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## **The Mental Health Index across the Italian Regions in the ESG Context**

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# The Mental Health Index across the Italian Regions in the ESG Context

## Abstract

The following article analyses the relationship between the mental health index and the variables of the Environment, Social and Governance-ESG model in the Italian regions between 2004 and 2023. The econometric analysis is aimed at investigating in detail the relationships between the mental health index and the individual components of the ESG model. The results are critically discussed.

Keywords: ESG, Mental Health Index, Panel Data, Data Analysis.

JEL CODE: I11, I12, I13, I14, I15, I18

## 1) Introduction

In recent years, the intricate interplay between environmental, social, and governance (ESG) factors and mental health has garnered increasing attention from researchers, policymakers, and public health officials. This focus is particularly pronounced in a country like Italy, where regional disparities—ranging from economic wealth to cultural traditions—profoundly impact public health outcomes. The following article aims to dissect these disparities, offering a nuanced understanding of how ESG factors contribute to mental health variations across different Italian regions. This article focuses on the Mental Health Index (MHI), a composite measure that reflects the prevalence of mental health issues within populations, adjusting for socio-economic and environmental variables. Understanding the MHI within the ESG framework allows for a comprehensive analysis of how external factors influence mental health outcomes. The concept of ESG factors encompasses a broad range of elements that influence an entity's operations and is traditionally applied to corporate assessments. However, its application in public health, particularly mental health, is a relatively novel approach that promises deeper insights into the non-medical influences on health:

- **Environmental Factors:** these include geographical attributes, climate variations, and urban versus rural settings, which can affect lifestyle, stress levels, and access to mental health resources.
- **Social Factors:** social determinants such as education, employment, family dynamics, and cultural norms play significant roles in shaping mental health outcomes. In Italy, the variation in social structures from region to region provides a rich study ground for analysing these effects.
- **Governance Factors:** public policies, healthcare infrastructure, and regional governance also dictate how mental health services are distributed and how effectively they can address regional needs.

Numerous studies have explored the individual effects of environmental, social, and economic factors on mental health. However, few have integrated these within the ESG framework to provide a complex view of their interplay and impact on regional mental health disparities in Italy. This gap in research motivates the current study, which seeks to fill this void by providing empirical evidence and detailed analysis. This document aims to: evaluate the Mental Health Index across various Italian regions, analyze the contribution of ESG factors to regional mental health disparities, offer insights into how regional policies might be tailored to address specific mental health challenges effectively. These objectives are pursued through a robust methodological framework that combines quantitative data analysis with qualitative assessments, ensuring a thorough exploration of the underlying causes of mental health disparities. The study employs a mixed-methods approach, integrating data from Italy's national health databases with regional economic and social data. Statistical tools and econometric models are used to establish relations among ESG factors and mental health outcomes. This methodological rigor enhances the reliability of the findings, providing a foundation for recommendations aimed at policymakers. By elucidating the connections between ESG factors and mental health, this study contributes significantly to the broader field of public health and regional planning. It offers a framework for policymakers to integrate mental health considerations into environmental, social, and governance policies, potentially leading to more effective and targeted mental health interventions. As Italy continues to face regional disparities in health outcomes, the insights from this study are timely and critical. They not only enhance our understanding of the complex factors influencing mental health but also inform a targeted approach in health policy that considers the unique ESG profiles of different regions. Ultimately, this research advocates for a holistic view of mental health management, where environmental, social, and governance factors are integral to solutions, reflecting a mature understanding of health that transcends traditional biomedical models.

The article continues as follows: the second section contains the econometric models, the third section concludes.

## **2) Econometric models for estimating the value of the mental health index in the context of the ESG model**

In the following section we analyze with econometric techniques the relationship between the mental health index and each of the three components of the ESG model, namely Environment, Social and Governance. The econometric models used are panel data, focusing mainly on fixed effects and random effects. The data analyzed refers to the 20 Italian regions from 2004 to 2023. The detailed econometric results are present in the appendix with indication of tables, graphs and statistical indicators. All the data analyzed were acquired from the official ISTAT-BES dataset. The abbreviations and descriptions of the variables are indicated in the "*Abbreviations and Variables*" section following the conclusions.

### **2.1) Mental Health Index and E-Environment**

Below we analyze the relationship between the value of the mental health index and a set of environmental variables detected in the Italian regions. The data is analyzed for the period between 2004 and 2023 from the ISTAT-BES database. To estimate the model, panel data models were used, in particular the panel data model with fixed effects, and the panel data model with random effects. The following equation was estimated:

$$MHI_{it} = \alpha + \beta_1(CLD)_{it} + \beta_2(CDR)_{it} + \beta_3(PERL)_{it} + \beta_4(WT)_{it} + \beta_5(SWAC)_{it} + \beta_6(CS)_{it} + \beta_7(CACC)_{it}$$

where  $i = 20$   $t = [2004; 2023]$ .

There is a positive relationship between MHI and the following variables:

- CDR: the complex relationship between consecutive days without rain and mental health indices is not straightforward and varies across different demographic groups and regional climates. Research into this topic provides insights that are nuanced and variable, indicating that the impact of weather patterns on mental health can depend heavily on several factors. One significant study conducted in Western Australia observed the mental health-related emergency department presentations among residents of the Wheat Belt region from 2002 to 2017. The study utilized average daily rainfall as a measure of drought conditions and explored the associations based on various spatial aggregations of underlying data at multiple temporal windows. The findings were mixed but generally indicated a small positive association between mental health issues and increased rainfall during the summer months, with a rate ratio increase up to 1.05 per 0.5 mm of daily rainfall. Conversely, during winter months, the rate ratios could go as low as 0.96 per 0.5 mm of daily rainfall, suggesting a slight negative effect of increased rainfall on mental health (Yap et al., 2021). Another pivotal study explored the impact of early life exposure to above-average levels of rainfall on adult mental health. This study, which did not find significant effects from prenatal rainfall exposure, revealed that postnatal positive rainfall shocks could decrease average mental health scores significantly by 15 percent and increase the likelihood of depression by 5 percent. Notably, these effects were confined predominantly to females, indicating a gender-specific sensitivity to early environmental conditions (Pasha et al., 2018). These studies underscore the complexity of the relationship between rainfall and mental health. The variability in findings across different studies and the inconsistent results reported even within single studies suggest that while there is an association, it is likely influenced by a range of other factors including geographic location, demographic characteristics (such as age and gender), and possibly other environmental and socio-economic conditions. For instance, the impact of rainfall on mental health could be moderated by factors such as the individual's ability to access community resources, personal resilience, and the overall climate of the region. Moreover, it is crucial to consider the psychological and physical aspects that might connect rainfall and mental health. For example, prolonged periods without rain can lead to drought conditions, which have been associated with increased stress and anxiety in agricultural communities due to economic pressures. Conversely, excessive rainfall can lead to disruptions in daily life and even traumatic events such as flooding, which can have immediate and long-lasting psychological impacts (Figure 1).

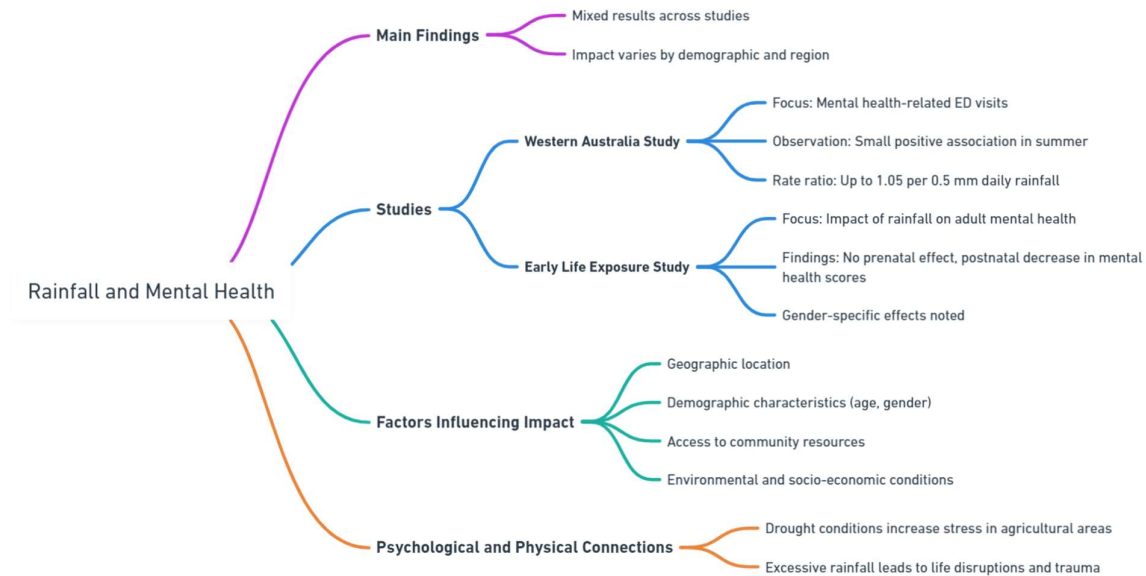


Figure 1. Relationships between rainfall and mental health.

- PERL: the hypothesis that mental health indices might improve among populations exposed to the risk of landslides seems counterintuitive, as exposure to such risks typically increases stress and anxiety levels. However, considering this in a different light reveals complex socio-psychological dynamics that might underlie unexpected improvements in certain mental health metrics under these circumstances. In regions prone to natural disasters like landslides, there can be enhanced community resilience and social cohesion. Communities often strengthen social networks and support systems to prepare for and respond to disasters. This increased social cohesion can lead to improved community mental health, as individuals feel more supported and less isolated in the face of adversity (Aldrich and Meyer, 2015). Exposure to risks doesn't always result in negative outcomes. In some cases, individuals and communities experience what is known as post-traumatic growth, where people develop psychological resilience and report positive changes following adversity. Such growth often includes improved relationships, a greater appreciation for life, increased personal strength, and recognition of new possibilities (Tedeschi and Calhoun 2004). Communities repeatedly exposed to landslide risks often develop robust disaster preparedness programs, which can include psychological training and community drills that improve the population's readiness and reduce anxiety about potential events. Knowing there are measures in place to manage and mitigate these risks can alleviate mental stress associated with uncertainty (Paton et al. 2005). Areas frequently facing landslide risks often receive more attention and support from government and non-governmental organizations in terms of mental health services and infrastructure improvements. This heightened level of support can lead to better mental health care availability and potentially better mental health outcomes (Norris et al. 2008). While at first glance, it might seem paradoxical that mental health indices could improve in populations at risk of landslides, a deeper exploration reveals that the mechanisms of community resilience, post-traumatic growth, enhanced preparedness, and increased support could play crucial roles in this dynamic (Figure 2).



Figure 2. Relationships between landslide risks and mental health improvements.

- SWAC: the notion that mental health could improve in environments with soil waterproofing from artificial cover is not straightforward. However, exploring this requires a broader understanding of urban development, green infrastructure, and their psychological impacts. Urban areas with effective soil waterproofing often incorporate engineered green spaces, such as parks and gardens, that contribute to mental well-being. Research has shown that access to green spaces in urban environments can reduce stress, enhance mood, and improve overall mental health (Hartig, et al. 2014). These spaces not only offer aesthetic and recreational benefits but also provide a buffer against the psychological impacts of urban density. Soil waterproofing is often part of larger urban planning strategies that include the installation of green roofs and similar structures that can mitigate the urban heat island effect. These modifications can lead to improved urban air quality and lower temperatures, contributing to better mental health outcomes. Lower stress levels and reduced heat-related morbidity positively affect the psychological well-being of urban residents (Berardi et al. 2014). Areas with effective soil waterproofing are less susceptible to flooding, which can reduce the stress and anxiety related to flood risks. The psychological relief from living in environments protected from such natural disasters can not be overstated, as highlighted by research linking reduced exposure to natural disasters with better mental health outcomes (Lowe et al 2015). Urban environments that incorporate soil waterproofing in their infrastructure often have better-maintained public spaces that encourage social interaction and enhance community cohesion. Studies have demonstrated the role of social cohesion and a supportive social environment in promoting mental health (Jennings and Bamkole, 2019). While direct studies specifically linking soil waterproofing from artificial cover to mental health are limited, it's clear that the broader context in which these urban planning elements are implemented can have significant indirect benefits for mental health. These benefits arise from improved urban living conditions, including enhanced green spaces, reduced heat and pollution, lowered disaster risk, and improved social environments. Each of these factors is known to contribute positively to mental well-being in densely populated urban settings. Further research could help delineate more specific pathways through which soil waterproofing and related urban planning strategies directly impact mental health (Figure 3).

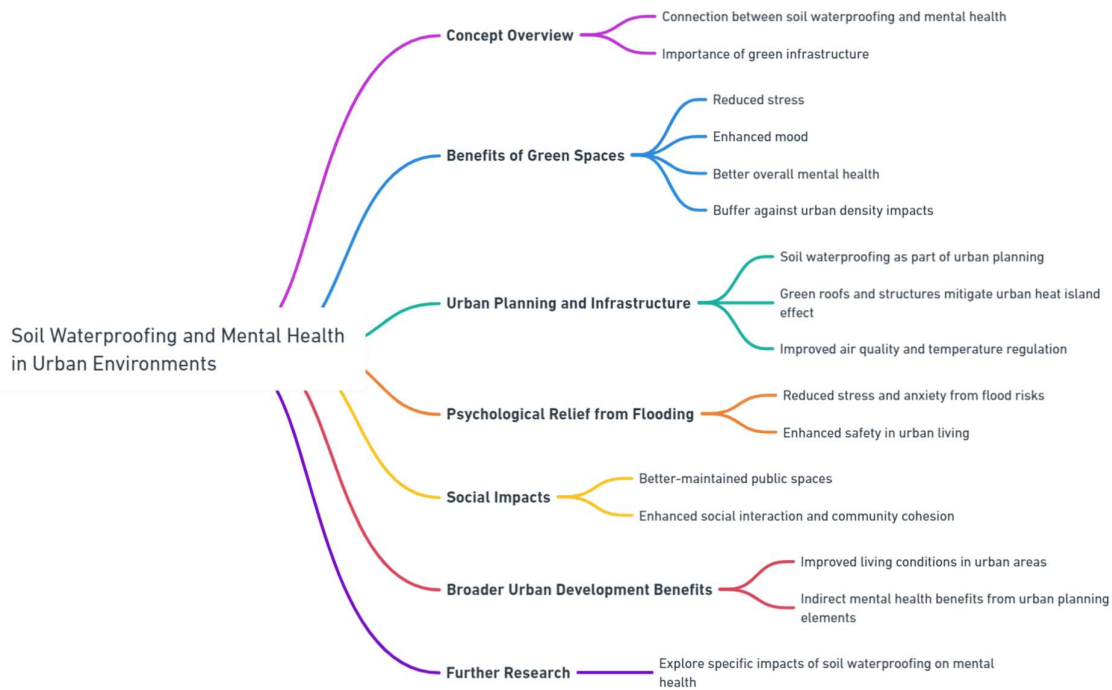


Figure 3. Relationships between soil waterproofing and mental health in urban environments.

- CS: the result that mental health indices might improve in populations living near contaminated sites is quite counterintuitive, as exposure to pollution and contamination typically correlates with negative health outcomes, including psychological stress, anxiety, and depression. However, considering potential positive outcomes in this context might involve examining indirect effects and broader socio-economic interventions. Communities affected by environmental contamination often mobilize to demand action, leading to stronger community ties and a heightened sense of empowerment. This collective action, aimed at addressing and remedying environmental injustices, can enhance community cohesion and provide residents with a sense of purpose and control over their lives. Increased social capital and community efficacy can improve mental health outcomes (Pellow, 2000). Similar to communities experiencing natural disasters, communities facing environmental hazards might experience post-traumatic growth, where individuals find new strengths and develop greater community bonds in response to adversity. This growth often involves improved interpersonal relationships and a renewed appreciation for life, contributing to better mental health (Tedeschi and Calhoun, 2004). Areas recognized as contaminated often become the focus of public health campaigns and interventions, including mental health services. The increase in resources, healthcare provision, and attention from governmental and non-governmental organizations can lead to improvements in overall health outcomes, including mental health (Clougherty et al. 2010). Contaminated sites, once identified, may undergo remediation and economic revitalization, leading to job creation and improved local economic conditions. Economic stability and growth contribute significantly to mental well-being by reducing stress related to unemployment and financial insecurity (Gould and Lewis, 2017). While the direct association between living near contaminated sites and improved mental health is unlikely, indirect mechanisms through community action, resilience building, increased

health interventions, and economic improvements might play roles in enhancing mental health under specific circumstances (Figure 4).

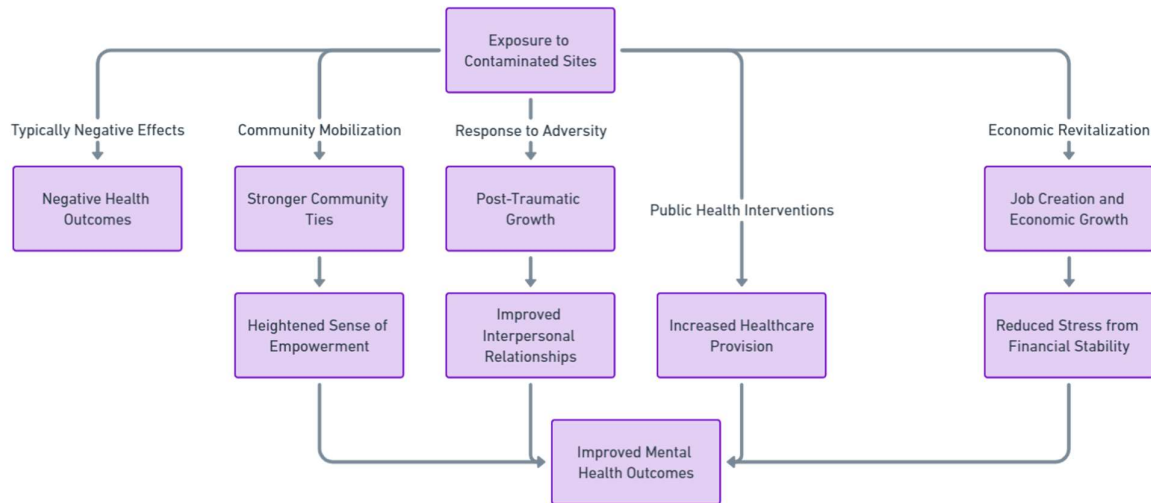


Figure 4. Relationships between exposure to contaminated sites and mental health outcomes.

There is a negative relationship between MHI and the following variables:

- CLD: concerns about landscape deterioration can significantly impact mental health for several reasons. These impacts are deeply rooted in how people perceive and interact with their environment. Landscape deterioration, whether through urban sprawl, industrial development, deforestation, or pollution, can lead to a loss of 'sense of place,' which is crucial for personal identity and belonging. When familiar and cherished environments are degraded, it can lead to feelings of loss and helplessness, impacting mental health negatively (Stedman, 2003). People can experience profound grief and mourning when they witness the destruction of natural landscapes and the environment. This “ecological grief” mirrors the feelings of loss associated with bereavement, where individuals mourn not only the loss of environmental beauty but also the associated biodiversity and the ecosystem services that these landscapes provided (Cunsolo and Ellis, 2018). Worry about landscape deterioration is often accompanied by anxiety about the future, especially concerning environmental sustainability and the world that future generations will inherit. This existential anxiety can lead to chronic stress, feelings of despair, and hopelessness, contributing to overall declines in mental health (Clayton, 2020). Natural landscapes often provide restorative benefits, offering individuals opportunities for stress recovery and psychological restoration. Deterioration of these landscapes reduces access to environments that support mental health through leisure and relaxation activities, ultimately impacting well-being (Hartig et al. 2014). Landscape deterioration can affect community health and social cohesion. As environments degrade, community structures often weaken, social ties are strained, and local residents may experience increased conflict over dwindling resources and spaces, further impacting mental health (Pfefferbaum and North, 2020). The degradation of landscapes leads to a complex interplay of emotional, psychological, and social effects that can severely impact mental health. The distress linked with landscape deterioration reflects broader concerns about environmental sustainability and personal well-being, necessitating comprehensive approaches to manage these psychological impacts effectively (Figure 5).



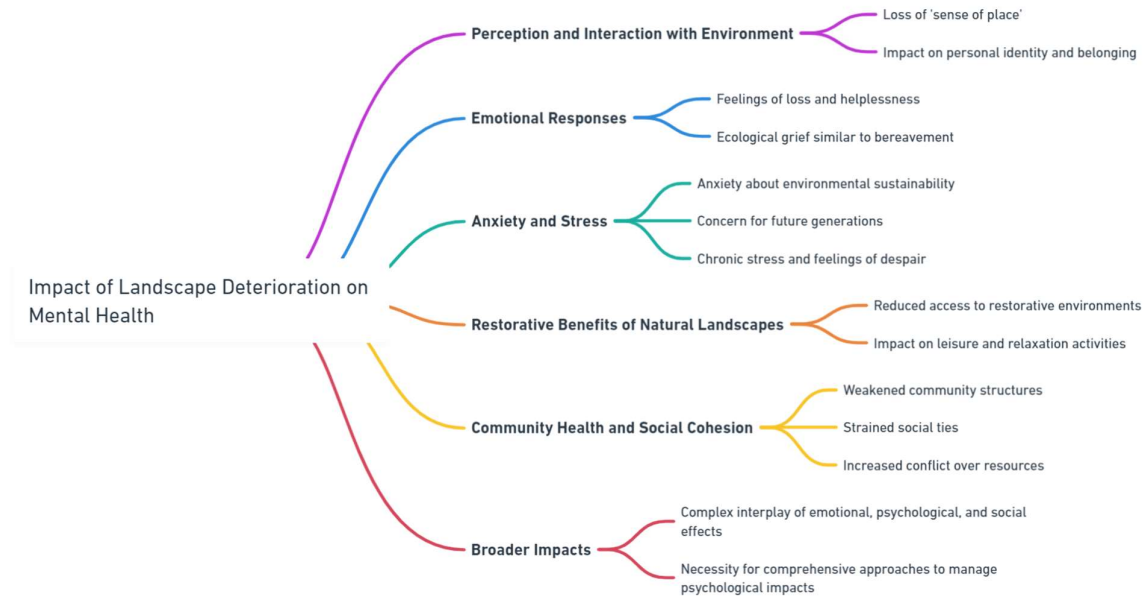


Figure 5. Relationships between landscape deterioration and mental health.

- WT: the relationship between wastewater treatment facilities and declining mental health indices is nuanced and multifaceted. While wastewater treatment plants are essential for public health and environmental protection, their presence and operations can have unintended negative psychological effects on nearby residents. One of the most immediate and noticeable impacts of wastewater treatment plants is the emission of odors, which can be significant and persistent. The presence of foul smells can lead to discomfort, stress, and annoyance among local residents. Chronic exposure to unpleasant odors has been linked to increased rates of mood disorders, stress-related illnesses, and overall declines in quality of life (Sucker et al. 2008). Even when actual health risks are managed and minimal, the perception of risk from living near a wastewater treatment plant can cause anxiety and stress. Concerns about potential chemical exposure, water contamination, and accidents can lead to persistent unease and fear, which are detrimental to mental health. The uncertainty and perceived lack of control over these environmental factors can exacerbate feelings of anxiety and helplessness (Elliot et al. 1993). Living near a wastewater treatment facility can carry a stigma that affects residents' self-esteem and community identity. There are also concerns about decreased property values, which can lead to economic stress and resentment. These social and economic pressures can contribute to community dissatisfaction, social isolation, and increased mental health disorders among residents (Smardon, 2006). Wastewater treatment plants can be sources of continuous noise from machinery and operational activities. Chronic noise exposure is a well-documented stressor that adversely affects mental health, leading to increased rates of sleep disturbances, hypertension, and aggressive behavior. The constant background noise can disrupt normal living conditions and degrade quality of life (Stansfeld and Matheson, 2003). The visual impact of wastewater treatment plants can also detract from the aesthetic value of the landscape, reducing opportunities for recreational and leisure activities that are important for mental well-being. The industrial appearance and restricted access to surrounding areas can diminish the use of natural resources for relaxation and stress relief (Kaplan and Kaplan, 1989). While wastewater treatment is crucial for environmental health, its associated impacts on local communities can be significant. These

include odor, noise, visual blight, perceived health risks, and socio-economic factors, all of which can negatively affect mental health. Addressing these impacts requires effective communication, community engagement, and mitigation strategies to reduce nuisances and improve the relationship between wastewater facilities and community residents (Figure 6).

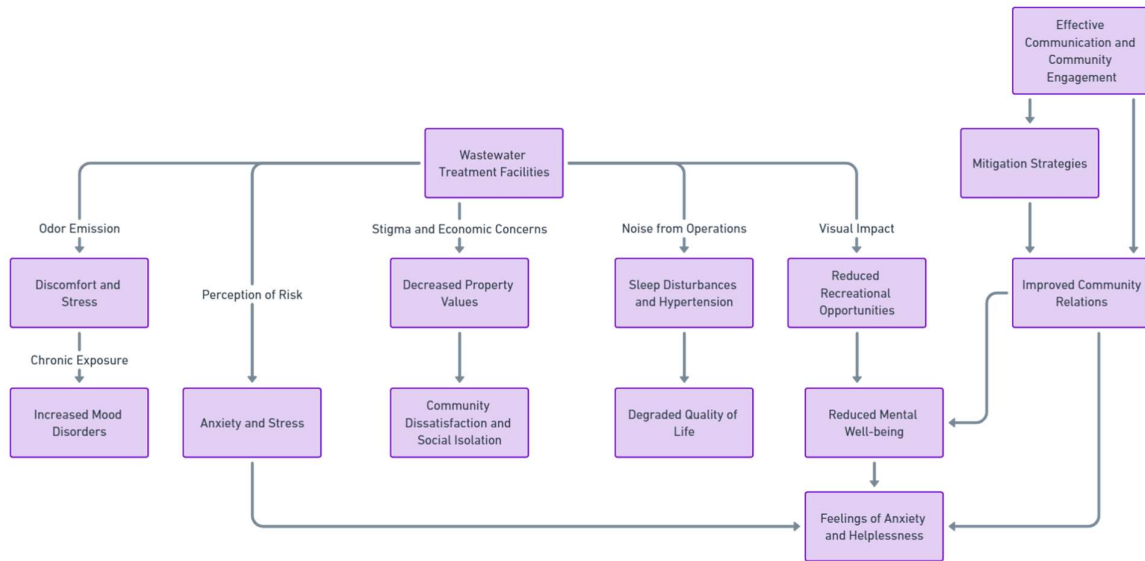


Figure 6. Relationships between Wastewater Treatment and Mental Health.

- CACC: concern about climate change can have profound impacts on mental health. As global awareness of climate change's effects grows, so too does the psychological burden on individuals and communities. Eco-anxiety, defined as a chronic fear of environmental doom, is a significant psychological response to climate change. Many people, especially younger generations, experience intense worry about the future of the planet—concerns about extreme weather events, loss of biodiversity, and future living conditions can lead to persistent stress and anxiety (Clayton et al. 2017). The global scale of climate change can make individuals feel helpless and insignificant. The perception that personal actions are too small to make a difference can lead to feelings of despair and nihilism, reducing proactive behavior and increasing feelings of depression (Bandura, 2000). Many individuals and communities mourn environmental losses that climate change has caused, such as the disappearance of species, coral reefs, and traditional landscapes. This sense of loss, often called ecological grief or solastalgia, reflects sadness and mourning over environmental changes that affect one's home and sense of identity (Cunsolo and Ellis, 2018). Climate change leads to more frequent and severe weather events like hurricanes, wildfires, and floods. These events can cause direct trauma and displacement, which are primary stressors. Additionally, they can lead to secondary stressors such as economic loss, increased conflicts, and community breakdown, all of which can negatively impact mental health (Fritze et al., 2008). The broader implications of climate change include potential disruptions to economies and livelihoods, especially in industries reliant on natural resources. Uncertainty about the future, concerns about job security, and increased social inequality can exacerbate stress and anxiety (Klinsky et al., 2017). The decrease in mental health indices due to climate change concerns is driven by a complex mix of direct and indirect factors. These include immediate anxieties about the impacts of climate change, the existential dread of environmental degradation, and the real socio-economic changes that threaten individuals' way of life (Figure 7).

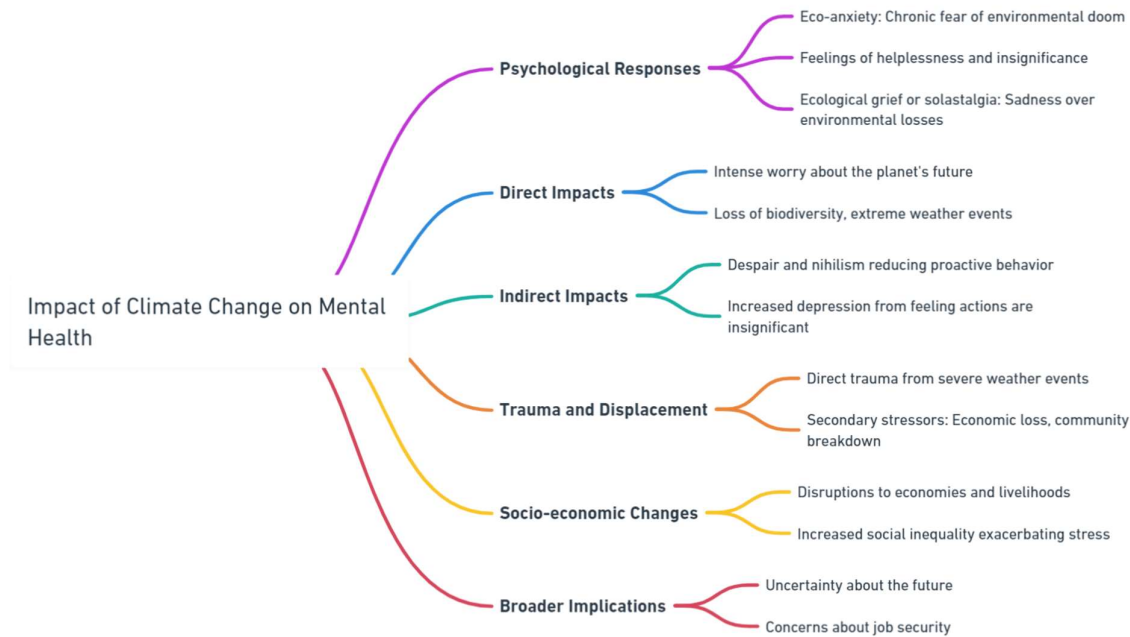


Figure 7. Relationships between impact of climate change and mental health.

In conclusion, our results suggest that there is a positive relationship between the value of the mental health index and the E-Environment component within the ESG model in the Italian regions. That is, the value of the mental health index tends to increase with the improvement of the environment.

## 2.2) Mental Health Index and S-Social

Below we analyze the relationship between the value of the mental health index and a set of social variables detected in the Italian regions. The data is analyzed for the period between 2004 and 2023 from the ISTAT-BES database. To estimate the model, panel data models were used, in particular the panel data model with fixed effects, and the panel data model with random effects. The following equation was estimated:

$$MHI_{it} = \alpha + \beta_1(NEET)_{it} + \beta_2(ILS)_{it} + \beta_3(RBN)_{it} + \beta_4(ERY)_{it} + \beta_5(EFJ)_{it} + \beta_6(POI)_{it} + \beta_7(NII)_{it} + \beta_8(HCO)_{it} + \beta_9(SWFR)_{it}$$

Where  $i=20$  and  $t=[2004;2023]$ .

There is a positive relationship between MHI and the following variables:

- NEET: typically, NEET status is associated with poorer mental health outcomes due to factors like social isolation, lack of daily structure, and economic stress. However, if data from Italian regions show that NEETs score higher on the mental health index, this suggests they experience less psychological distress compared to their peers involved in education, employment, or training. The role of family and community in Italy might provide stronger emotional and social support to NEETs, buffering against the negative psychological impacts of being out of work or school. The NEET category includes a wide range of individuals, from those actively seeking work to those who have chosen to take time out for personal reasons. This diversity could mean that some segments within the NEET population might not

experience the same level of psychological distress as others. Regional differences in policies addressing unemployment and education might affect the well-being of NEETs. For instance, regions with more comprehensive social welfare systems or active labour market programs might help alleviate the stress associated with being NEET. Understanding the factors that contribute to a higher mental health index among NEETs could inform targeted interventions aimed at supporting mental health in this population. Policies designed to support NEETs should consider not only economic factors but also the psychological and social dimensions, promoting programs that integrate mental health support with education and employment services. This positive relationship challenges conventional assumptions about the mental health of NEETs and underscores the importance of considering regional and cultural contexts in understanding and addressing the needs of this population. Further detailed studies are required to unravel the complexities of this relationship and to formulate effective support mechanisms (Figure 8).

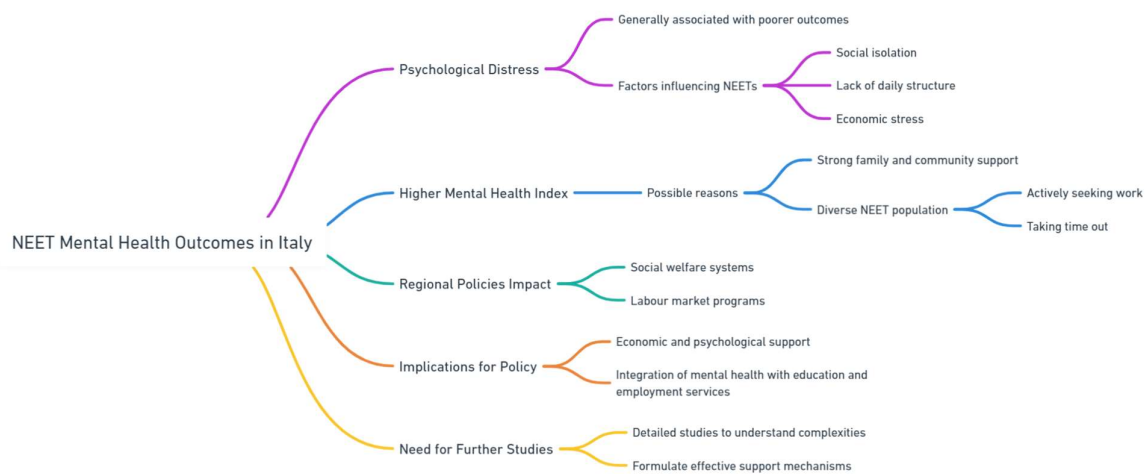


Figure 8. NEET and mental health in the Italian regions.

- RBN: reading books and newspapers can positively impact mental health in various ways. Several studies have examined the relationship between reading and psychological well-being, supporting the idea that engaging with written content can enhance mental health indices. A study found a dose-response survival advantage for book reading, suggesting that those who read books regularly had a significant survival advantage over those who did not, and this advantage was greater than that observed for reading newspapers or magazines. The cognitive engagement from reading books contributed to a longer life, potentially due to the mental stimulation and cognitive reserve built through reading (Bavishi et al. 2016). Another study discussed how nostalgia and emotional connections from re-reading favorite books can promote mental well-being and social connectedness. This study highlighted the emotional benefits and narrative transportation that re-reading familiar books can provide, suggesting that these activities can bolster one's social and psychological health by evoking nostalgia and enhancing social connectedness (Kneuer et al. 2022). Engaging with books and newspapers can serve as a form of escapism and stress reduction. Reading provides a temporary withdrawal from one's immediate environment or stresses, offering a refuge in the worlds or information within the pages. This can lead to reductions in stress levels, which is beneficial for mental health. Studies have shown that reading fiction can improve mental health and mood by allowing readers to experience empathy and gain insights into human behavior and

emotions. Fiction provides a space for readers to explore complex emotional experiences and scenarios in a safe and controlled environment, which can enhance emotional intelligence and empathy (Carney & Robertson, 2022). These studies suggest that reading, whether books or newspapers, can be a valuable tool for improving mental health through cognitive engagement, emotional relief, and social connectivity. The act of reading not only entertains and informs but also has profound effects on mental well-being, supporting the observed growth in mental health indices associated with this activity (Figure 9).

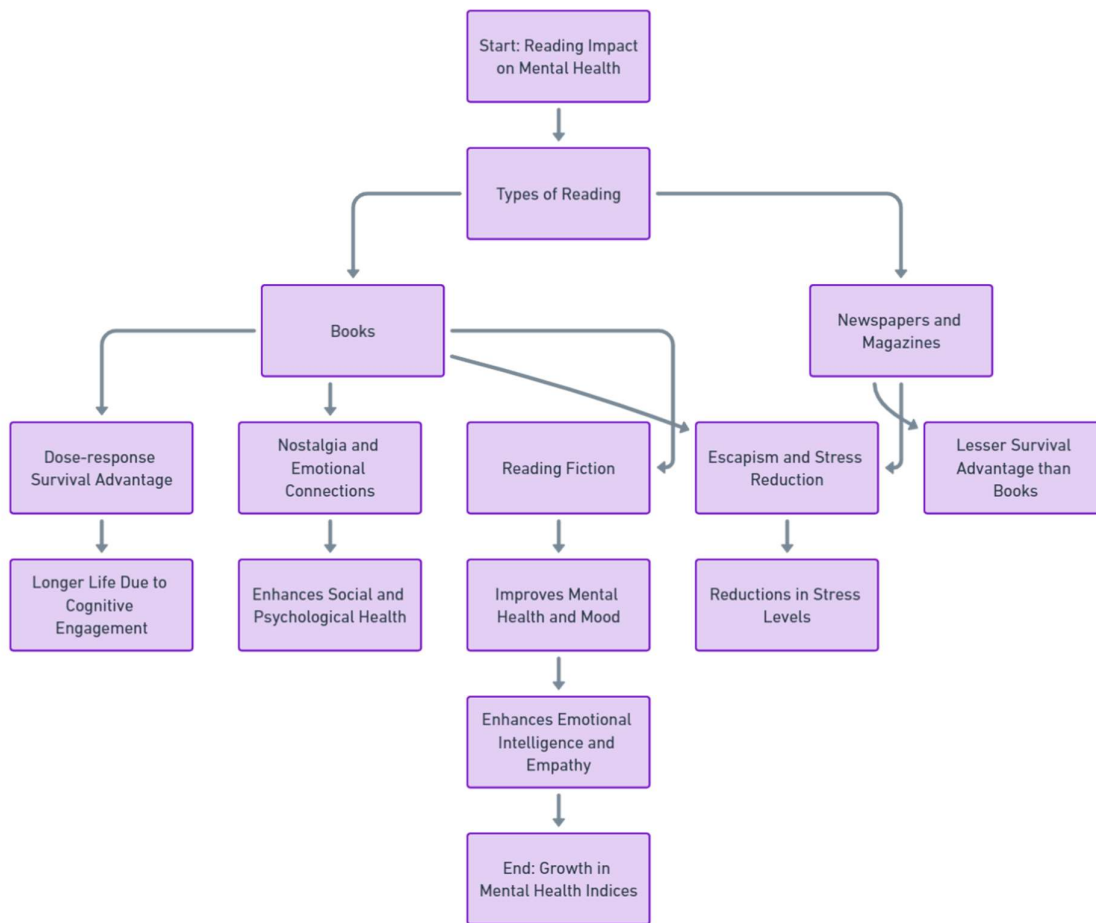


Figure 9. Relationships between reading books and newspapers and mental health.

- ERY: employment status is significantly associated with mental health outcomes. A study in Korea found that unemployed young adults reported higher rates of depressive mood and suicide ideation compared to their employed counterparts. This suggests that employment can play a critical role in enhancing mental well-being by providing structure, purpose, and social interaction, which are vital for psychological health (Nam et al., 2021). Research from the United States indicated that employment rates decrease with increasing severity of mental illness. Individuals with serious mental illness had significantly lower employment rates, which points to the challenges faced by those with more severe mental health issues in maintaining employment (Luciano & Meara, 2014). Unemployment has been shown to significantly increase the risk of mental health problems. Data from a study assessing emerging adults in 12 states revealed that unemployed individuals were about three times

more likely to suffer from depression compared to those who were employed. This underscores the psychological impact of unemployment, highlighting the stress, loss of income, and reduced social contact that can exacerbate mental health problems (McGee & Thompson, 2015). Studies also indicate that the relationship between employment and mental health can vary by gender. Women, in particular, may experience different stressors or benefits from employment relative to men, affecting their mental health differently. This highlights the need to consider gender-specific approaches when addressing employment and mental health issues. These findings collectively suggest a positive relationship between employment and mental health, where employment tends to be associated with better mental health outcomes (Figure 10).

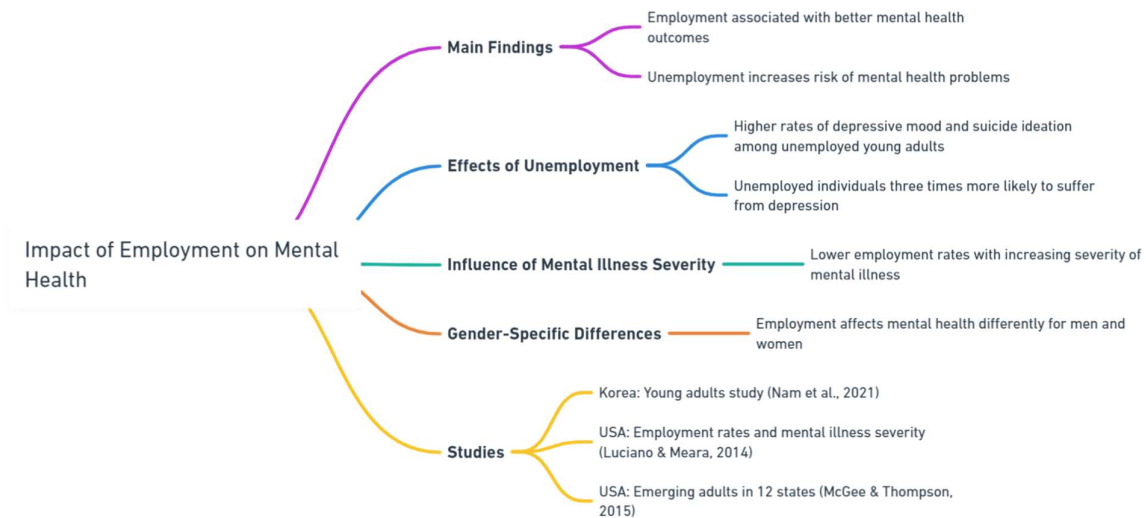


Figure 10. Relationships between employment and mental health.

- NII: in Italy, regions vary significantly in terms of economic development, cultural attitudes, social services, and healthcare access. Wealthier regions, often with higher levels of income inequality, might also have better overall healthcare infrastructure, including mental health services. This could result in higher mental health index scores, reflecting better access to care and more resources for mental health management. Italian regions have diverse cultural backgrounds, which can influence community support systems and social capital differently. In some cases, regions with higher inequality might still possess strong family bonds and community networks that support mental health. These social structures could buffer the psychological impact of economic disparities. The way mental health index is measured might capture aspects of well-being that are less directly impacted by income disparities. The mental health index might reflect acute distress more than chronic socioeconomic stressors, or the population surveyed may perceive their well-being in ways that are not immediately impacted by financial inequality. Sometimes, a rise in income inequality is associated with economic growth or recovery phases where certain segments of the population might experience rapid increases in income, raising their perception of well-being faster than inequality can negatively impact it. In some Italian regions, recent economic improvements could temporarily elevate mental health perceptions. There could also be a psychological resilience factor at play, where individuals in regions with higher inequality have adapted to the disparities, with less impact on their perceived mental health than expected. This might be particularly true in regions with historical disparities where communities have developed

copied mechanisms. Understanding these dynamics fully would require a deeper analysis of the specific socioeconomic, cultural, and healthcare factors at play in different Italian regions. Further research could explore whether these trends hold over time and how specific interventions could target mental health improvements particularly in regions with high inequality (Figure 11).

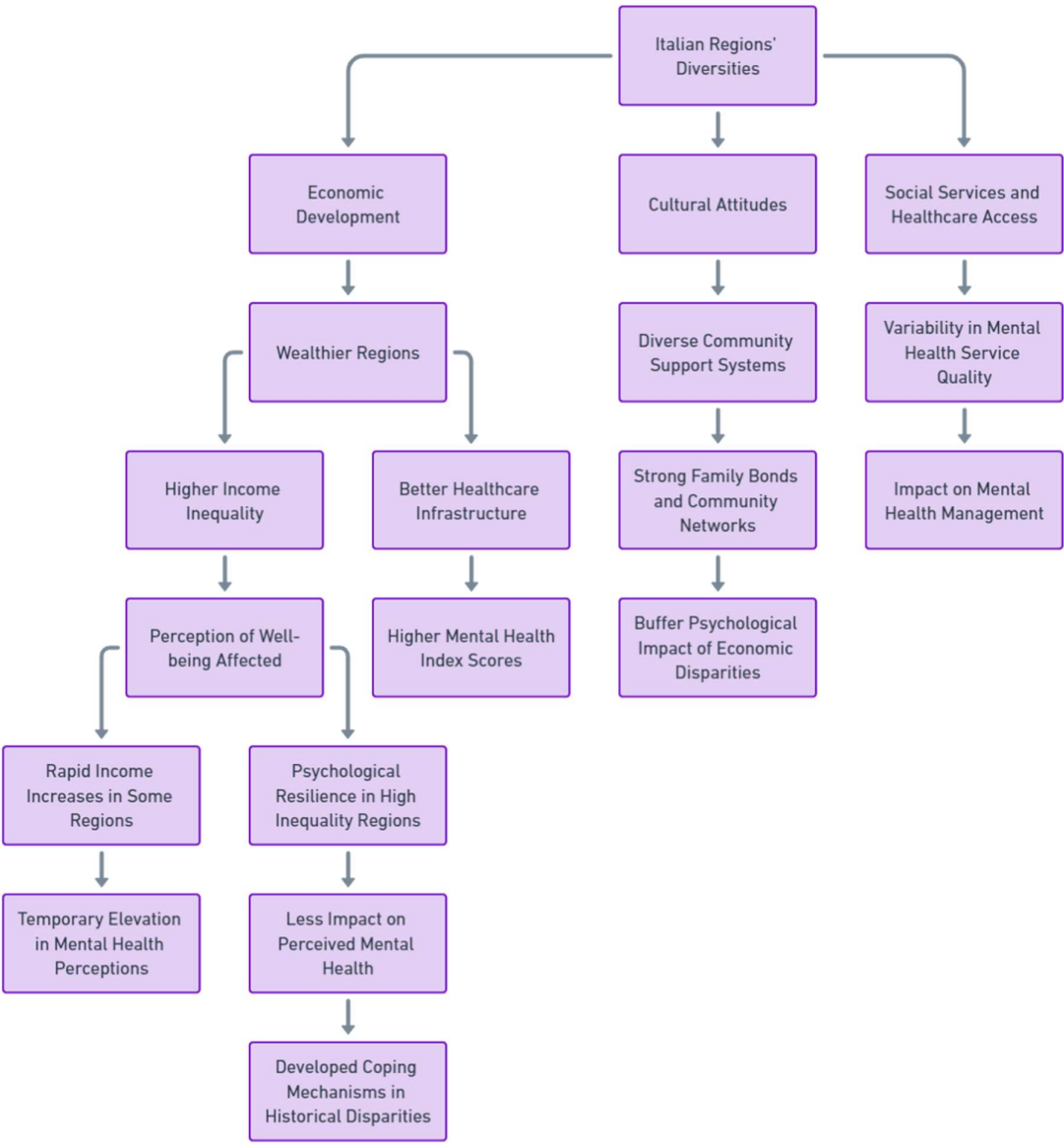


Figure 11. Relationships between net income inequality and mental health index.

- SWFR: satisfaction with family relationships has a significant impact on the mental health index, influencing various dimensions of psychological well-being, including anxiety, depression, and overall emotional and psychological health. Research indicates that a positive family environment, characterized by open expression of feelings, support, and low conflict, is associated with higher life satisfaction and lower levels of depression and anxiety.

Satisfaction with family relationships can buffer against psychological distress and contribute to higher scores on the mental health index (Liu, 2023). Another study explored psychological well-being across different family generations, finding that satisfaction with family and social relationships contributed significantly to mental health across the adult life span. This suggests that positive family dynamics are beneficial for mental health at all ages, reinforcing the importance of stable and supportive family relationships (Hitchcott et al., 2017). The interplay between family satisfaction, physical health, and mental health was examined, revealing that individuals who are satisfied with their family relationships often experience better physical health and higher life satisfaction, which in turn positively influences their mental health index (Fastame, 2020) (Figure 12).

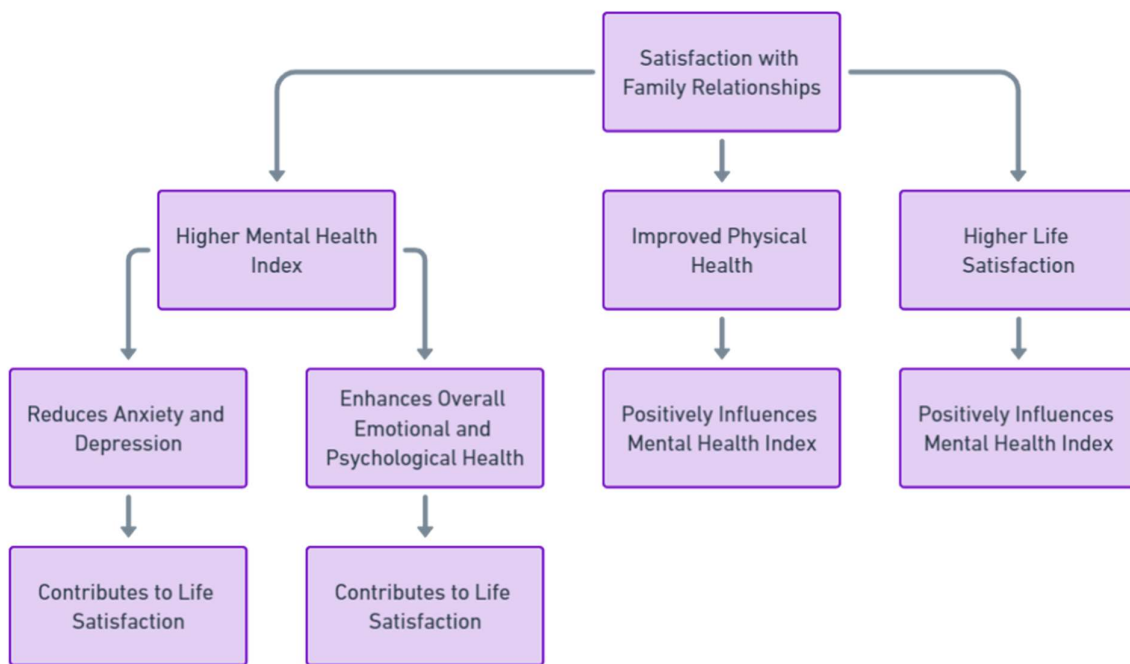


Figure 12. Relationships between satisfaction with family relationships and mental health.

There is a negative relationship between MHI and the following variables:

- ILS: the relationship between mental health indices and inadequate literacy skills among third grade secondary school students often shows a negative correlation, where students with lower literacy skills tend to have poorer mental health outcomes. McLean and Connor (2015) indirectly relates to how depressive symptoms in teachers negatively impact classroom learning environments and student outcomes, including literacy. Lower literacy skills in students can be compounded by less effective educational support, contributing to stress and lower self-esteem, which negatively impacts mental health. Nobre et al. (2022) discuss the concept of psychological vulnerability, which can be exacerbated by academic struggles such as poor literacy skills. The inability to meet academic standards can increase stress, anxiety, and other mental health issues in adolescents (Nobre et al., 2022). Miles and Stipek (2006) shows how literacy achievement correlates with social behaviors, including negative



behaviors when literacy skills are inadequate. Poor literacy achievement can lead to frustration and aggression, impacting mental health. Arnbak (2004) highlights how inadequate literacy can directly threaten educational achievement, with significant implications for self-perception and mental well-being. Students who consistently perform poorly in literacy may develop chronic stress and decreased self-esteem, contributing to a lower mental health index (Figure 13).

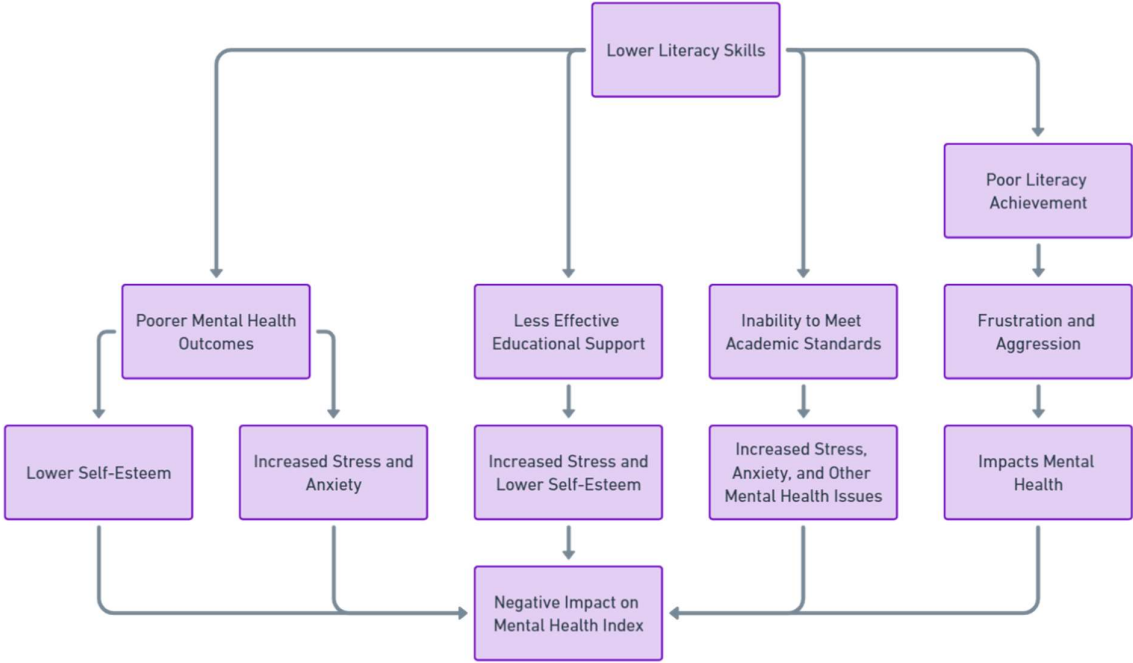


Figure 13. Relationships between inadequate literacy skills and mental health.

- EFJ: the negative relationship between the Mental Health Index and being employed in fixed-term jobs for at least 5 years can be attributed to several factors related to job insecurity and the psychological impact of non-permanent employment. Research shows that job insecurity, a common issue with long-term fixed-term employment, is consistently associated with poor mental health outcomes. The stress of uncertain job continuity can lead to increased anxiety, depression, and overall lower mental health indices. This effect is noted to be particularly strong in environments where fixed-term contracts are prevalent, leading to a significant level of job insecurity and stress among employees (Hünefeld & Köper, 2016) (Figure 14)

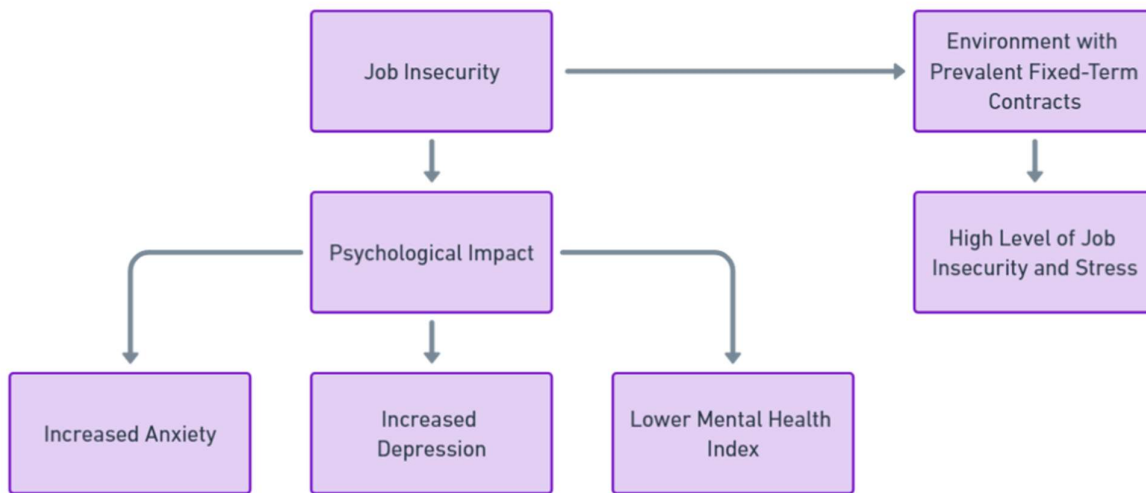


Figure 14. Relationships between job insecurity and mental health.

- POI: the negative relationship between the Mental Health Index and the perception of employment insecurity is a well-documented phenomenon that can have profound effects on employees' psychological well-being. This relationship is supported by research that highlights how the fear of job loss and the uncertainty associated with insecure employment can lead to a range of negative mental health outcomes. Russo and Terraneo (2020) found that job insecurity significantly worsens mental well-being by enhancing the worker's sense of unpredictability and reducing their sense of agency. This study underscores that the psychological impact of job insecurity is a critical factor in mental health deterioration across both permanent and temporary workers, highlighting its pervasive effects regardless of employment status. Watson and Osberg (2018) indicate that job insecurity, both perceived and actual, is associated with increased psychological distress among Canadian workers. This study emphasizes that the stress of potential job loss is a significant predictor of mental health issues, affecting a wide demographic across different industries. Rajani et al. (2016) provide robust evidence that job insecurity leads to significant mental health declines, exacerbated by financial difficulties. Selenko and Batinic (2013) investigates how perceptions of job insecurity impact access to the psychological and financial benefits of employment. Their study concluded that perceived lack of job security not only affects mental health directly but also by diminishing access to work-related benefits which are crucial for psychological well-being. This research highlights the layered impacts of job insecurity, affecting both direct mental health outcomes and the broader employment benefits that support overall well-being. These studies collectively illustrate the profound impact of perceived job insecurity on mental health, showing that it can lead to stress, anxiety, and depression, thereby lowering the overall Mental Health Index among affected workers (Figure 15).

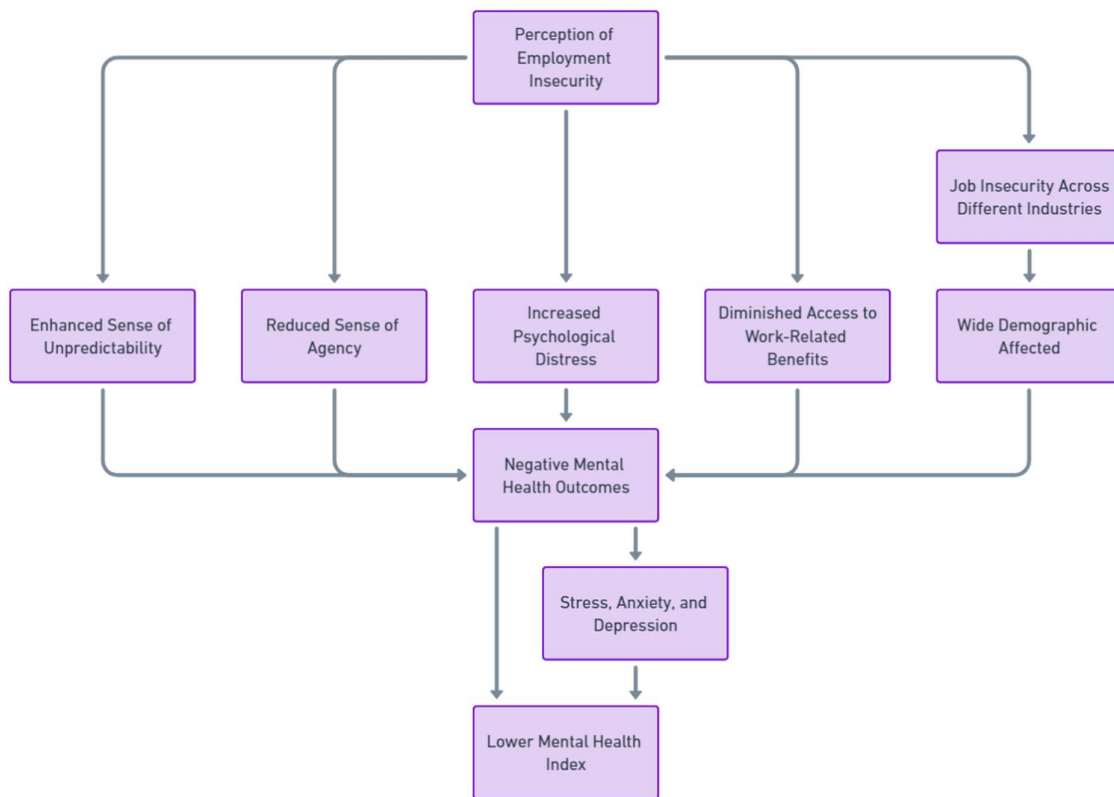


Figure 15. Relationships between perception of employment insecurity and mental index.

- HCO: the negative relationship between the Mental Health Index and housing cost overburden is supported by various studies that investigate the effects of housing affordability on mental health. High housing costs relative to income can lead to financial stress, which in turn has detrimental effects on mental health. Ghazali et al. (2021) focuses on the mental health conditions of low-income groups living in low-cost housing in Kuala Lumpur. It reveals that a significant percentage of residents experience depression, anxiety, and stress, which are exacerbated by the conditions of their living environment, highlighting the broader impact of housing affordability on mental health. The findings suggest that not just the cost, but also the quality of housing, significantly affects mental health outcomes. Singh et al. (2019) examines how unaffordable housing impacts mental health through financial hardship and reduced social support. It uses data from the Household, Income and Labour Dynamics in Australia Survey to show that increased housing costs significantly worsen mental health. This effect is particularly mediated by financial hardship, highlighting the stress and anxiety caused by high living costs. Bentley et al. (2011) focuses on the long-term effects of housing affordability stress on mental health, revealing that prolonged exposure to high housing costs negatively impacts mental health. It further illustrates that the impact varies by gender, with men showing a stronger dose-response relationship, underscoring the cumulative mental health impact of sustained high housing costs. Kavanagh et al. (2016) examines how housing tenure and affordability impact mental health following the acquisition of a disability. The findings suggest that secure and affordable housing can buffer against the mental health deterioration associated with disability acquisition, indicating the broader protective effects of affordable housing on mental health (Figure 16).

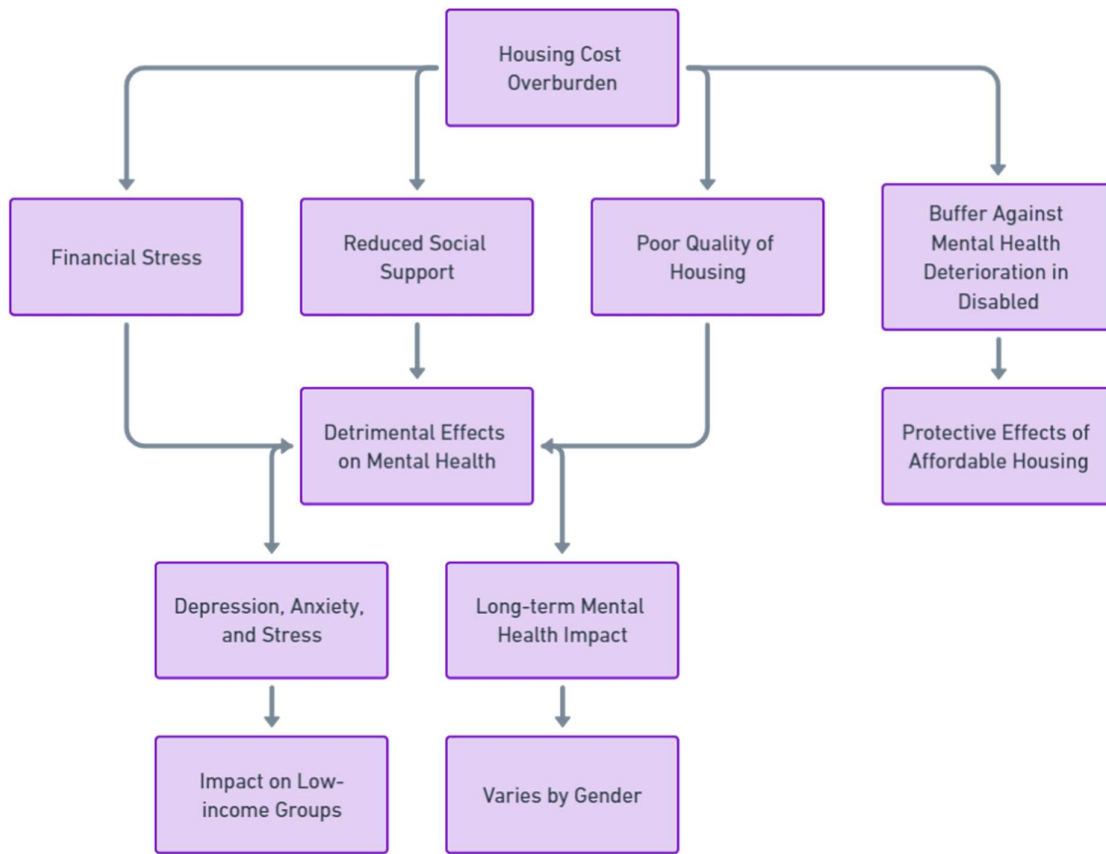


Figure 16. Relationships between housing costs overburden and mental health.

Our results show a positive relationship between the value of the mental health index and the value of the analyzed variables attributable to the S-Social dimension within the ESG model. That is, an improvement in the social condition of the population found in the Italian regions tends to be positively associated with an improvement in the mental health index.

### 2.3) Mental Health Index and G-Governance

Below we analyze the relationship between the value of the mental health index and a set of variables relating to governance detected in the Italian regions. The data is analyzed for the period between 2004 and 2023 from the ISTAT-BES database. To estimate the model, panel data models were used, in particular the panel data model with fixed effects, and the panel data model with random effects. The following equation was estimated:

$$MHI_{it} = \alpha + \beta_1(DCP)_{it} + \beta_2(P)_{it} + \beta_3(ONEPC)_{it}$$

Where  $i=20$  and  $t=[2004;2023]$ .

We find that MHI is positively associated to:

- ONEPC: greater internet use is associated with reduced probability of depression among older adults, suggesting that internet access can help mitigate loneliness and social isolation which are critical factors affecting mental health (Cotten et al., 2014). However, internet use does not necessarily have a straightforward positive impact on all aspects of mental health. For example, internet use among adolescents did not show a significant relationship with

depression but was associated with lower anxiety, indicating that the effects may vary by age and specific mental health outcomes (Thom et al., 2018). A meta-analysis highlights that while there is a slight detrimental effect of internet use on psychological well-being overall, the impact is small and varies greatly depending on individual factors such as age and type of internet use (Huang, 2009). Increased access to the internet has been found to provide mental health benefits by improving social support and reducing loneliness among older adults, which in turn enhances life satisfaction and psychological well-being (Heo et al., 2015). Overall, having at least one computer and internet connection in the family tends to have a positive impact on mental health, particularly in reducing depression among older adults and lowering anxiety in adolescents. This benefit is largely due to the ability of internet access to reduce social isolation and enhance social support, although the effects can vary based on age and other individual factors (Figure 17).

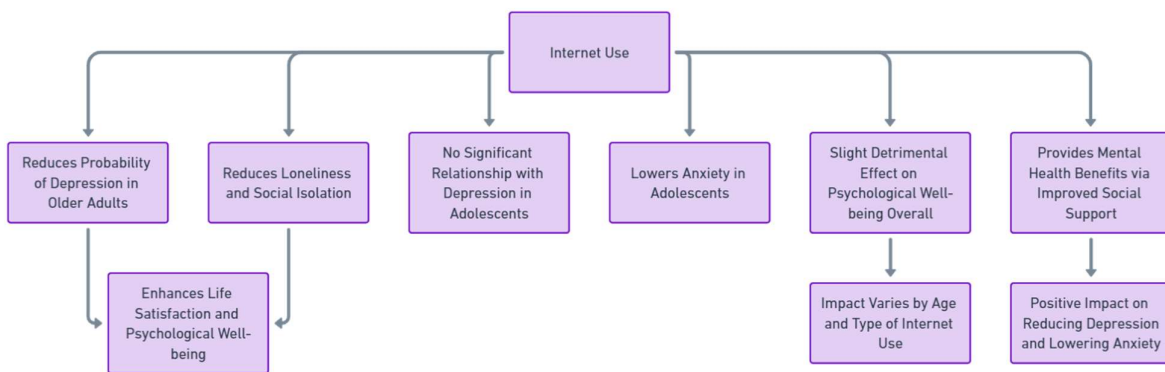


Figure 17. Relationships between internet use and mental health.

We also find that MHI is negatively associated to:

- DCP: research on the relationship between the Mental Health Index and the duration of civil proceedings indicates that prolonged legal disputes can have detrimental effects on mental health. Negative experiences and perceptions of civil hearings, such as feeling coerced or perceiving the process as unfair, are associated with worse mental health outcomes. Individuals who experienced civil hearings negatively showed lower interpersonal trust and a weaker therapeutic alliance with clinicians, which can impede mental health recovery (Donnelly et al., 2011). The stress associated with prolonged civil proceedings, especially those that involve mental health review tribunals, can lead to increased psychological distress. This is evident from research showing that participants in these tribunals often do not see improvements in their mental health, and the adversarial nature of the proceedings can exacerbate stress and anxiety (Myers, 1997). Prolonged civil proceedings can negatively affect mental health by creating stressful and adversarial environments that undermine trust in the legal process and strain individuals' psychological well-being. Efforts to streamline such processes and reduce their adversarial nature may help mitigate these effects (Figure 18).

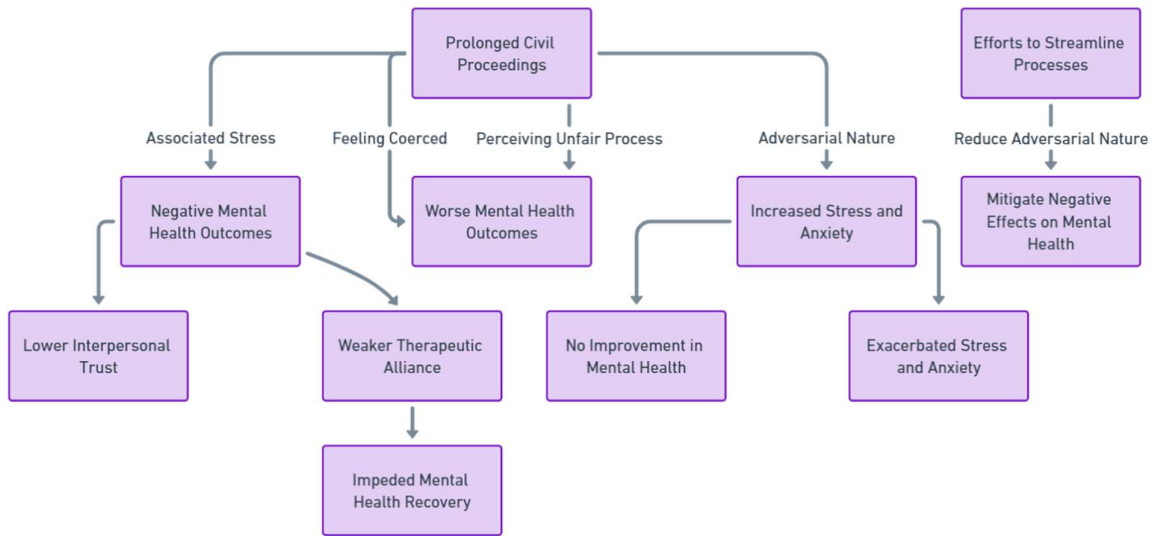


Figure 18. Relationships between prolonged civil proceeding and mental health.

- P: while there isn't direct research on the relationship between the Mental Health Index and pickpocketing, the concept of safety, including personal and community safety, can be associated with mental health outcomes in various contexts. Public safety personnel, such as police officers and firefighters, experience higher rates of mental health conditions than other workers, influenced by organizational factors like lack of supervisor support and negative workplace culture. These factors impact their mental health significantly (Edgelow et al., 2022). Fear of crime in inner-city areas has been found to negatively impact mental health, creating "time-space inequalities" where individuals, particularly vulnerable groups like low-income mothers, are deterred from social activity and community involvement due to safety concerns, further impacting their mental health (Whitley & Prince, 2005). These studies suggest that safety, or the lack thereof significantly influences mental health, supporting the idea that in areas where pickpocketing (a safety concern) is prevalent, there might be a negative impact on the Mental Health Index. Further research specific to pickpocketing and its direct effects on mental health would be needed to draw more concrete conclusions (Figure 19).



Figure 19. Relationship between pickpocketing, understood as an approximation of the feeling of safety, and mental health.

Our results show that regions that have better outcomes in terms of Governance also have higher levels of Mental Health Index-MHI.

### 3) Conclusions

This research has utilized a mixed-methods approach, integrating quantitative data analysis and qualitative insights, to draw correlations between the Mental Health Index-MHI and ESG factors, offering a detailed landscape of mental health across Italian regions. Environmental Factors play a crucial role in shaping mental health outcomes, as evidenced by the variations in MHI scores across regions. The study highlights that areas with better environmental conditions—such as more green spaces, lower pollution levels, and robust environmental policies like those in Trentino-Alto Adige/Südtirol—tend to have higher MHIs. This suggests that proactive environmental management and sustainable practices are not merely ecological concerns but are integral to public health strategies. The implications are clear: enhancing urban greenery, reducing environmental pollutants, and strengthening climate resilience are essential steps in promoting better mental health outcomes. Social factors are equally significant, with social determinants like education, employment, and community dynamics deeply influencing mental well-being. Regions with higher employment rates, better educational opportunities, and stronger social networks exhibit better mental health metrics. For instance, Lombardia and Emilia-Romagna, known for their robust economies and cohesive social structures, consistently show higher MHI scores. This underlines the importance of social policies that foster inclusive and supportive communities, equitable access to quality education, and comprehensive employment benefits that collectively enhance mental well-being. Governance has a pivotal impact on mental health, particularly through the distribution and efficacy of healthcare services. The disparity in MHI between regions such as Campania, with lower scores, and more affluent northern regions underscores the critical role of governance in healthcare. This points to the necessity for government intervention to ensure that mental health services are equitable and that policies are responsive to the unique challenges of each region. By underscoring the complex yet tangible ways in which ESG factors influence mental health across different Italian regions, the article provides a foundational blueprint for crafting more resilient, inclusive, and mentally healthy communities. As Italy continues to navigate its regional disparities, the insights from this research will be instrumental in guiding targeted health interventions and fostering an environment where mental well-being is a shared priority, ultimately leading to a more equitable distribution of health resources and better overall public health outcomes.

### 4) Abbreviations and Variables

Variables of the Model			
ESG Components	Variables	Acronym	Description
	Mental Health Index	MHI	The mental health index is a measure of psychological distress obtained from the synthesis of the scores obtained by each individual aged 14 years and over on 5 questions extracted from the SF36 questionnaire (36-Item Short Form Survey). The questions refer to the four dimensions main mental health issues (anxiety, depression, loss of behavioural or emotional control and psychological well-being). The index varies between 0 and 100, with better conditions of psychological well-being as the value of the index increases. Source: ISTAT-BES.
E-Environment	Concern about landscape deterioration	CLD	Percentage of people aged 14 and over indicate the ruin of the landscape caused by excessive building construction among the five most worrying environmental problems for all people aged 14 and over. Source: ISTAT-BES.
	Consecutive days without rain	CDR	Maximum number of consecutive days in the year with daily precipitation less than or equal to 1 mm. Source: ISTAT-BES.

	Population exposed to the risk of landslides	PERL	Percentage of the population residing in areas with high and very high landslide danger. Source: ISTAT-BES.
	Wastewater Treatment	WT	Percentage share of polluting loads flowing into secondary or advanced plants, in equivalent inhabitants, compared to the total urban loads (Actu) generated. Source: ISTAT-BES.
	Soil waterproofing from artificial cover	SWAC	Percentage of waterproofed soil on total land area. Source: ISTAT-BES.
	Contaminated sites	CS	Impact of sites of national interest (Sin) and the sites under the jurisdiction of the regions on the territorial surface, values per 1,000. Source: ISTAT-BES.
	Concern about climate change	CACC	Percentage of people aged 14 and over who consider climate change or the increase in the greenhouse effect and the ozone hole among the 5 priority environmental concerns. Source: ISTAT-BES.
S-Social	Young people who do not work or study (NEET)	NEET	Percentage of people aged 15-29 neither employed nor in education or training out of the total number of people aged 15-29. Source: ISTAT-BES.
	Reading books and newspapers	RBN	Percentage of people aged 6 and over who have read at least four books a year (paper books, e-books, online books, audio books) for reasons not strictly scholastic or professional and/or have read newspapers (paper and/or online) line) at least three times a week for all people aged 6 years and over. Source: ISTAT-BES.
	Employment rate (20-64 years)	ERY	Percentage of employed people aged 20-64 in the population aged 20-64. Source: ISTAT-BES.
	Net income inequality (s80/s20)	NII	Ratio of total equivalent income received by the 20% of the population with the highest income and that received by 20% of the population with the lower income. Source: ISTAT-BES.
	Satisfaction with family relationships	SWFR	Percentage of people aged 14 and over who are very satisfied with family relationships out of the total number of people aged 14 and over. Source: ISTAT-BES.
	Inadequate literacy skills (third grade secondary school students)	ILS	Percentage of students in classes III of lower secondary school who do not reach a sufficient level (Level I + Level II of 5 levels) of alphabetic proficiency. Source: ISTAT-BES.
	Employed in fixed-term jobs for at least 5 years	EFJ	Percentage of fixed-term employees and collaborators who have started their current job at least 5 years ago out of the total number of fixed-term employees and collaborators. Source: ISTAT-BES.
	Perception of employment insecurity	POI	Percentage of employed people who believe it is probable that they will lose their current job in the next 6 months and that it is little or not at all probable that they will find another similar one out of the total number of employed people. Source: ISTAT-BES.
	Housing cost overburden	HCO	Percentage of people living in families where the total cost of the home in which they live represents more than 40% of the net family income. Source: ISTAT-BES.
G-Governance	Duration of civil proceedings	DCP	Actual average duration in days of the proceedings settled in the ordinary courts (Civil Sector - Sicid Area net of the activity of the Guardianship Judge, the Preventive Technical Assessment on social security matters and from 2017 the Verbalisation of the sworn declaration). Source: ISTAT-BES.
	Availability of at least one computer and Internet connection in the family	ONEPC	Percentage of families who have an Internet connection and of at least one personal computer (including computers desktop, laptop, notebook, tablet; smartphones, PDAs with telephony functions are excluded, e-book reader and video game console). Source: ISTAT-BES.
	Pickpocketing	P	Victims of pickpocketing per 1,000 inhabitants. The number of victims is calculated using data on victims who reported the pickpocketing to the police, corrected with the number of victims they do not have reported taken from the Citizen Safety Investigation, through a specific correction factor for geographical distribution and one by sex and age group. Source: ISTAT-BES.

Table 8. Variables of the Model

## 5) Declarations

*Data Availability Statement.* The data presented in this study are available on request from the corresponding author.

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*Declaration of Competing Interest.* The authors declare that there is no conflict of interests regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication.



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