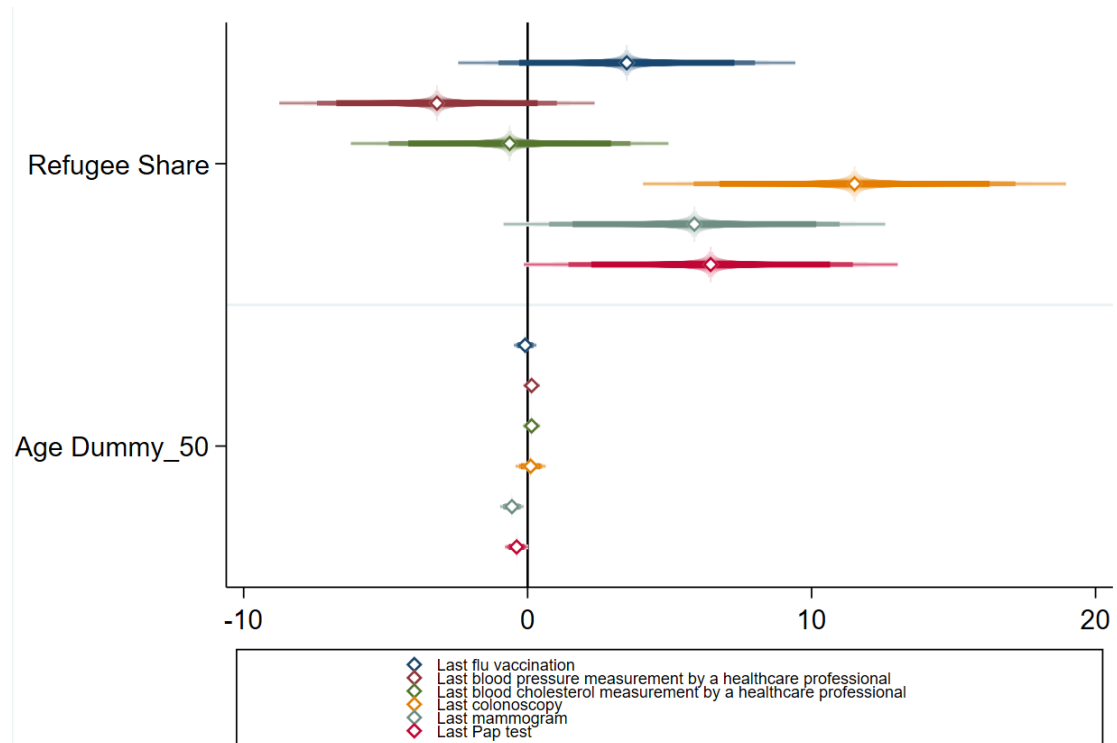


Figure A13: Prevention Services and Refugee Share with Age Dummy 50 plus years old

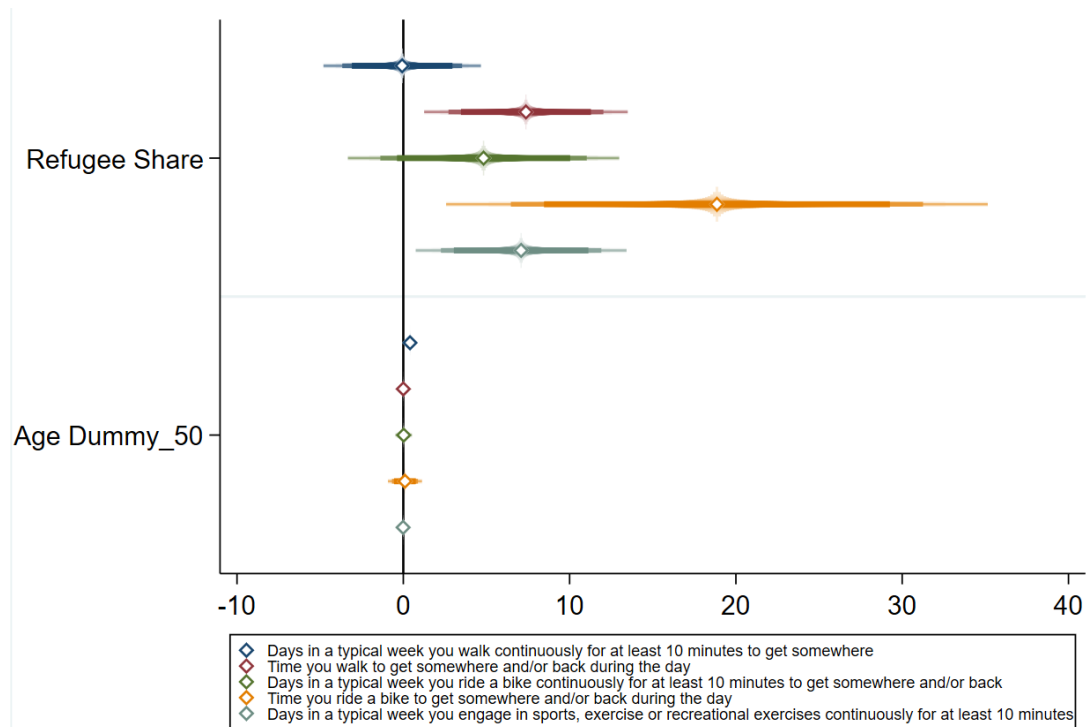


Figure A14: Physical Activity and Refugee Share with Age Dummy 50 plus years old

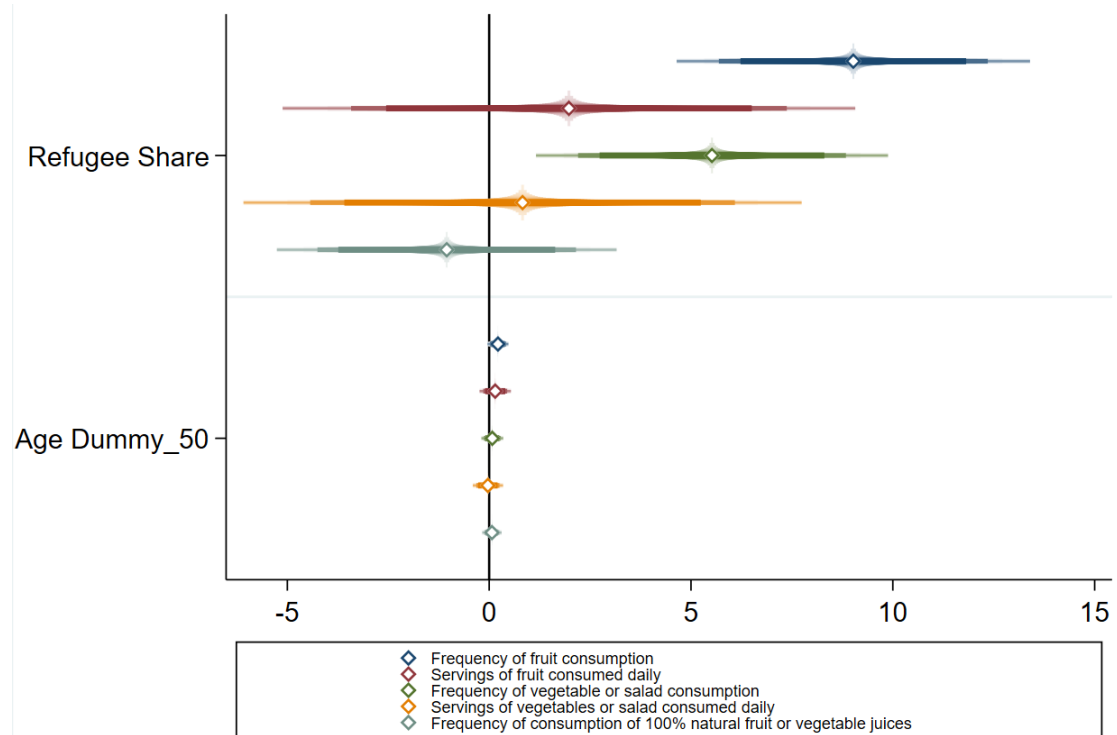


Figure A15: Healthy Eating Habits and Refugee Share with Age Dummy 50 plus years old

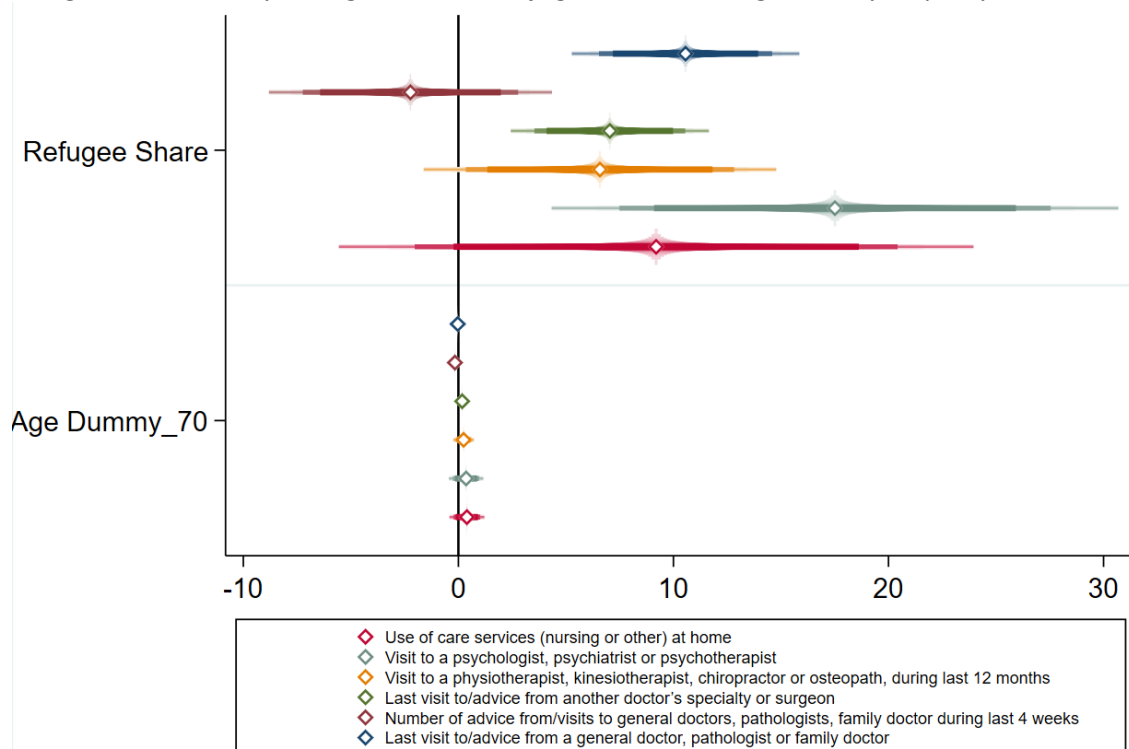


Figure A16: Use of Health Services and Refugee Share with Age Dummy 70 plus years old

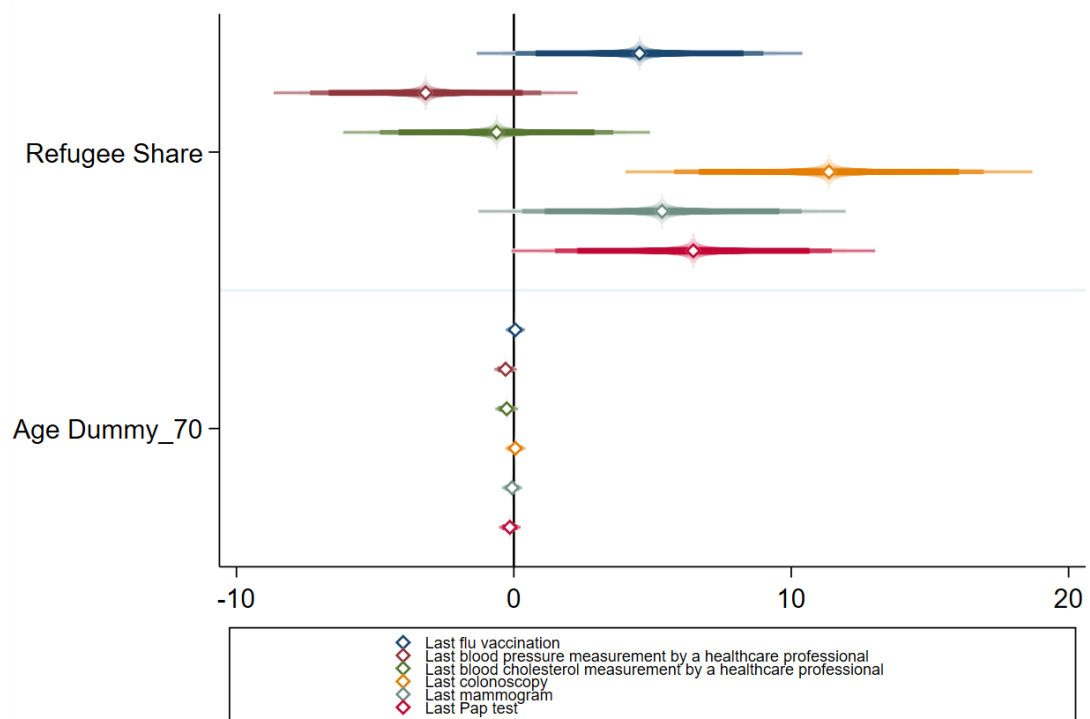


Figure A17: Prevention Services and Refugee Share with Age Dummy 70 plus years old

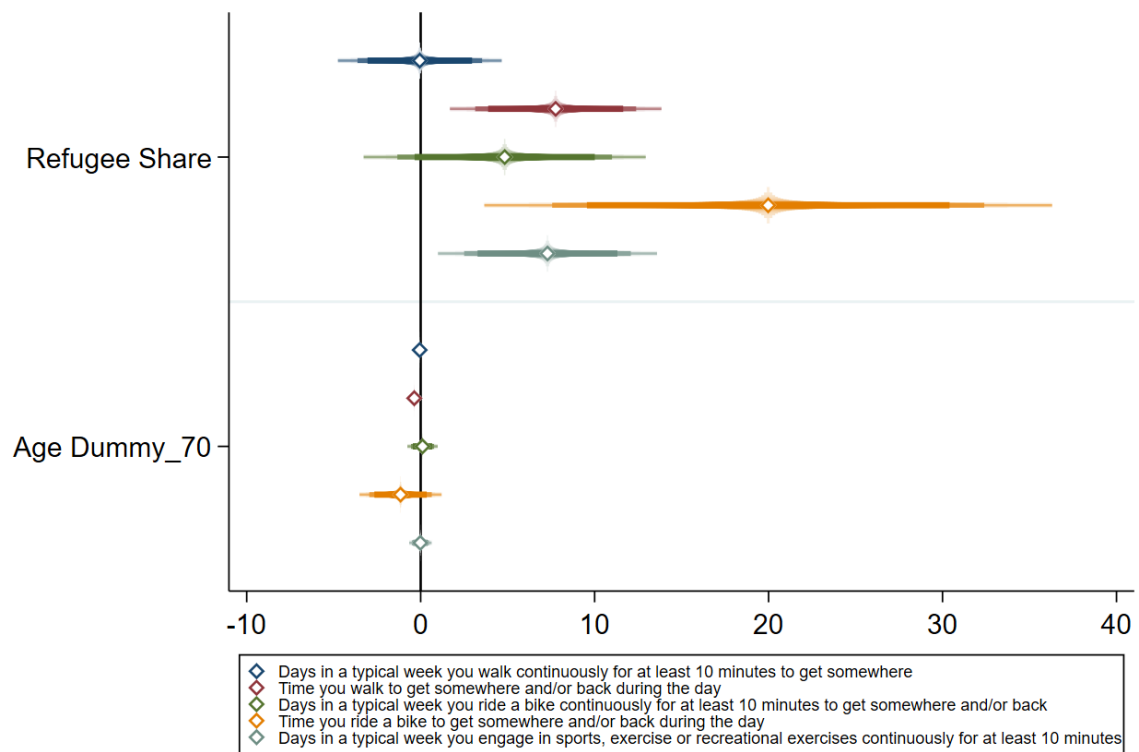


Figure A18: Physical Activity and Refugee Share with Age Dummy 70 plus years old

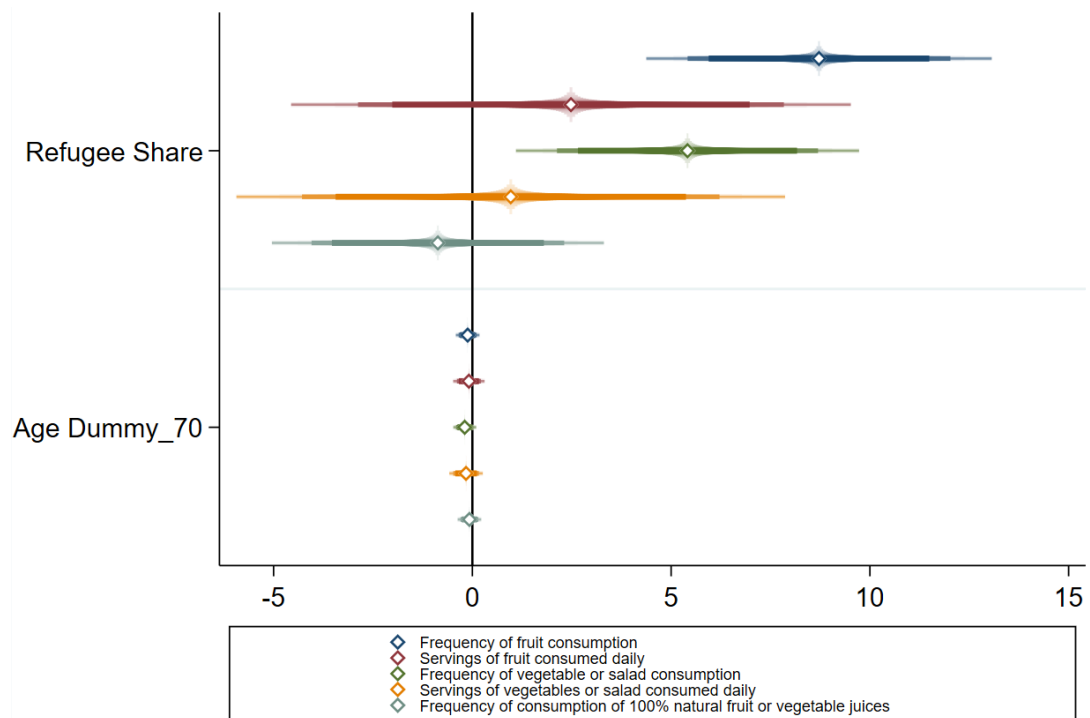


Figure A19: Healthy Eating Habits and Refugee Share with Age Dummy 70 plus years old

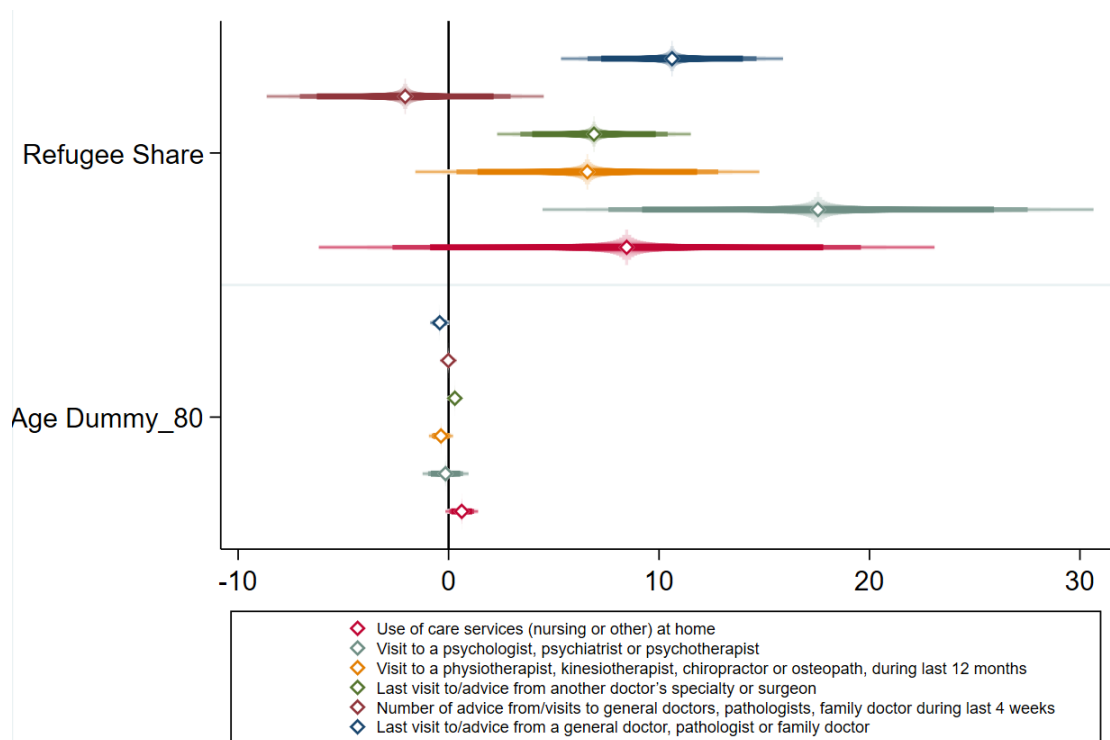


Figure A20: Use of Health Services and Refugee Share with Age Dummy 80 plus years old

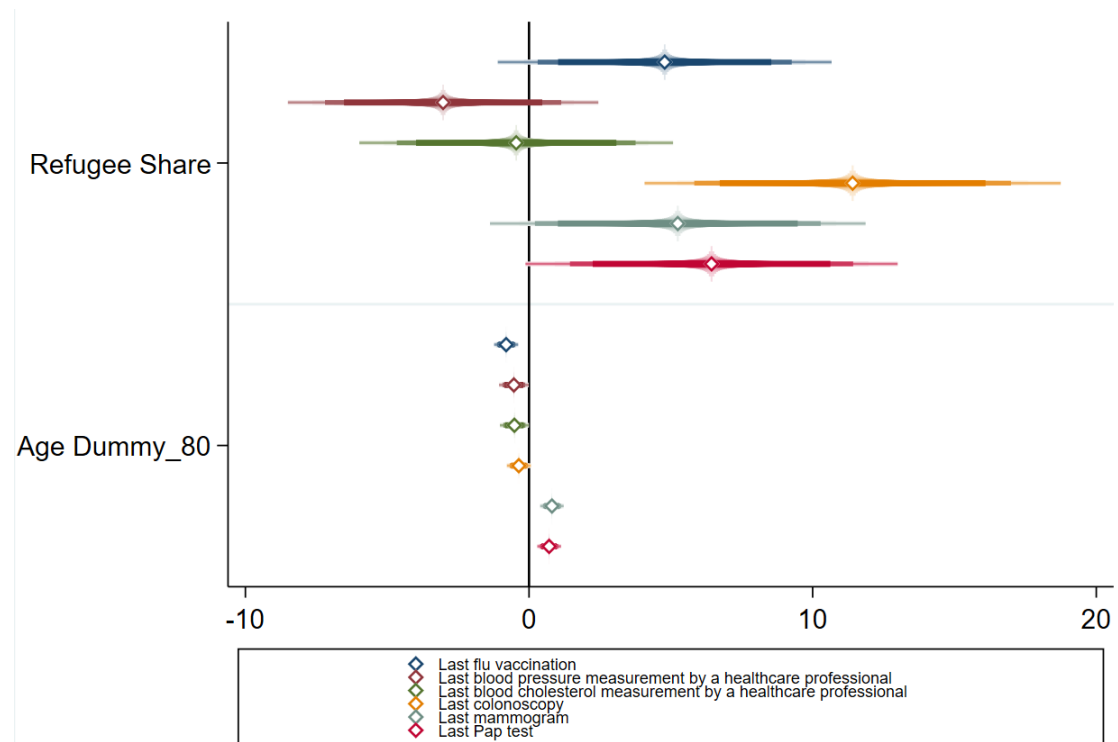


Figure A21: Prevention Services and Refugee Share with Age Dummy 80 plus years old

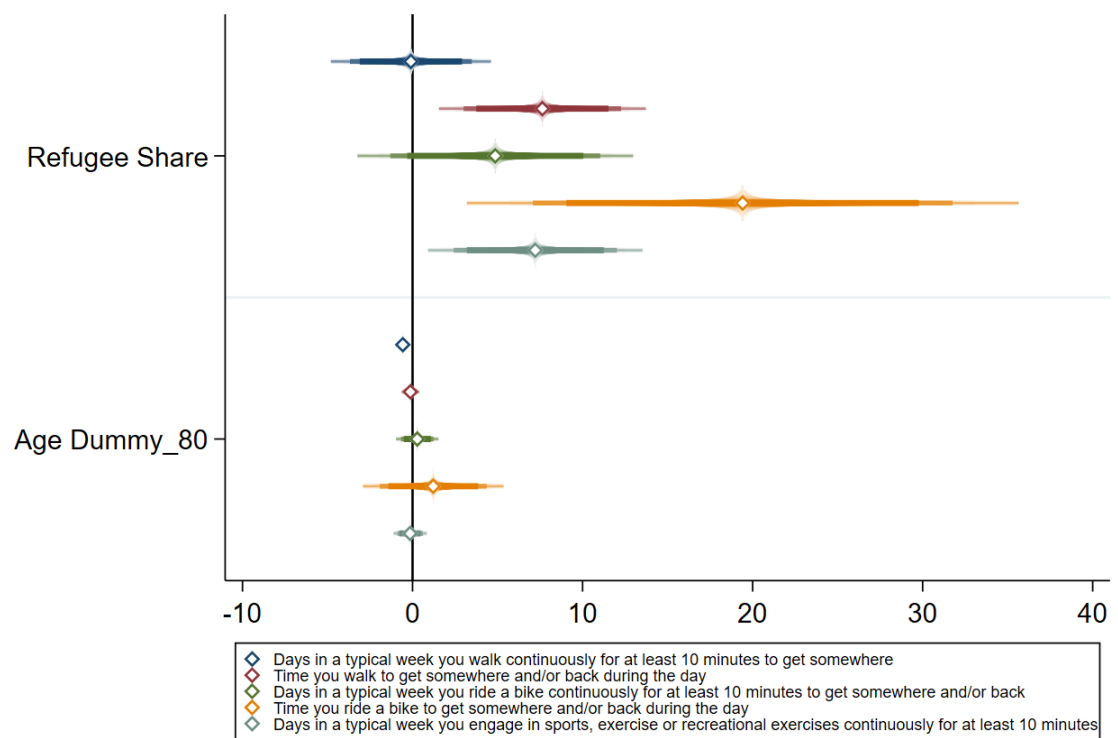


Figure A22: Physical Activity and Refugee Share with Age Dummy 80 plus years old

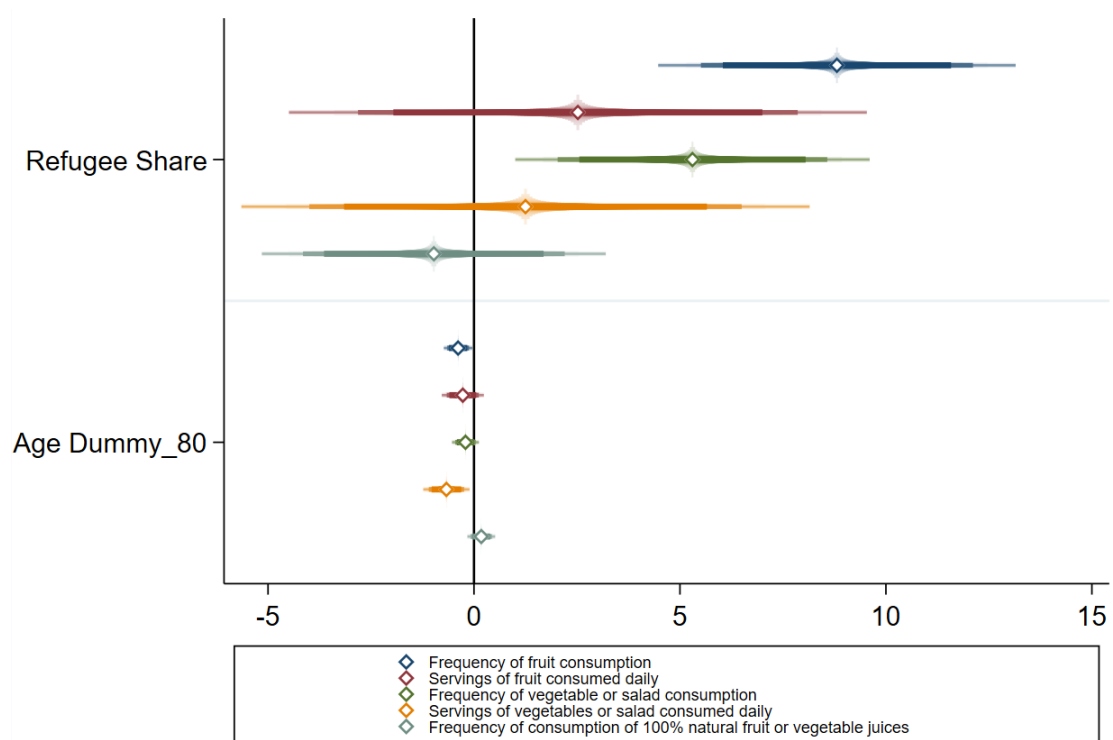
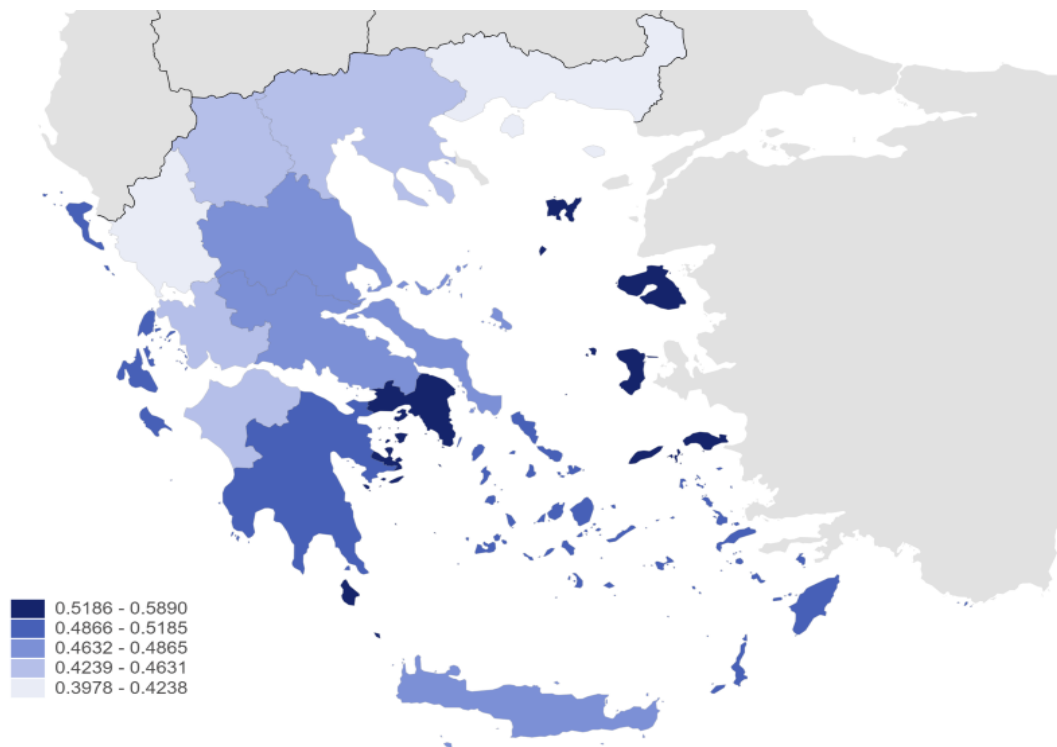
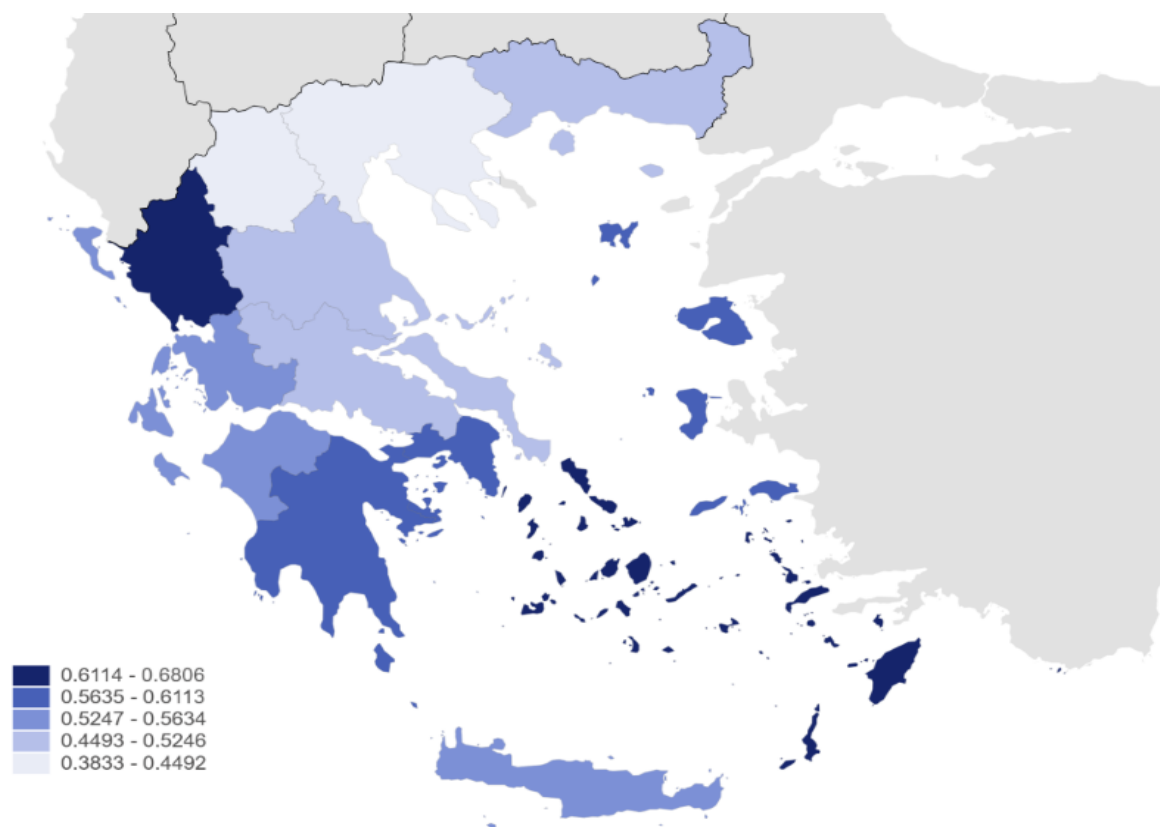


Figure A23: Healthy Eating Habits and Refugee Share with Age Dummy 80 plus years old



Source: Hellenic Statistical Authority, 1928 Census.

Map A1: Native Literacy Rates 1928



Source: Hellenic Statistical Authority, 1928 Census.

Map A2: Refugee Literacy Rates 1928

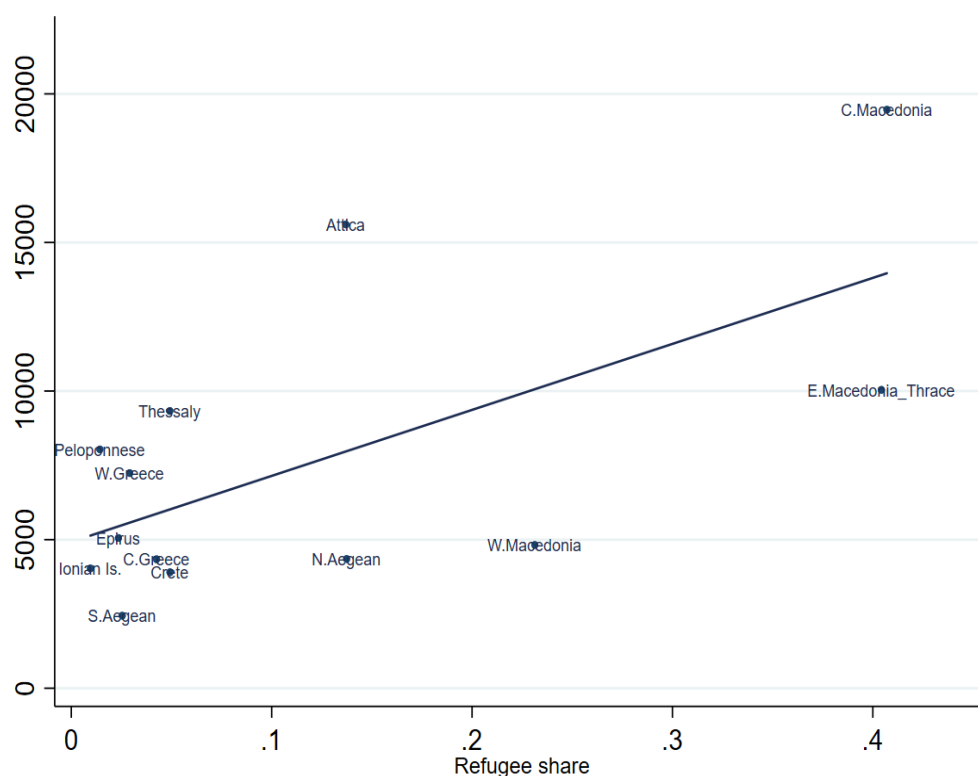


Figure A24: Average deaths of the total population (1923–1924) and refugee share by NUTS 2 region. Source: Hellenic Statistical Authority, Statistics of Causes of Deaths, annual data for the years 1923-192.

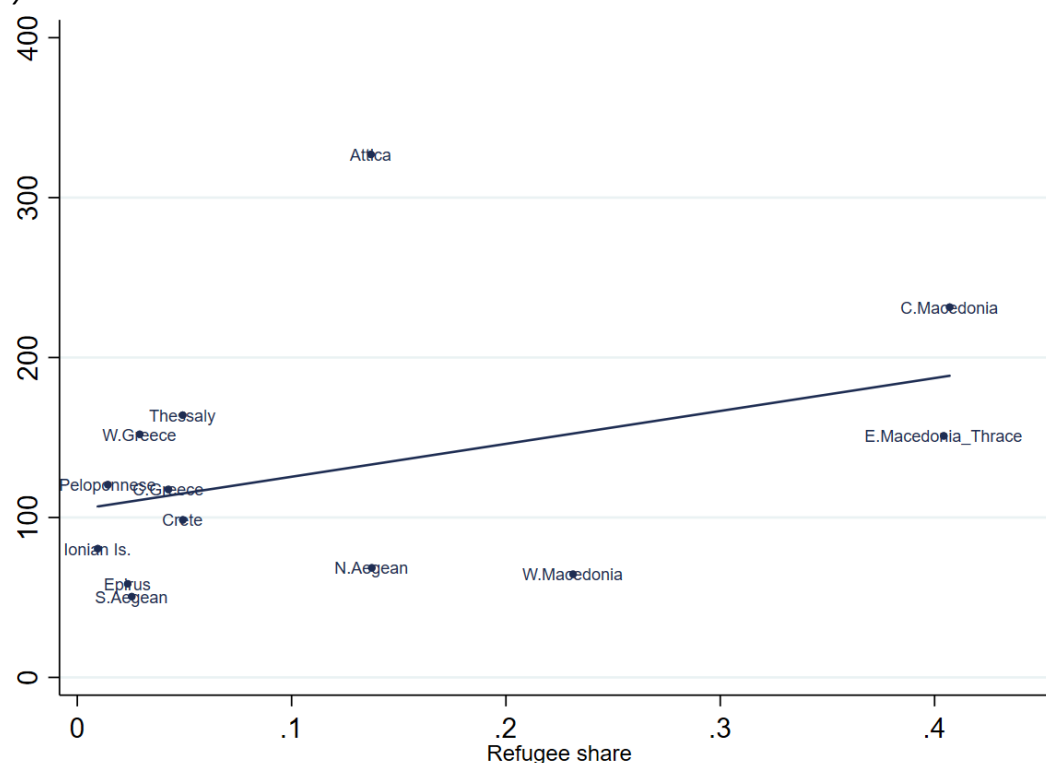


Figure A25: Average deaths from typhus cases in the total population (1923–1924) and refugee share by NUTS 2 region. Source: Hellenic Statistical Authority, Statistics of Causes of Deaths, annual data for the years 1923-1924.

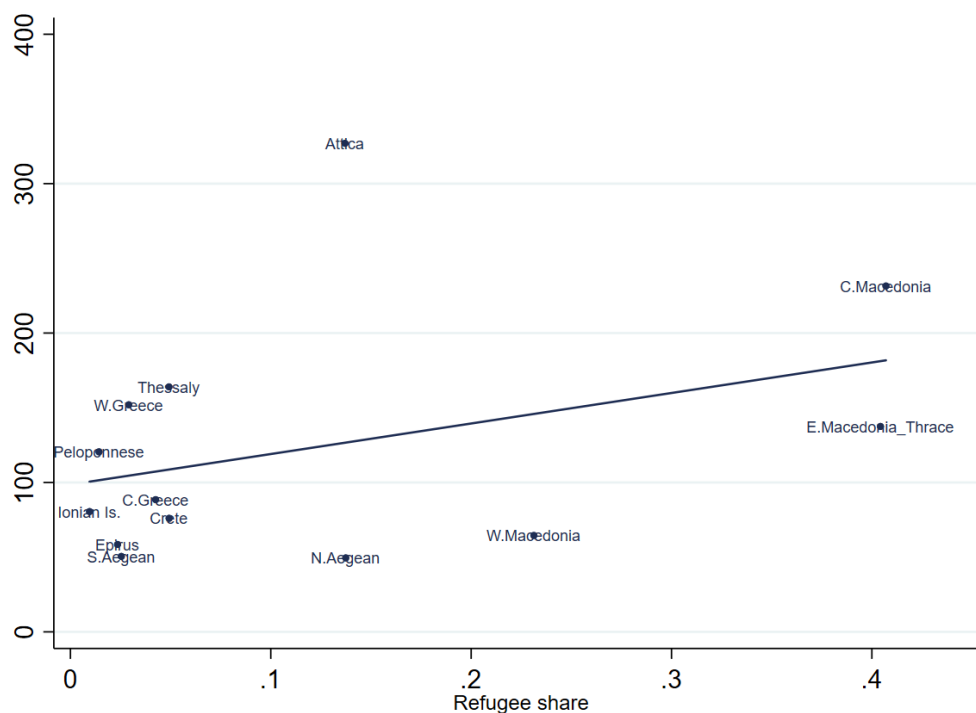


Figure A26: Average deaths from smallpox cases in the total population (1923–1924) and refugee share by NUTS 2 region. Source: Hellenic Statistical Authority, Statistics of Causes of Deaths, annual data for the years 1923-1924.

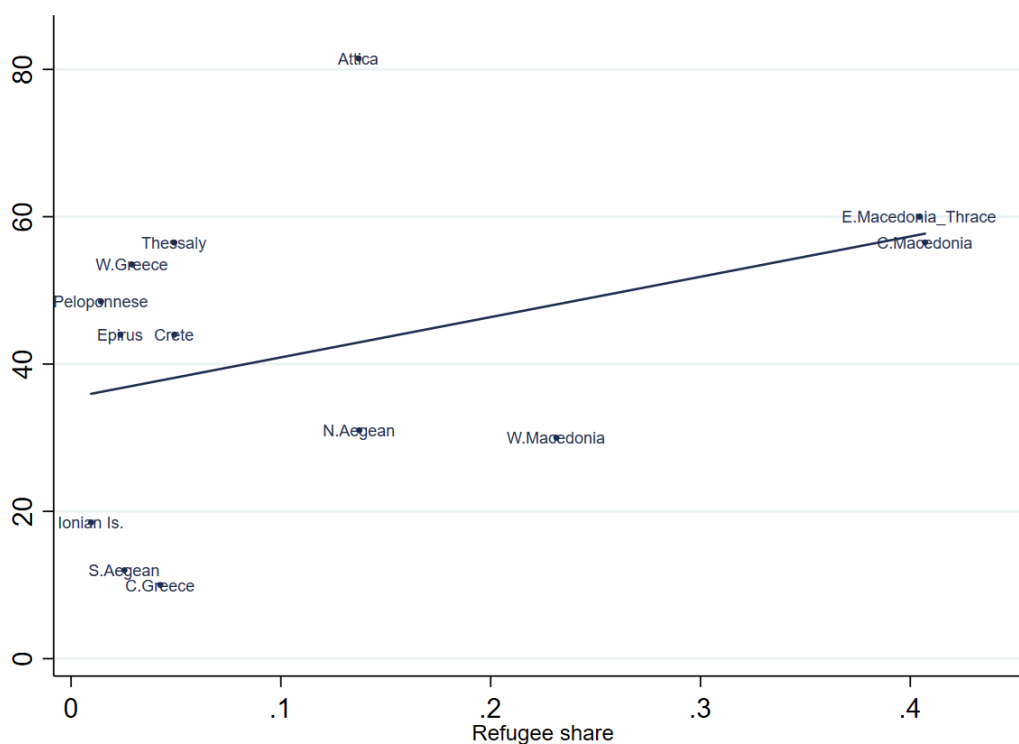


Figure A27: Average deaths from measles cases in the total population (1923–1924) and refugee share by NUTS 2 region. Source: Hellenic Statistical Authority, Statistics of Causes of Deaths, annual data for the years 1923-1924.

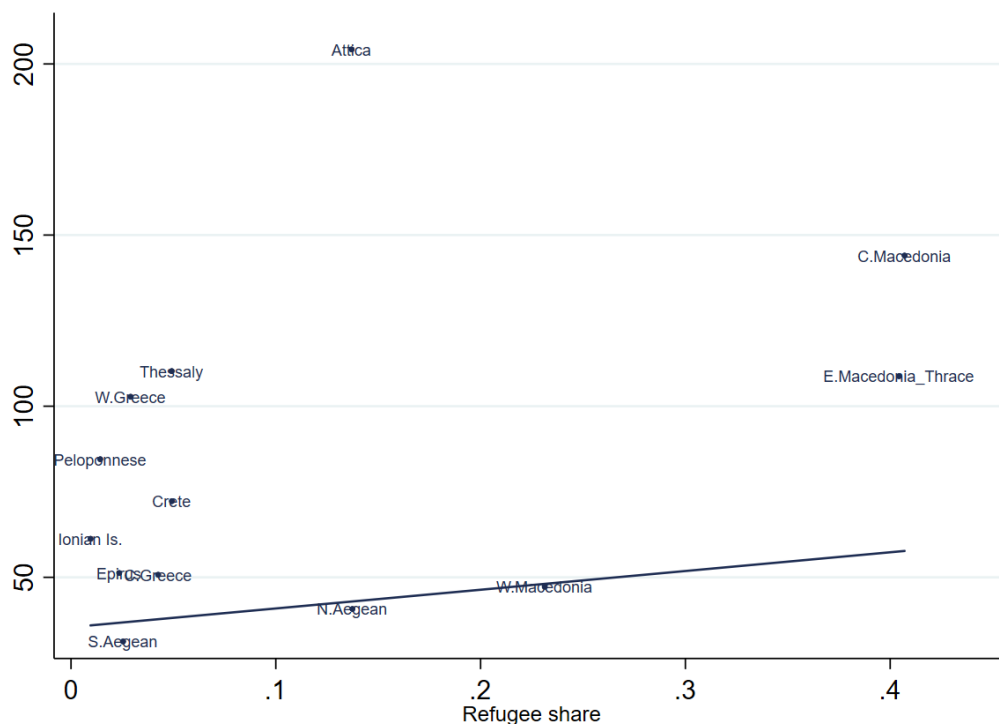


Figure A28: Average deaths from tuberculosis cases in the total population (1923–1924) and refugee share by NUTS 2 region. Source: Hellenic Statistical Authority, Statistics of Causes of Deaths, annual data for the years 1923-1924.

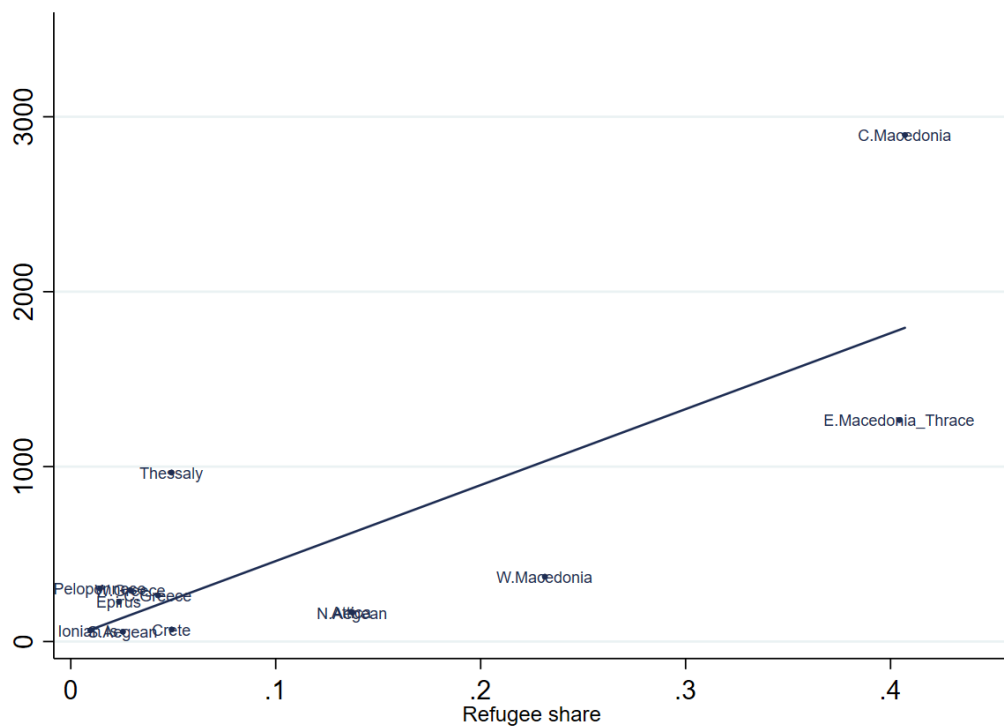


Figure A29: Average deaths from malaria cases in the total population (1923–1924) and refugee share by NUTS 2 region. Source: Hellenic Statistical Authority, Statistics of Causes of Deaths, annual data for the years 1923-1924.

