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Healthier Digital Lives

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We **believe** that unrestricted or unregulated access of minors and young people to the Internet — via tablets or smartphones — and to **digital services designed without considering their mental health**, is one of the determining factors of the results we have obtained in our research.

This **analysis** highlights that we have a **serious problem** in **Spain** concerning mental health in children and adolescents under 20 years old, **more pronounced in girls aged 11 to 20 years old**, who also show a high **correlation with eating disorders and obesity.**

Since **2012**, the year in which High-Speed Internet penetration reached 50% of Spanish households, tablets and smartphones have become easily accessible and there has been a widespread social acceptance of minors using social media globally. As a result, **cases of mental illness in children and adolescents have seen an explosive increase**, while **patterns of suicides** among teenagers have become more entrenched.

These phenomena reach their highest impact levels in the months immediately following the **Covid-19** pandemic — months of maximum digital media usage across all age groups — resulting in a surge in hospitalization costs concerning children and young people primarily due to mental health issues.

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Technology offers remarkable opportunities for our youth, but navigating the digital world is a complex task that children cannot handle alone. Pediatricians and medical professionals recommend that there be no screen time for children aged **0 to 2 years**. For children aged **3 to 5 years**, it is recommended not to exceed one hour of screen time per day with joint supervision, and less is better.

The following recommendations are for parents and caregivers, focused on guidance, communication, and supervision once children are old enough to independently consume digital media. Additionally, on our website, we have included additional information from the **Spanish Pediatric Association** so that any family can create a personalized media plan.

1 **Set a screen time limit for your child**

Create norms around times where phones are not allowed (at the meal times, during movie night, after bedtime), and adhere to the WHO recommendations of less than 2 hours of sedentary recreational screen time for kids age 5-17. Keep in mind, less is better.

2 **Monitor Online Activity**

Be aware of how your child spends time online, which platforms they use and who they interact with both online and offline. Use available tools to monitor time spent online and ensure protection of your child's personal data.

3 **Encourage Open Communication**

Establish a safe environment for you and your child to discuss their experiences—both positive and negative—on social media.

4 **Provide Proactive Support**

Be a supportive listener and a source of trust for your child as they navigate a wide array of online and offline experiences.

5 **Stay Informed**

Remain informed about the features and trends related to social and digital media that may impact your child's social development.

6 **Encourage Offline Activities**

Set up structured time or a routine for social and physical activities with friends and family, like sports or arts. Experts recommend that kids and adolescents from age 5-17 are active at least 60 minutes per day.

7 **Role Model Healthy Behavior**

Demonstrate healthy and positive behavior in your own interactions and limit screen time yourself.

8 **Emphasize Digital Citizenship**

Teach your child about the potential dangers that exist online, and the importance of respectful and responsible use. Explain the impact of their digital footprint.

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About Us

This project has been carried out by researchers and analysts from the cyber-intelligence and digital risk analytics firm, **Alto Intelligence**, with the invaluable support of **Dr. Manuel Carnero (MD, PhD)** from the San Carlos Clinical Hospital, Surgeon, Researcher at CNIC, and Statistical Advisor to various national and international medical journals.

We are a **non-profit project dedicated to empowering healthier digital lives.** With this analysis, we seek to improve understanding of the effects of technology among the youth, fostering greater collaboration among parents, educators, researchers, and policymakers in defending children and adolescents against harms stemming from inappropriate or abusive use of social media and digital platforms. Our efforts have focused on understanding the current situation to prevent harms anticipated to arise from the proliferation of services based on generative artificial intelligence.

The mission of this project is twofold: **to expand knowledge** on this important topic and to **drive civil and policy actions** for regulatory changes that promote the mental well-being of our younger generations in an ever-evolving digital environment.

All data sources used in this project are public, and the main ones are detailed in the Annex of this document along with the methodology and scientific background of this study. Our intention is to **encourage other organizations in other countries to conduct the same analysis with local data** to understand the extent to which we are experiencing the effects of a global phenomenon. Therefore, we offer the methodology and scripts used for the analyses in this study as “Open Source”.

To Stay Informed

WEB
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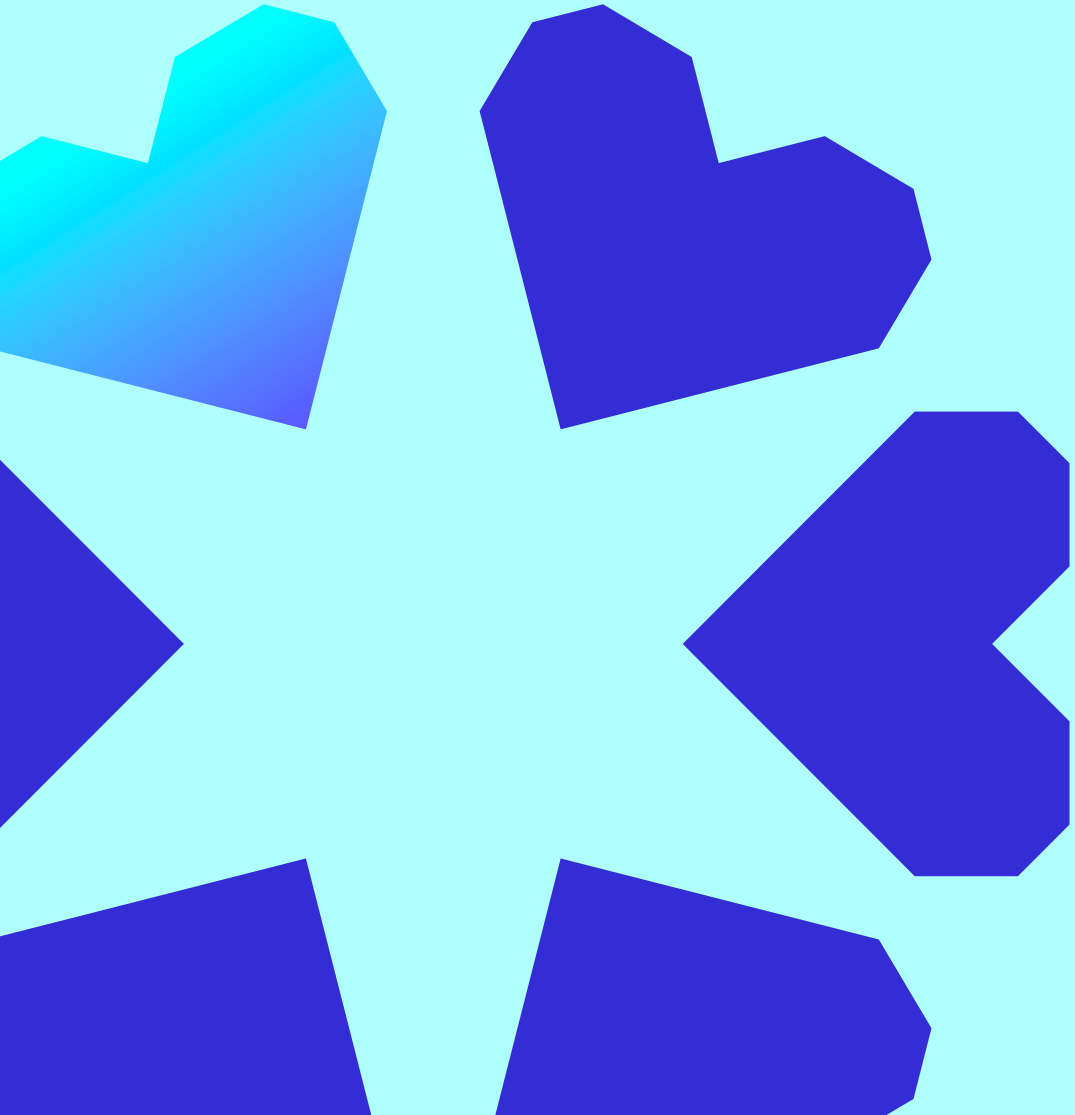

Research

Internet Use & Mental Illness in Children & Adolescents in Spain

1997 - 2021

Content

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Executive Summary

1. **Mental illnesses among individuals under 20 years old in Spain have experienced an explosive increase since 2012, particularly in girls. This surge peaked during the months immediately following the onset of the Covid-19 pandemic in Spain, with the historical series reaching its maximum with a +300% growth compared to 1997.**

2. **Adolescents have progressively experienced fewer injuries, traumas, or bone fractures since the late 1990s, and more prominently in the last decade, indicating a likely severe decrease in physical activity. There is a strong correlation, both in boys and girls, between the decrease in physical activity and the increase in mental illnesses. Similarly, the evolution of all diagnoses of childhood obesity and eating disorders from 1997 to 2021 in children and adolescents aged 0 to 20 years shows a constant increase in cases in both sexes, although from 2011-12 onwards, there has been a very significant increase, especially in girls, which has intensified notably during Covid-19. The correlation between obesity cases and eating disorders with mental health problems is strong (0.95 out of 1 in girls).**

3. **Arenas-Arroyo et al. (2023)** had already concluded that for every **increase of one standard deviation (SD) in the penetration of High-Speed Internet in households in Spain (HSI, fiber optic, fiber to the home), there was a +13.3% increase in cases of mental health disorders, with a particularly high incidence in cases of anxiety, mood disorders, substance abuse, self-harm, and suicide attempts.** In other words, a causal relationship, as well as correlation, is demonstrated between a greater increase in internet access speed and the increase in cases of mental illness. It is precisely throughout 2012 **when our analysis estimates that at least a 50% penetration of High-Speed Internet (fiber) in households was reached in all autonomous communities. In our study, when determining the correlation in the complete period 2007 - 2021, the evidence is very clear: with the exception of Boys aged 16-20 years old, where correlations vary significantly between strong and very weak or without apparent correlation in some autonomous communities, in the rest of the age groups, and especially with girls, there is a predominance of strong correlations in most autonomous communities between access to High-Speed Internet at home and mental health problems.**

4. **From 2011-12, there is also evidence of a change in suicide patterns, increasing**, and it is again during the Covid-19 stage where a greater total increase is observed. These data clearly show that the problem of mental health in individuals under 20 years old is real and is not the result of a greater number of medical diagnoses due to increased social and medical awareness or sensitivity.

5. The analysis of **costs per hospitalization for primary diagnoses of mental illness reveals two worrying trends: on the one hand, the cost has progressively increased by more than 500% in recent years**, and over 10% of total hospital costs related to mental illnesses in Spain are dedicated to treating individuals under 20 years old. Additionally, there is a **concerning trend in the costs dedicated to the care of girls, which already account for 75% of the total cost dedicated to individuals under 20 years old.**

•It is important to remember and reiterate that the Internet, as a technology, is neutral, that is, it is a capacity for accessing information and services. The Internet is already a fundamental element in the economies of countries and in their productive capacity, and is therefore essential as we experienced during the Covid-19 crisis. What this analysis and other similar ones suggest very clearly is that access to the Internet, and especially to social networks, from smart devices (tablets, smartphones), without restrictions on usage times or types of content, by children or adolescents, can lead to very serious mental health problems.

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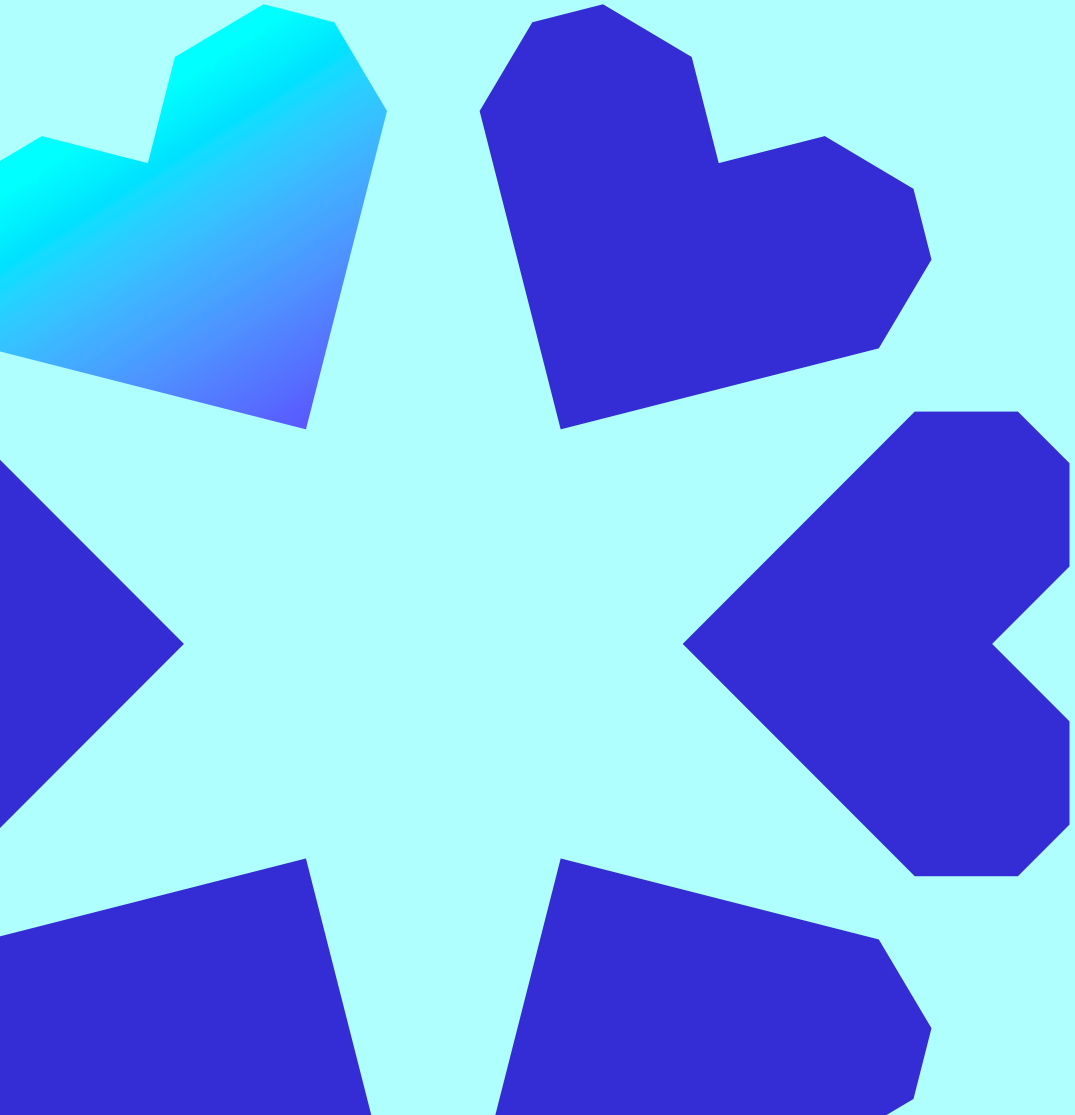
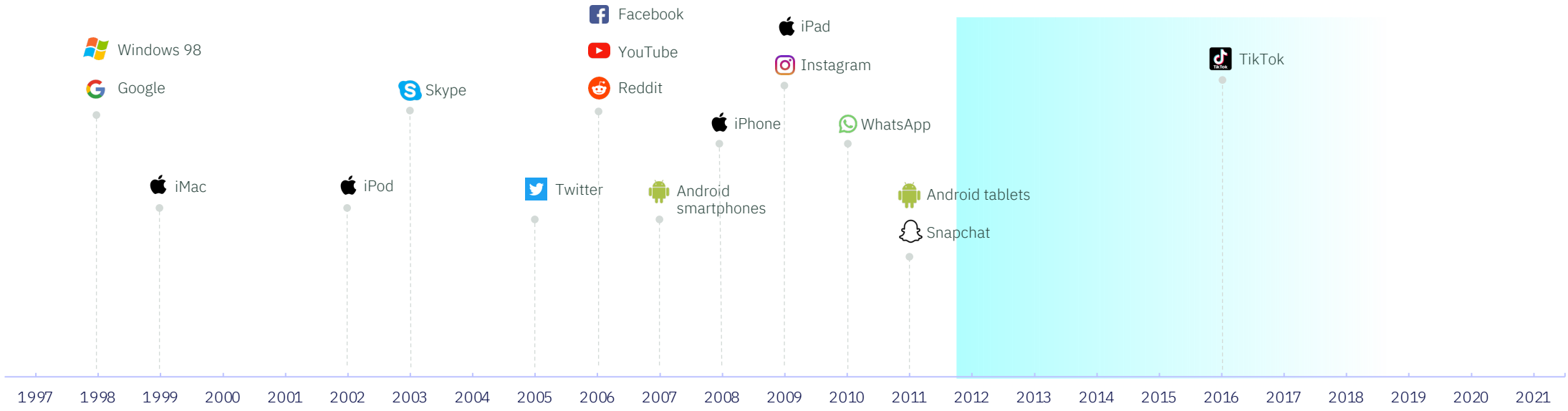


Temporal analysis of the initial dimensions of the research

Temporal evolution of the main *Internet access technologies and social media.*

Advances in devices with internet access and social media between 1997 and 2021. Since the beginning of 2012, unique conditions were present in Spain, as well as in the rest of the world: **the widespread use of smartphones and tablets expanded simultaneously with a wide variety of social networks and high-speed internet access.** Already active since the mid-2000s, the trend of massive social media usage solidified after the launch of Instagram, WhatsApp, Snapchat, and more recently TikTok.



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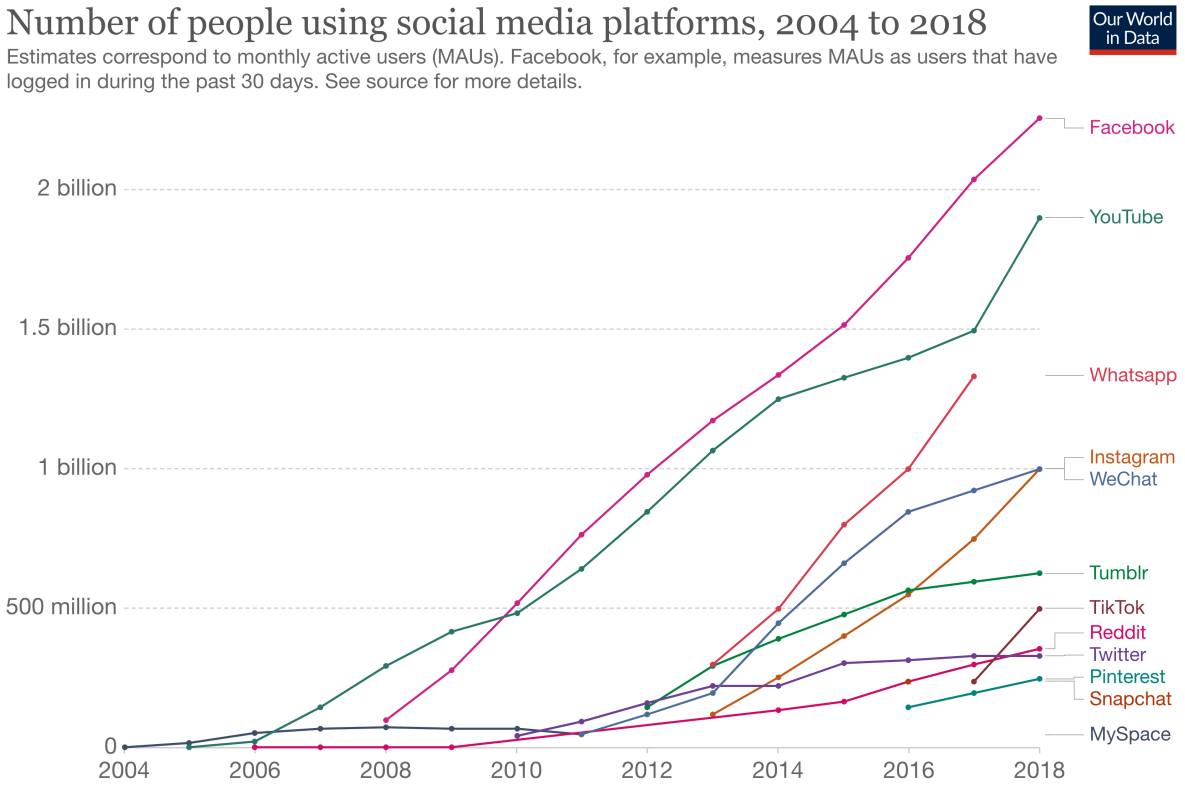
Social media users from 2004 to 2018, globally and locally.

Platforms like Facebook and YouTube were the first ones with global usage, although after 2012, extensive use of many other social networks also began.

The most visited social networks daily in **Spain** are:

- YouTube with an average time of 1 hour and 22 minutes
- TikTok with 1 hour and 21 minutes
- Instagram with an average of 1 hour and 13 minutes of daily usage Facebook with 1 hour
- Twitter (X) and LinkedIn have lower usage times: 48 and 37 minutes per day, respectively



https://ourworldindata.org/rise-of-social-media

https://unavidaonline.com/estadisticas-redes-sociales/

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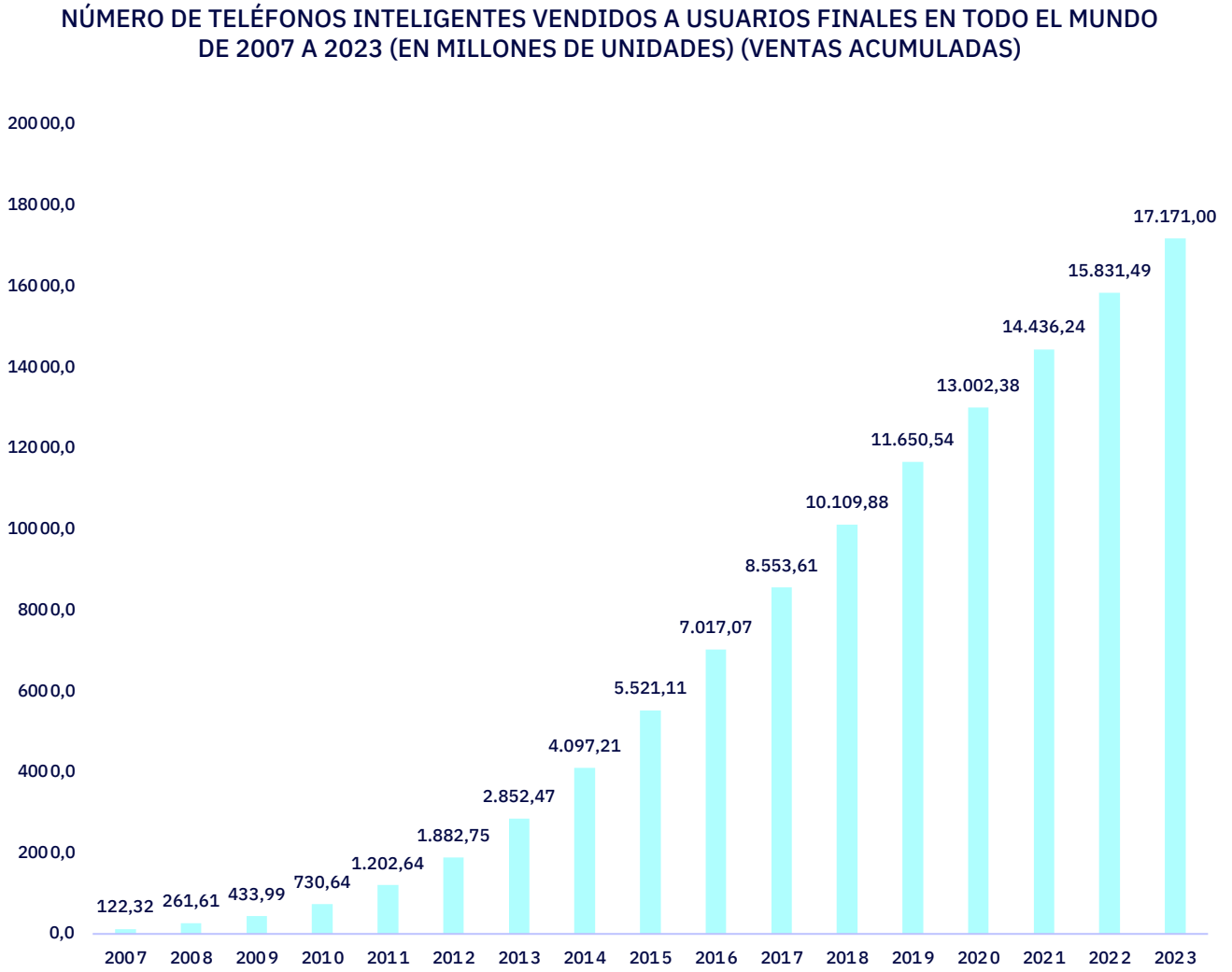
Smartphone sales between 2007 and 2023 (global cumulative sales) show that from 2011-2012, a relevant change occurs in the total accumulated phones on the planet. It is reasonable to think that this accumulation was concentrated in developed countries given the cost of such devices in those years.

During the year 2016, total sales of these devices accumulate to exceed the total population of the planet.



https://www.statista.com/statistics/263437/global-smartphone-sales-to-end-users-since-2007/

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Temporal evolution of mental illnesses in *young Spaniards between 1997 and 2021*

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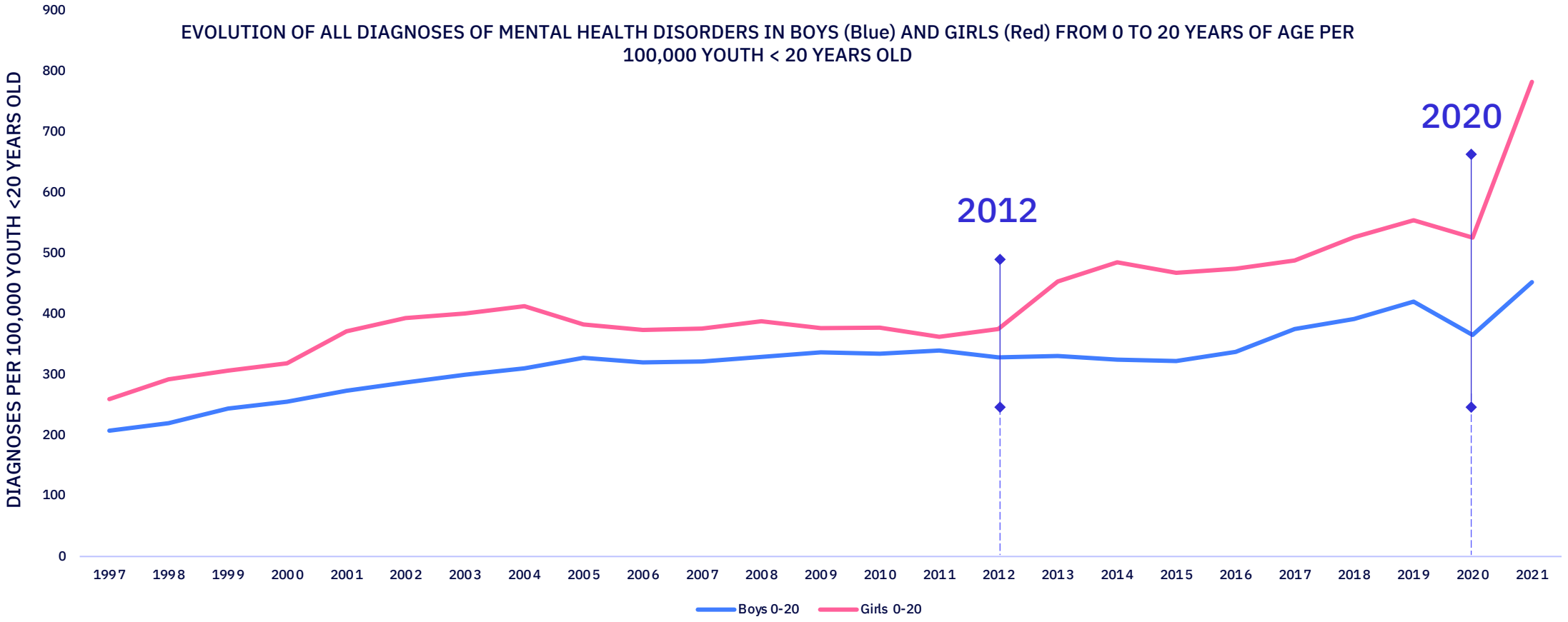
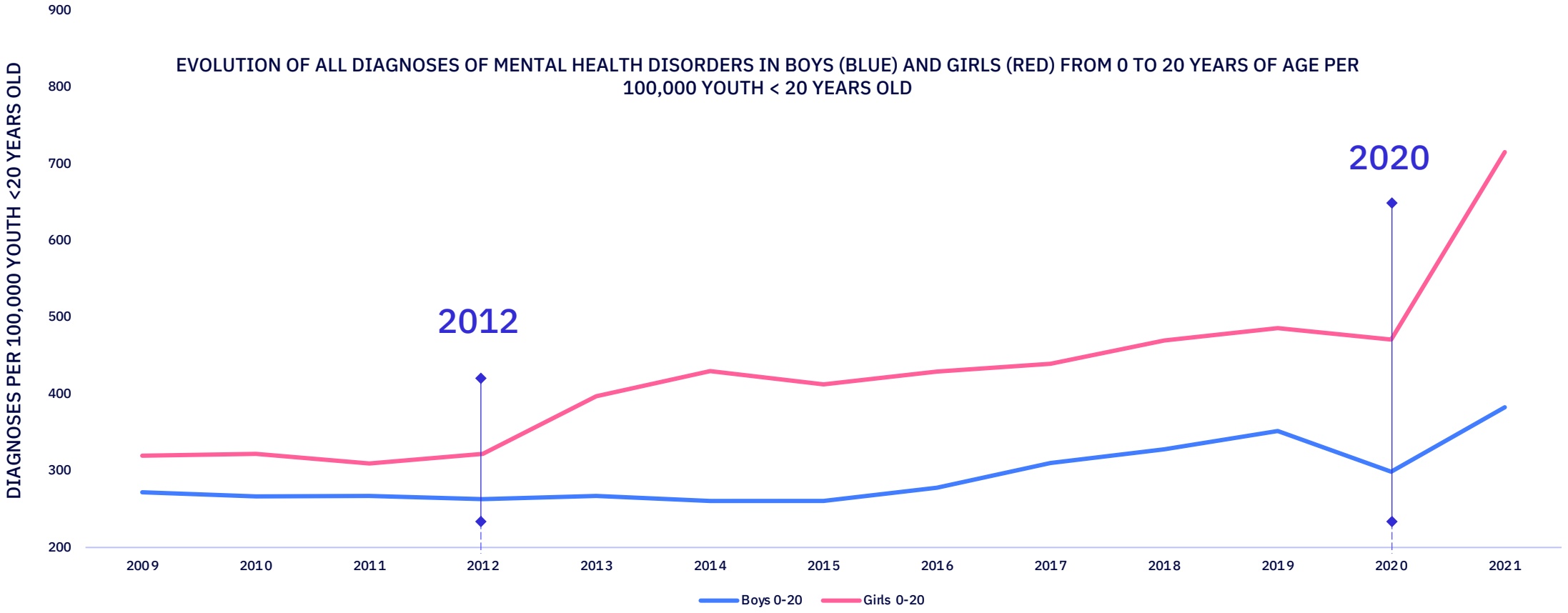
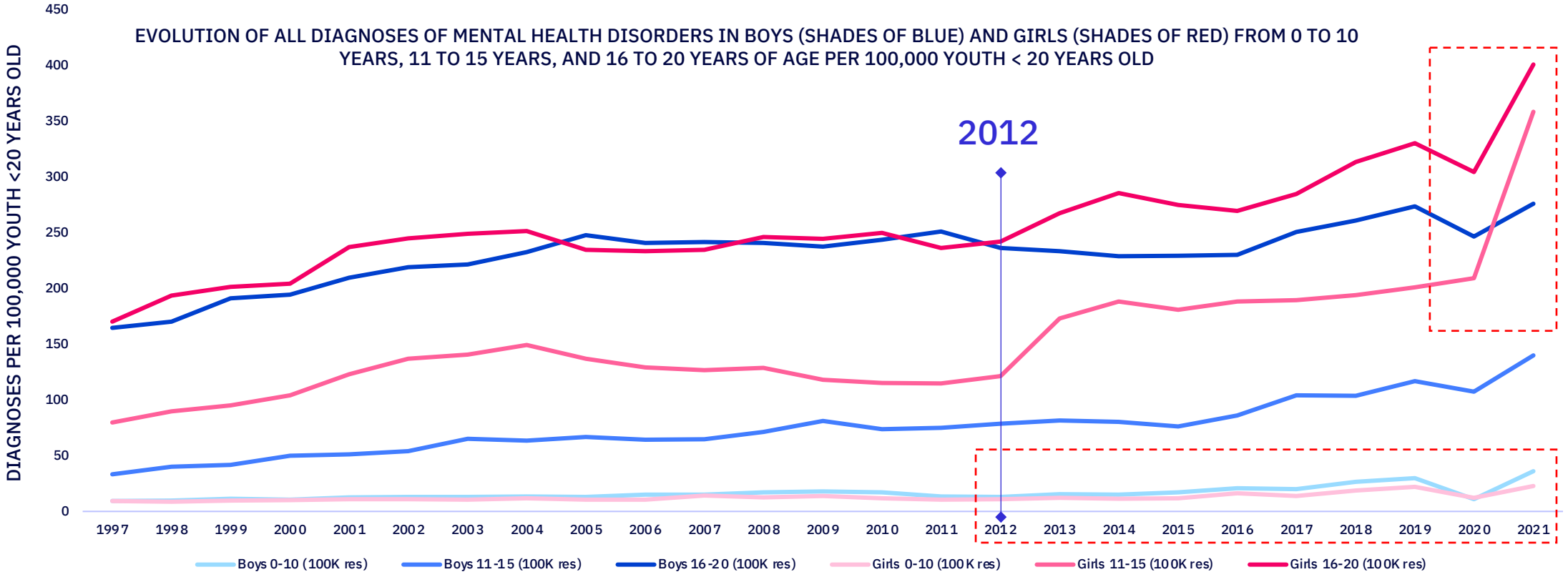
Mental illness as a primary and secondary diagnosis in boys and girls under 20 years old. Mental illness in individuals under 20 years old was progressively increasing from 1997 but always remained below 415 cases per 100,000 individuals. However, it is **from 2012 that the incidence begins its explosive rise, especially in girls, which culminates during the months immediately following the onset of the Covid-19** pandemic in Spain, reaching the **highest levels in the historical series with a +300% growth compared to 1997.**



Focus on 2009 - 2021. Over the previous graph, focusing on the most recent period confirms findings from other similar analyses outside of Spain: **it is girls who are most likely to suffer the impact of mental illnesses, especially from 2012 onwards** (as already referenced in studies by Arenas-Arroyo et al. (2023), Braghieri et al. (2022), Golin (2022), and McDool et al. (2020)). It is noteworthy that as a result of the Covid-19 crisis, the gap between boys and girls widens significantly once preventive Covid policies are relaxed and affected youth begin to receive medical attention.



Breakdown by age groups. For the first time in the historical series, at the **end of 2021, girls aged 11 to 15 surpass older boys, aged 16 to 20**, in mental illnesses, indicating that the **Covid-19 crisis has had a particularly significant impact on girls.** The detailed analysis of primary and secondary diagnoses – the main or secondary reason that prompts medical attention is mental illness – indicates that in girls, **primary diagnoses are the main contributors to this change in trend, meaning that mental illness is the primary cause of hospital data recording.** It is noteworthy that cases in girls aged 11 to 15 are **almost equal to those in girls aged 16 to 20, and the trend of increasing cases in children under 10 years old for both sexes is increasing.**



Description of the analyzed categories of Mental Illnesses

MOOD [AFFECTIVE] DISORDERS
This category includes disorders in which the primary disturbance is a change in mood or affect toward depression (with or without associated anxiety) or toward euphoria. The mood change is usually accompanied by a change in the overall level of activity; most other symptoms are secondary or easily understood in the context of the mood and activity change. Most of these disorders tend to be recurrent, and the onset of individual episodes often can be related to stressful events or situations.

SCHIZOPHRENIFORM, SCHIZOID, AND DELUSIONAL DISORDERS
This category brings together schizophrenia, as the most important member of the group, schizoid disorder, persistent delusional disorders, and a broader group of acute and transient psychotic disorders.

PERSONALITY AND BEHAVIOR DISORDERS IN ADULTS
This category includes a variety of clinically significant conditions and behavior patterns that tend to be persistent and seem to be the expression of the individual's characteristic lifestyle and way of relating to themselves and others.

NEUROTIC, STRESS-RELATED, AND SOMATOFORM DISORDERS
This category includes various disorders related to phobic anxiety, obsessive-compulsive behavior, severe stress reaction, dissociative [conversion] disorders, and somatoform disorders.

BEHAVIORAL SYNDROMES ASSOCIATED WITH PHYSIOLOGICAL AND PHYSICAL FACTORS
A group of disorders characterized by early onset (usually in the first five years of life), lack of persistence in activities requiring cognitive involvement, and a tendency to switch from one activity to another without completing any, along with disorganized, poorly regulated, and excessive activity.

MENTAL AND BEHAVIORAL DISORDERS DUE TO PSYCHOACTIVE SUBSTANCE USE
This category contains a wide variety of disorders that differ in severity and clinical form but are attributable to the use of one or more psychoactive substances, which may or may not have been medically prescribed.

BEHAVIORAL AND EMOTIONAL DISORDERS WITH ONSET USUALLY IN CHILDHOOD AND ADOLESCENCE
A group of disorders characterized by early onset (usually in the first five years of life), lack of persistence in activities requiring cognitive involvement, and a tendency to switch from one activity to another without completing any, along with disorganized, poorly regulated, and excessive activity.

ICD-10 Version:2019 (who.int)

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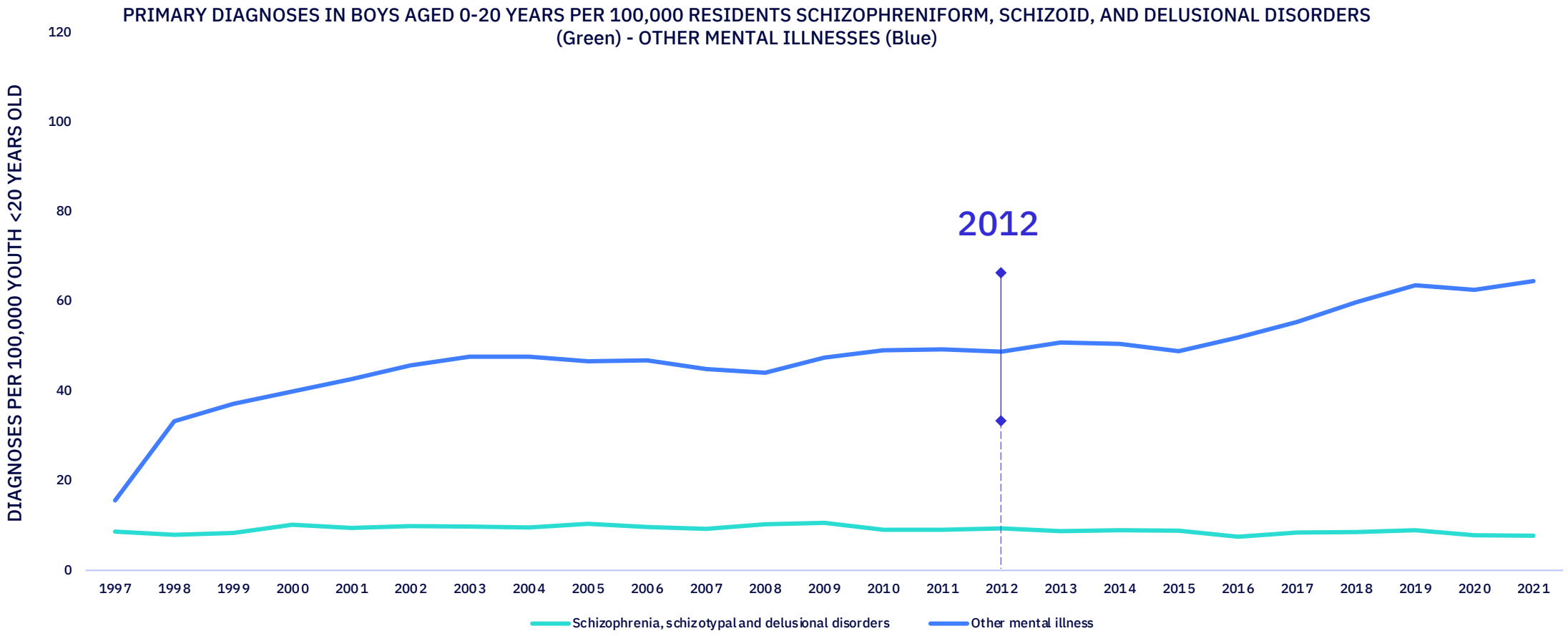
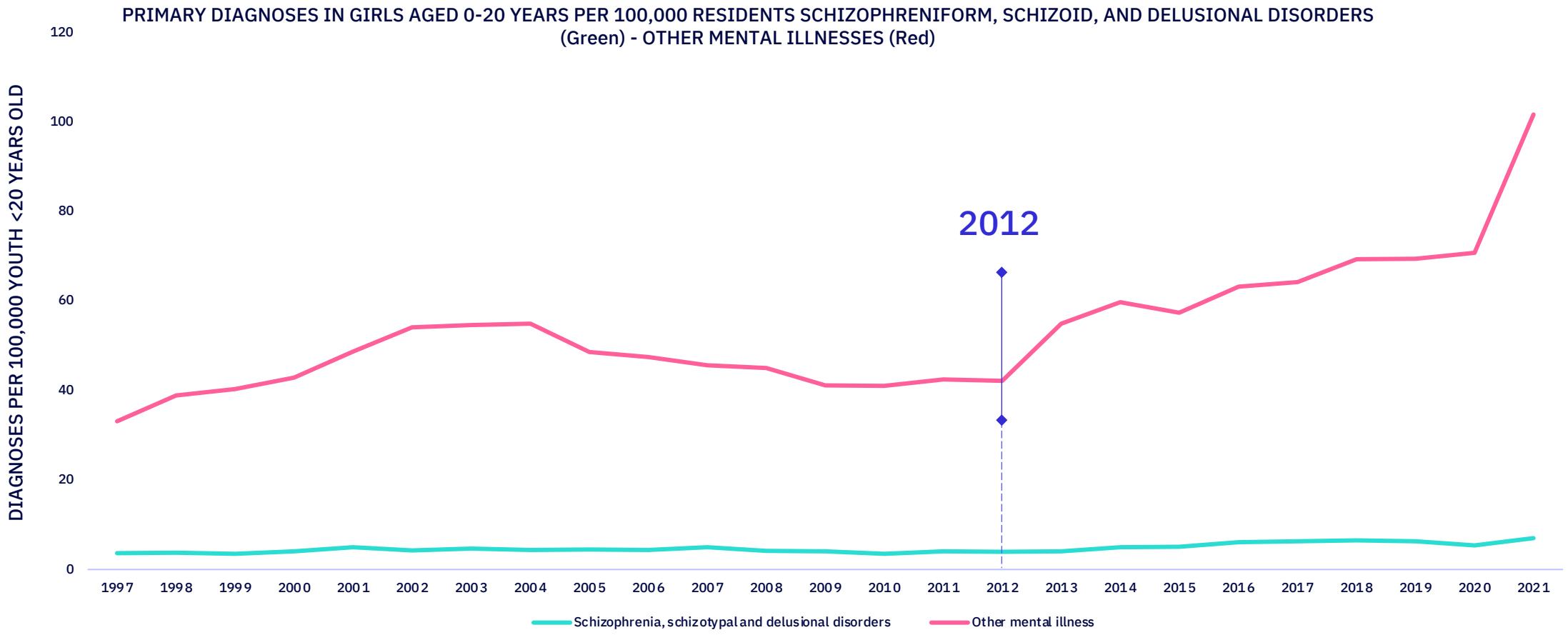
Mental illness as the primary diagnosis in children from 0 to 20 years old, by category. Schizophrenia appears to be the most stable mental illness in terms of incidence, while the rest of the mental illnesses contribute to the progressive increase in cases.



Mental illness as the primary diagnosis in girls from 0 to 20 years old, by category. Like boys, girls are not affected by an increase in the incidence of schizophrenia cases.



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Temporal evolution and correlation of mental illnesses and *injuries attributable to physical activity in Spanish youth between 1997 and 2021.*

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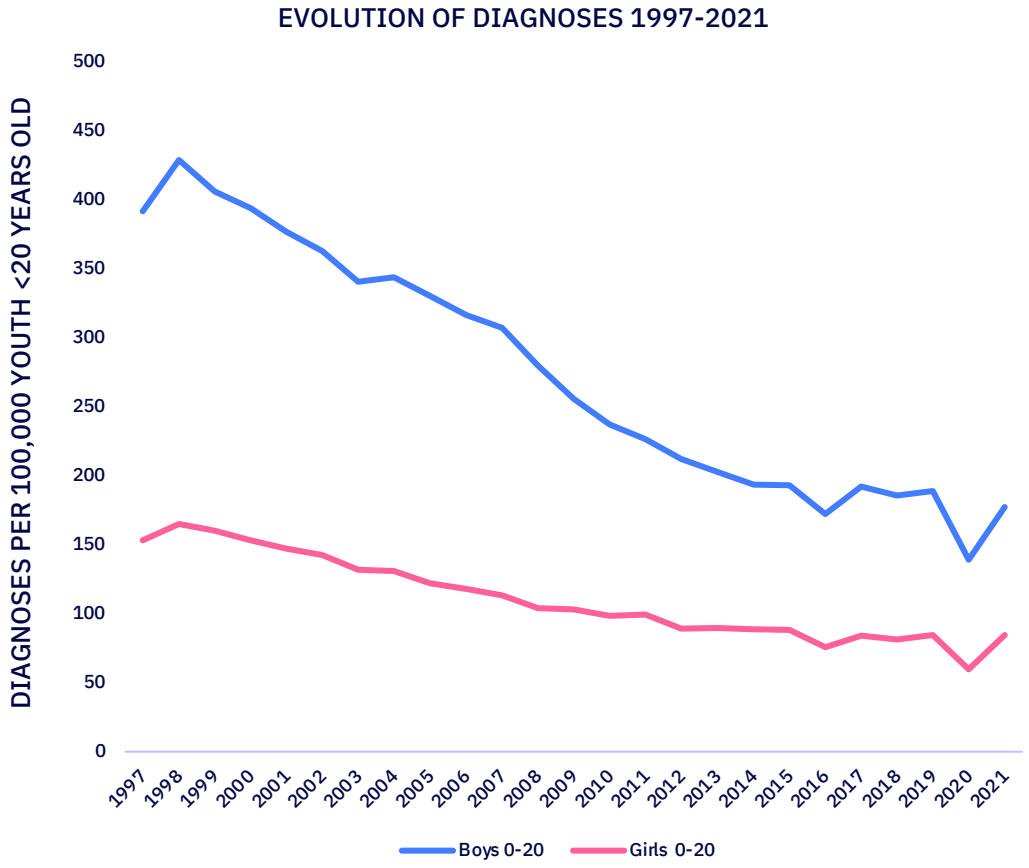
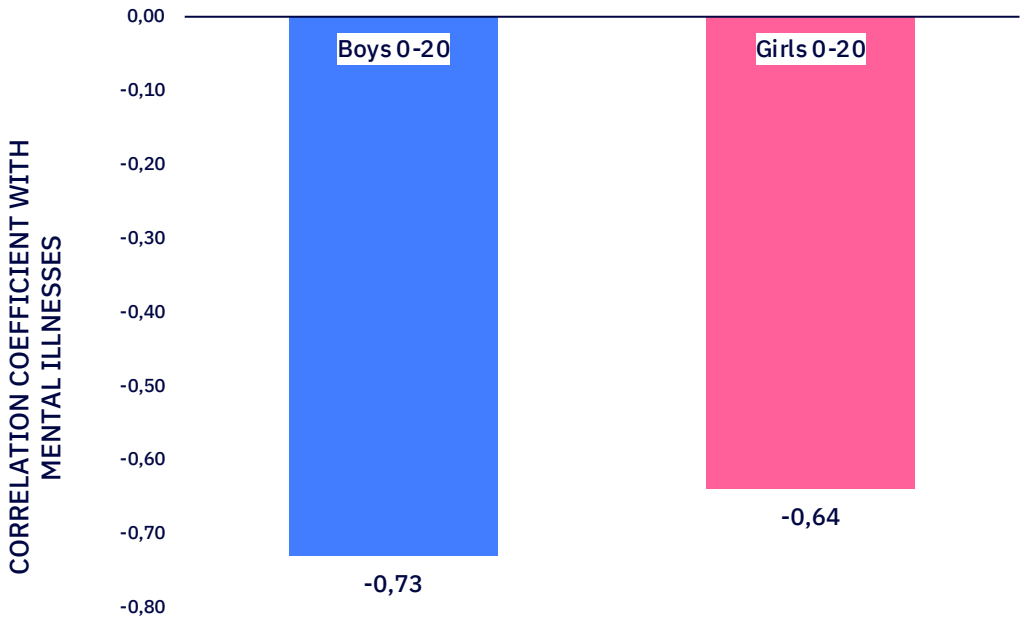
Evolution of diagnoses of injuries and traumas attributed to physical activity from 1997 to 2021 and their correlation with Mental Illnesses.
Adolescents have progressively ceased to suffer injuries, traumas, or bone fractures since the late 1990s, with a more pronounced decline in the last decade, demonstrating a possible severe decrease in their physical activity. There is a **strong correlation in both boys and girls between the decrease in physical activity, particularly related to outdoor play at certain ages, and the increase in mental illnesses.**





Interpretation of the correlation coefficient in absolute values:

Between 0 and 0.10: No correlation
Between 0.10 and 0.29: Weak correlation
Between 0.30 and 0.50: Moderate correlation
Between 0.50 and 1.00: Strong correlation

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Temporal evolution and correlation of mental illnesses and *obesity or eating disorders in Spanish youth between 1997 and 2021.*

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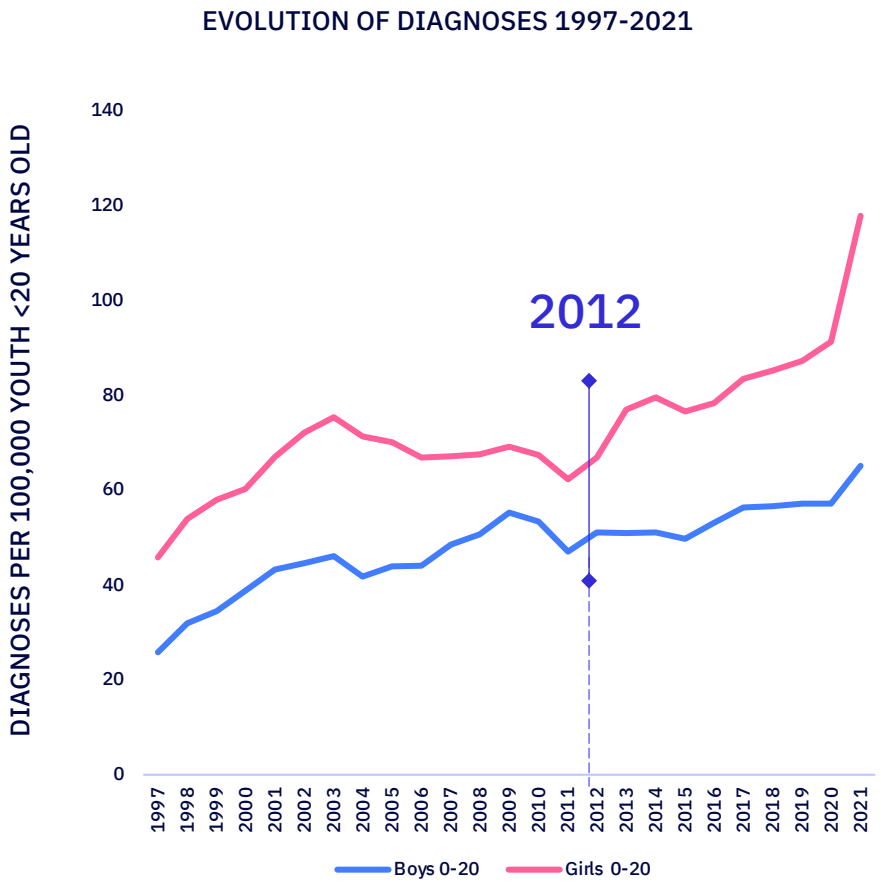
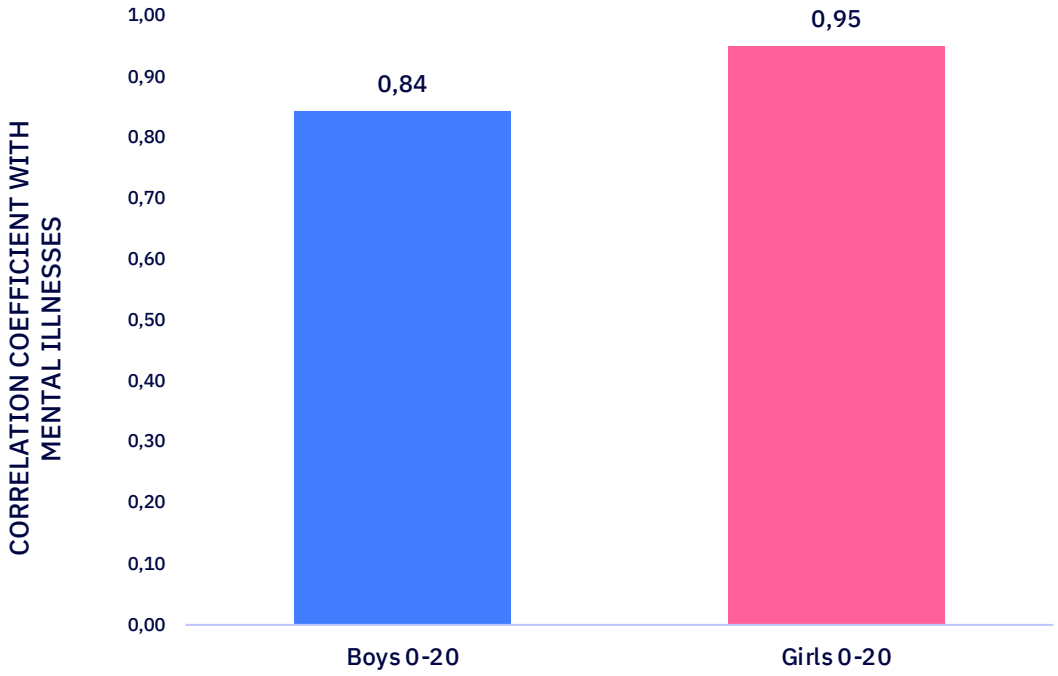
Evolution of all diagnoses of childhood obesity and eating disorders from 1997 to 2021 in children and adolescents aged 0 to 20 years. The number of cases in both sexes has experienced a constant increase, although fro**m 2011-12 onwards, there is an explosion, especially in girls, which notably intensifies during Covid-19.** The correlation between cases of obesity and eating disorders with mental health problems is strong: 0.95 out of 1 in girls.





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Correlation and *Causality* between the evolution of *mental illness* diagnoses and *internet access*.

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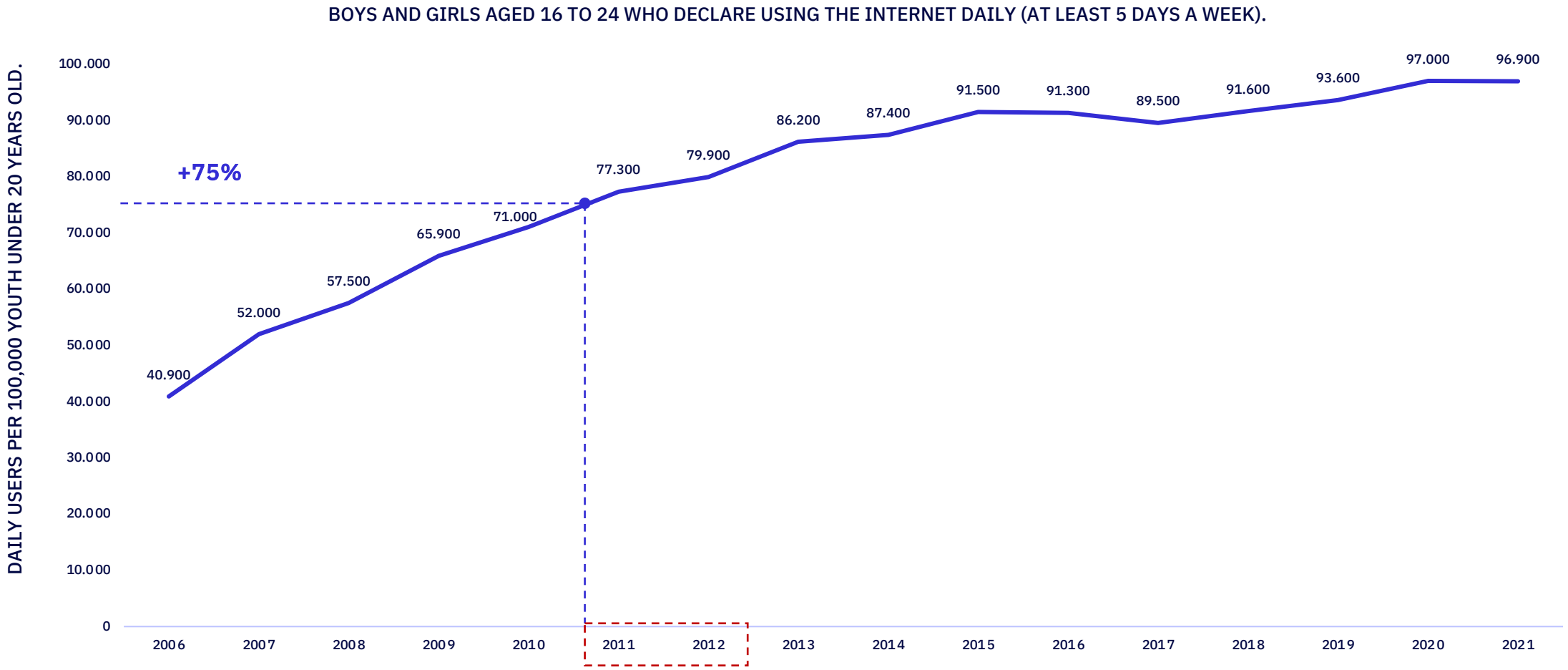
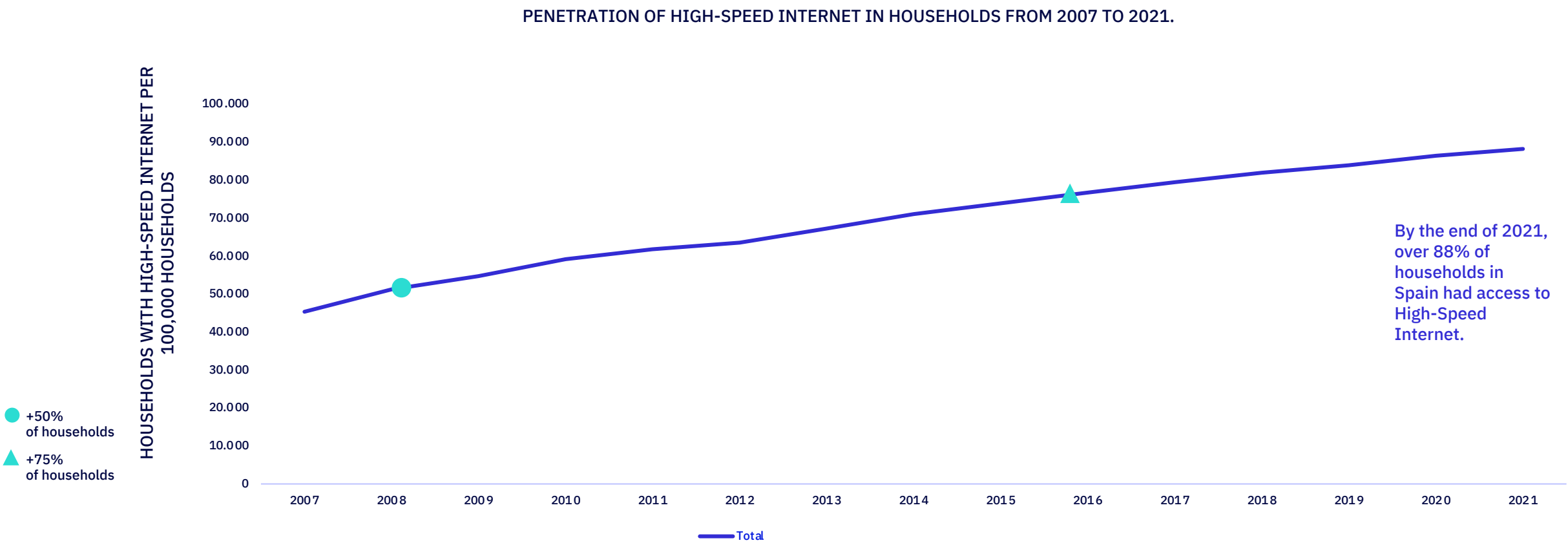
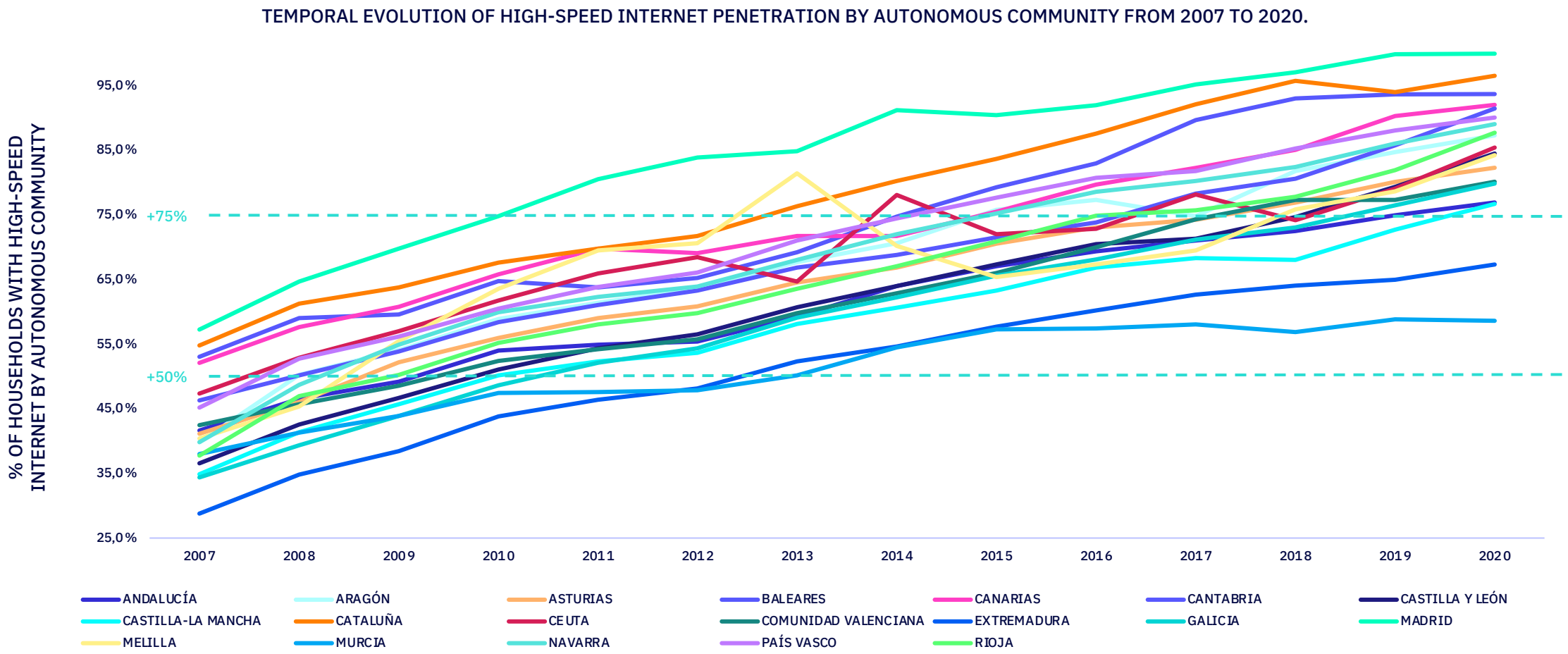
Daily internet usage among young people aged 16 to 24 (at least 5 days a week). There is a progressive increase in reported usage, reaching 75% of young people in Spain by 2011.



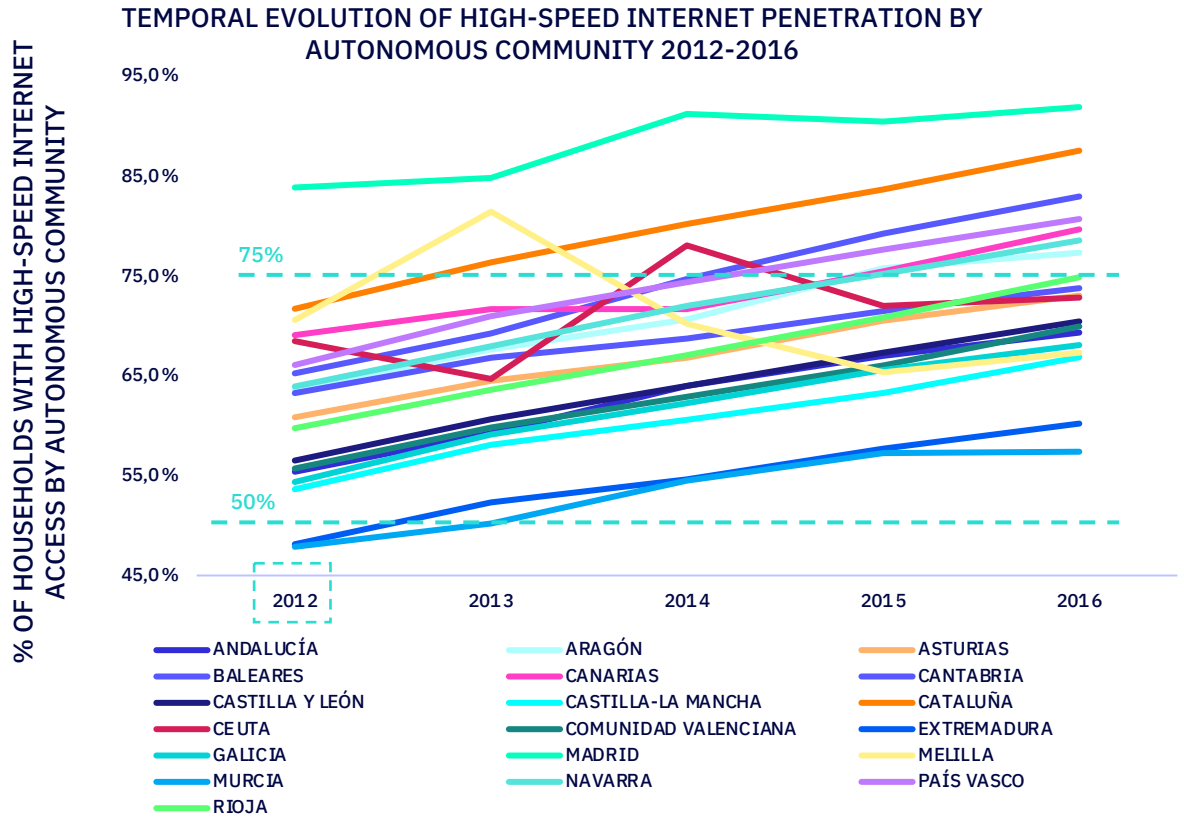
Households with High-Speed Internet (HSI) 2007-2021. The previous data on declared internet access usage by adolescents between 16 and 24 years old is consistent with the deployment of HSI (FTTH, Fiber To the Home) in Spain. It is important to note that, as detailed on the following page, this progressive deployment over several years was not uniform (for multiple reasons, as indicated in the analysis by Arenas-Arroyo et al., 2023). Therefore, two effects can be expected: a) communities where HSI penetration was slower should reflect a lower correlation with the incidence of mental illnesses, and b) the massive increase in HSI usage during Covid-19 should be reflected in a massive increase in mental illness cases, something that has already been observed in previous analyses.

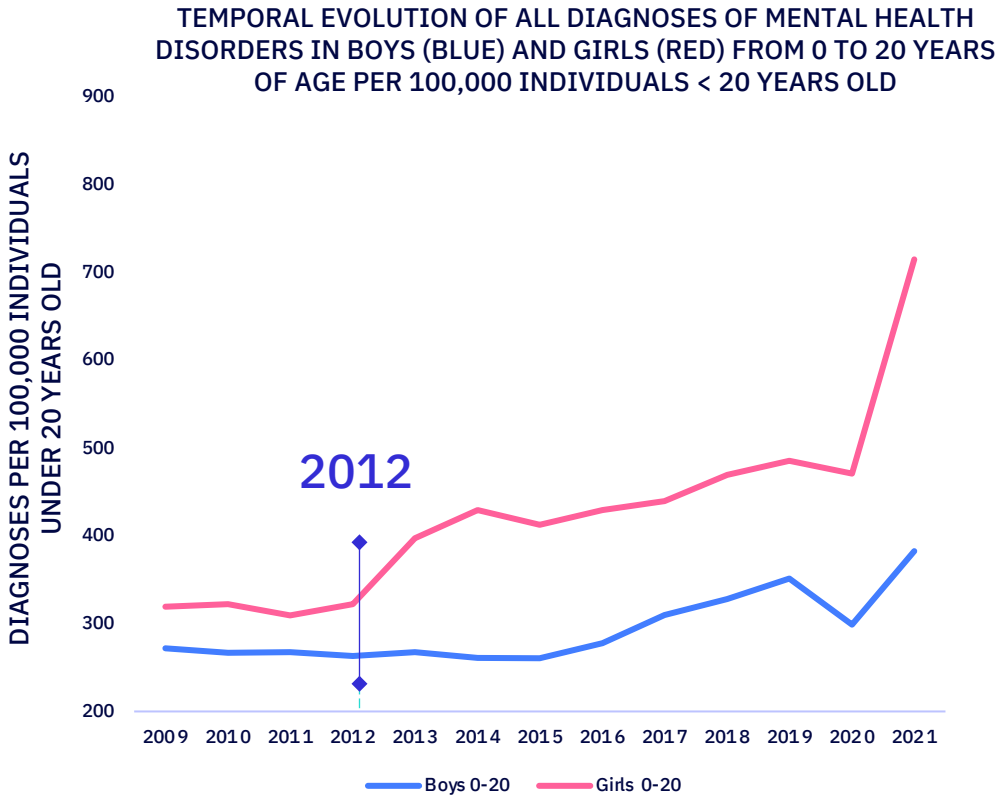


Percentage of households with High-Speed Internet (HSI) by autonomous community from 2007 to 2020. The data in this graph confirm that, as already indicated by Arenas-Arroyo et al. (2023), **the penetration of High-Speed Internet (HSI) in households is very uneven over time:** in Extremadura, a penetration of HSI of 50% of households is not reached until after 2012, while in Madrid, a penetration of HSI exceeding 75% of households is achieved before 2010. For a more detailed understanding of the causes, reading the Annex of this document is recommended.



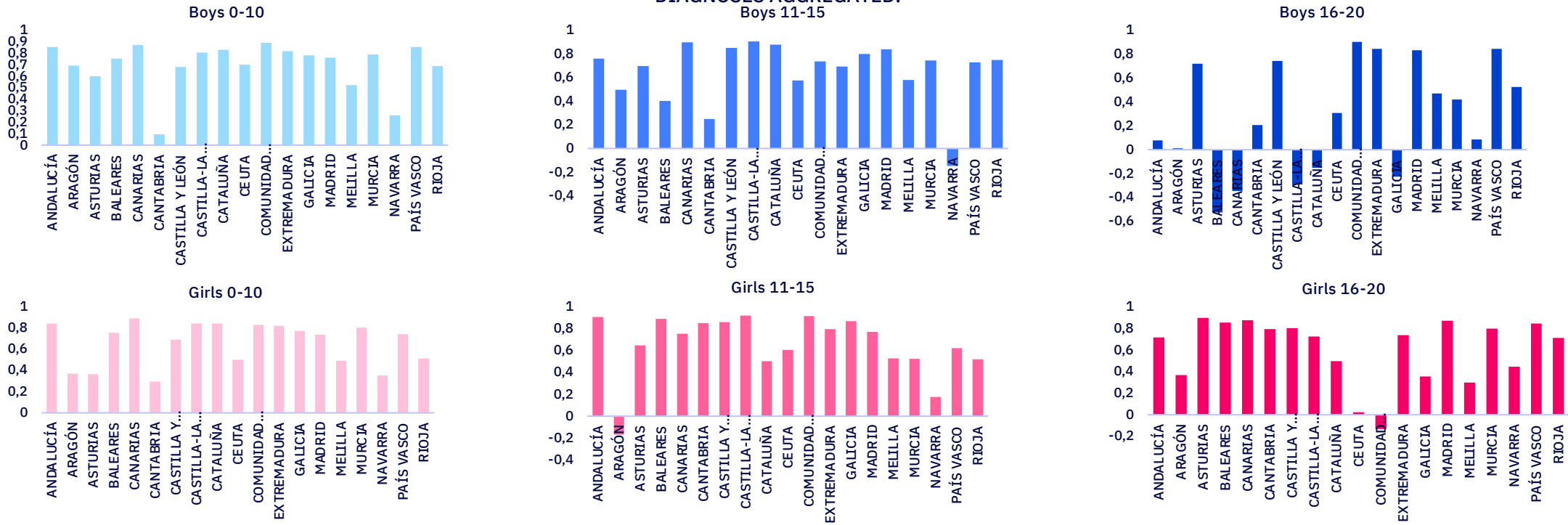
Focus on 2012. The data in this graph focuses on the period from 2012 to 2016, a key period as indicated since it is in **2012 when a significant increase in cases of mental illness in children and adolescents, especially in girls, is recorded, and this increase has not ceased**. It is precisely **in 2012 when at least a 50% penetration of High-Speed Internet (HIS) was reached in all autonomous communities.** Arenas-Arroyo et al. (2023) also conclude that for each increase of one standard deviation (SD) in the penetration of HIS (fiber optic, fiber to the home), that is, with greater penetration of HIS, **there was an increase in the cases of mental health disorders by +13.3%, with a special increase in the incidence of cases of anxiety, mood disorders, substance abuse, self-harm, and suicide attempts. This data already suggested that an increase in usage would imply an increase in cases, which is reflected in the impact of the Covid-19 crisis.**





Correlation between households with fixed broadband and increases in mental health disorders in all diagnoses from 2007 to 2021. In our study, when determining the correlation over the complete period of 2007 - 2021, the evidence is very clear: except for boys aged 16-20 years where the correlations vary significantly between strong and very weak or no apparent correlation in some autonomous communities, in the rest of the age groups, especially with girls, **there is a predominance of strong correlations in most autonomous communities between access to high-speed internet at home and mental health problems.** It is important to remember and emphasize that the internet, as a technology, is neutral, meaning it is a capacity for accessing information and services. What this analysis and similar ones suggest very clearly is that **internet consumption, from smart devices (tablets, smartphones), without restrictions on time or types of content, by children or adolescents, can lead to very serious mental health problems.**

CORRELATION BETWEEN HOUSEHOLDS WITH FIXED BROADBAND (IAV) AND INCREASES IN MENTAL HEALTH DISORDERS BY AUTONOMOUS COMMUNITY FROM 2007 TO 2021 ACCORDING TO AGE GROUP (YOUTH UNDER 20 YEARS OLD) AND GENDER. THE 'Y' AXIS REPRESENTS THE CORRELATION COEFFICIENT. PRIMARY AND SECONDARY DIAGNOSES AGGREGATED.



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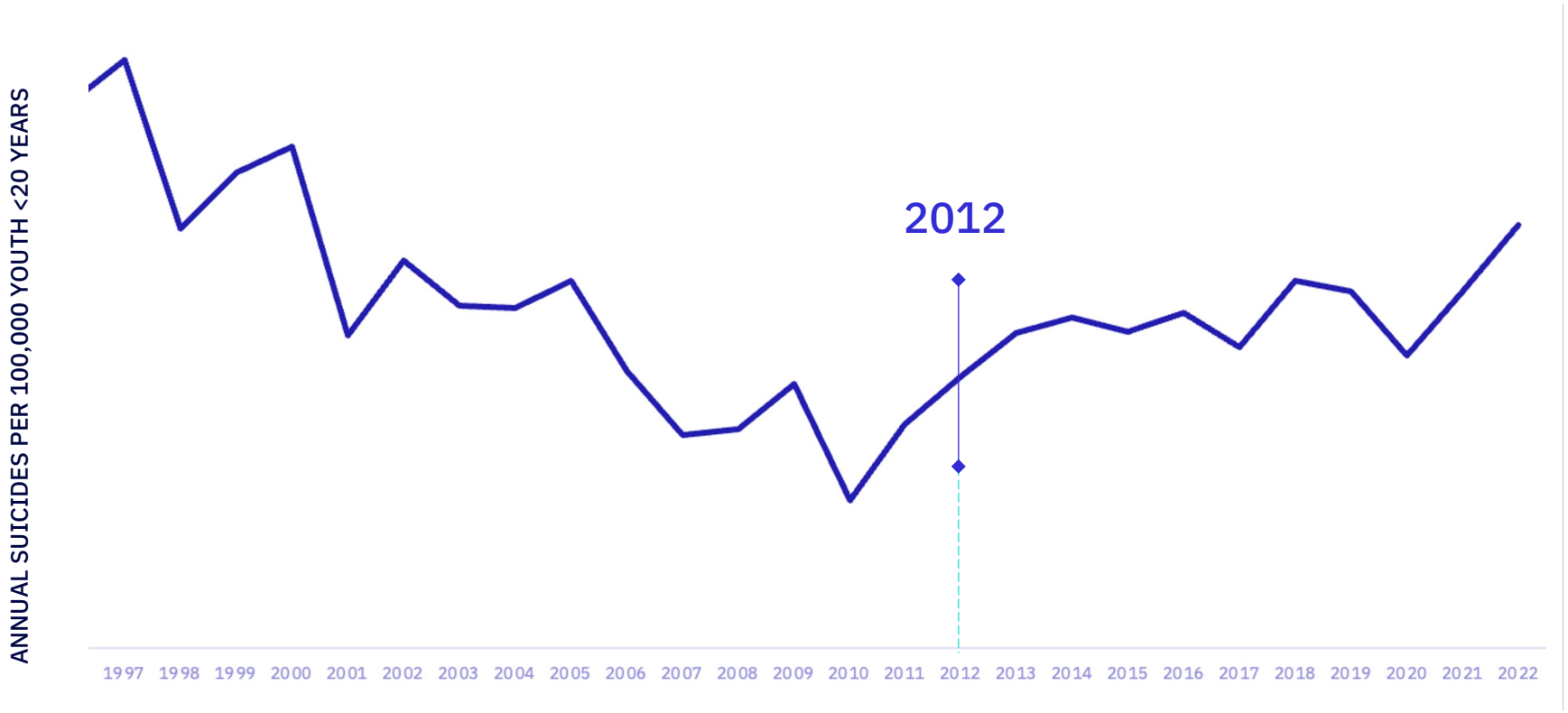
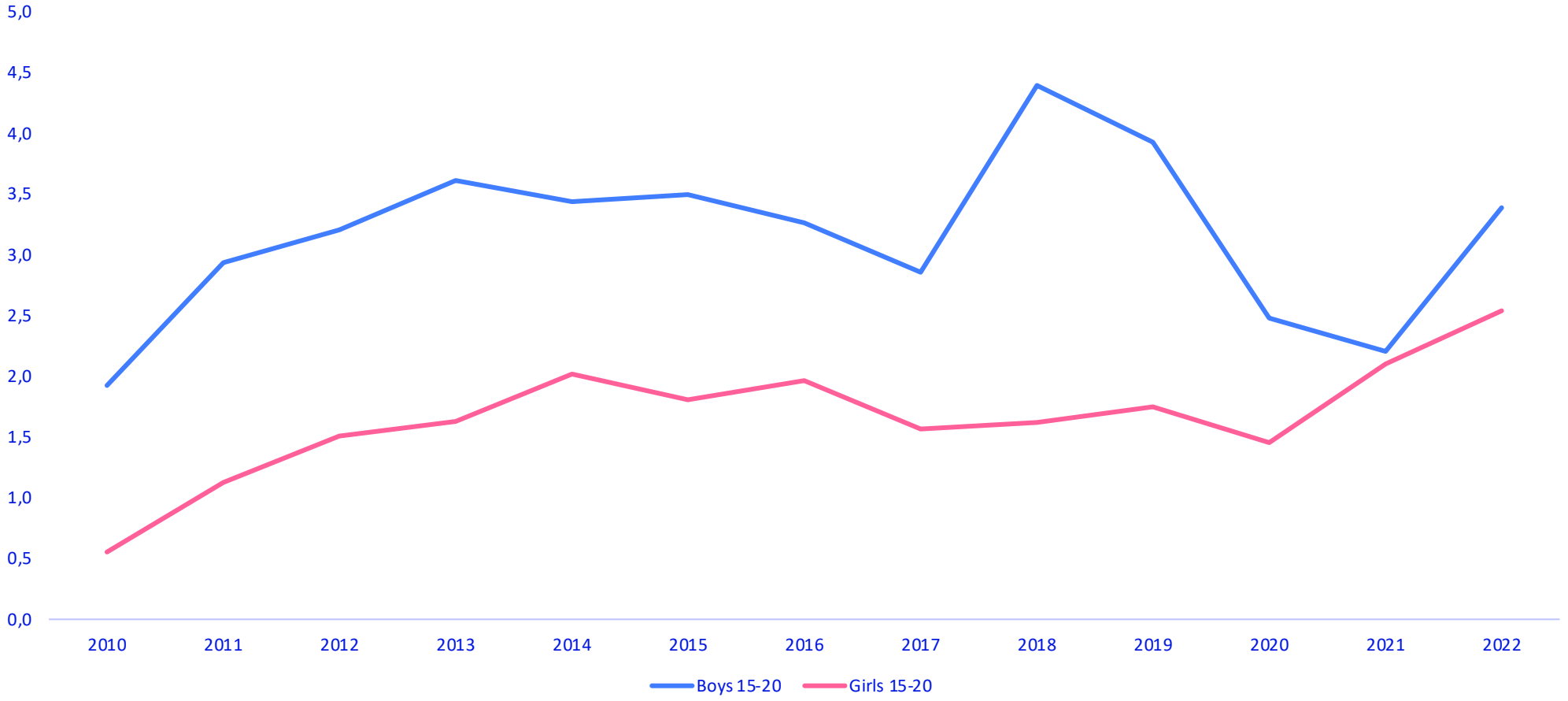
Temporal evolution of suicides in *Spain among individuals under 20 years old*

Deaths by suicide in individuals under 20 years old. From 2011-12, a change in trend that had begun in the late 1990s becomes evident. It is again during the Covid-19 period where a greater increase is observed. These data are **clear evidence that the issue of mental health in individuals under 20 years old is real and not merely a result of an increased number of medical diagnoses due to greater social and medical awareness.**

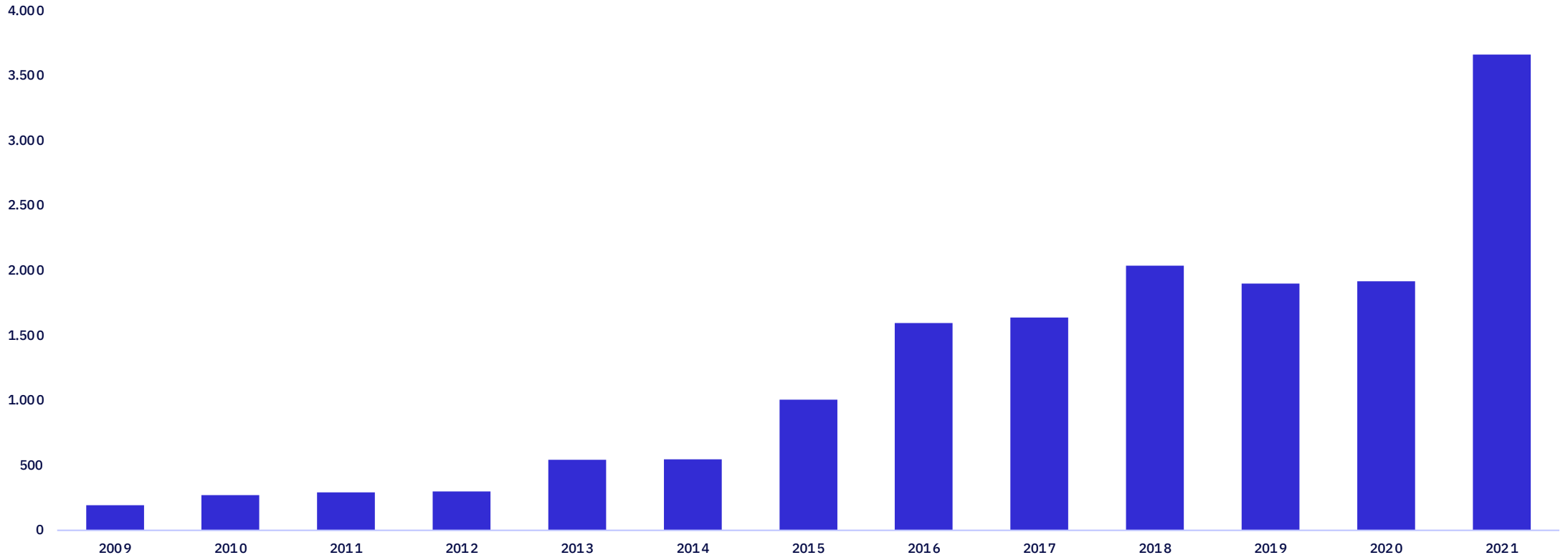


Suicides in boys and girls between 15 and 20 years old. It is noteworthy that the traditional predominance of suicide among males disappeared in 2021 when the effectiveness in committing suicides between boys and girls becomes almost equal.



Requests for help related to suicidal ideation and suicide attempts in young people from the ANAR Foundation. The increase in suicides among young people under 20 years old since 2011-2012 coincides with a significant increase in requests for help from young people reported by the ANAR Foundation, reaching their peak in 2021.

PHONE CALLS MADE TO THE ANAR FOUNDATION FOR HELP REGARDING SUICIDAL IDEATION AND SUICIDE ATTEMPTS IN YOUNG PEOPLE.



https://www.epdata.es/datos/cifras-suicidio-espana-datos-estadisticas/607?accion=2

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Analysis of Costs *of Mental Illnesses for* Hospitalizations *due to Primary Diagnoses 1999 - 2021*

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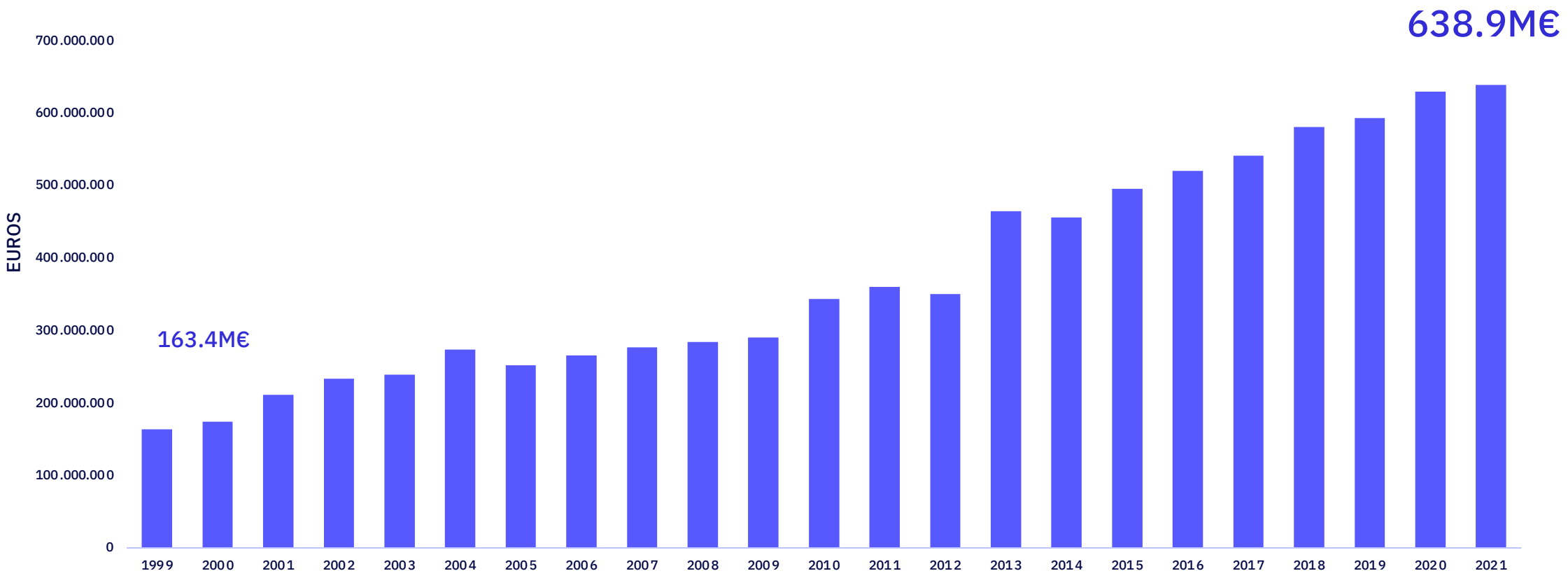
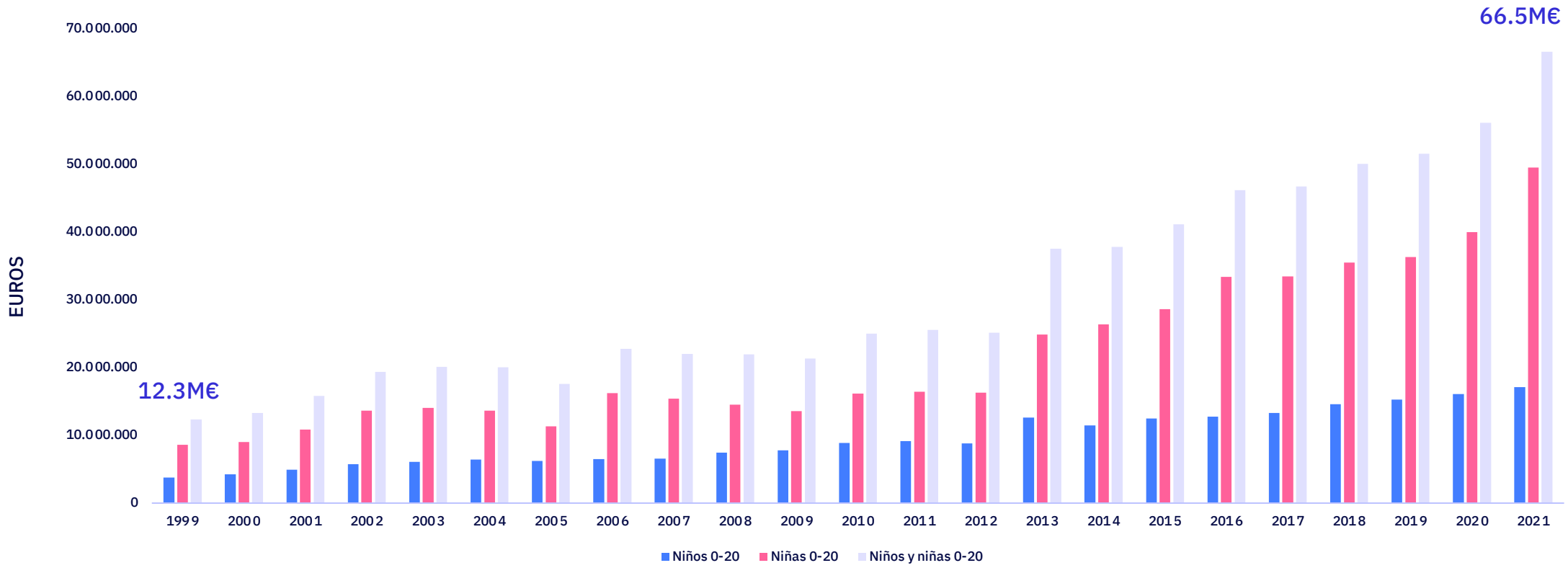
Costs of diagnoses related to mental illnesses in Spain for all ages. The total cost - of expenses associated with all ages - **has progressively increased from 163.4 million euros in 1999 to 638.9 million euros in 2021. This represents an increase of almost 400%.** ***Only cases where mental illness is the primary diagnosis and not secondary have been considered. This avoids overrepresenting the cost in cases where diagnoses unrelated to mental illnesses are the main cause of admission and their diagnosis or procedure is more expensive.***



Costs derived from hospitalizations primarily related to mental illnesses in children and adolescents aged 0 to 20 years. It is very important to note that only hospital costs are represented here, meaning the costs derived from the hospitalization of individuals under 20 years old due to mental illnesses, i.e., the most severe cases. When asked about the reasons that may lead to hospitalization, we have been informed that there are two: either the patient may attempt against their own life or against the lives of others, meaning only **extreme cases are reflected in this cost analysis**. Two worrying trends stand out in the graph: on the one hand, **the cost has progressively increased from 12.3 million euros in 1999 to 66.5 million euros in 2021. Therefore, more than 10% of the total hospital costs related to mental illnesses in Spain are dedicated to treating individuals under 20 years old, and this expenditure has increased by more than 500% since 1999, with a significant increase again since the year 2012 and particularly pronounced in the period following Covid-19**. Additionally, there is a concerning trend in the costs dedicated to the care of girls, which now **account for 75% of the total cost.**



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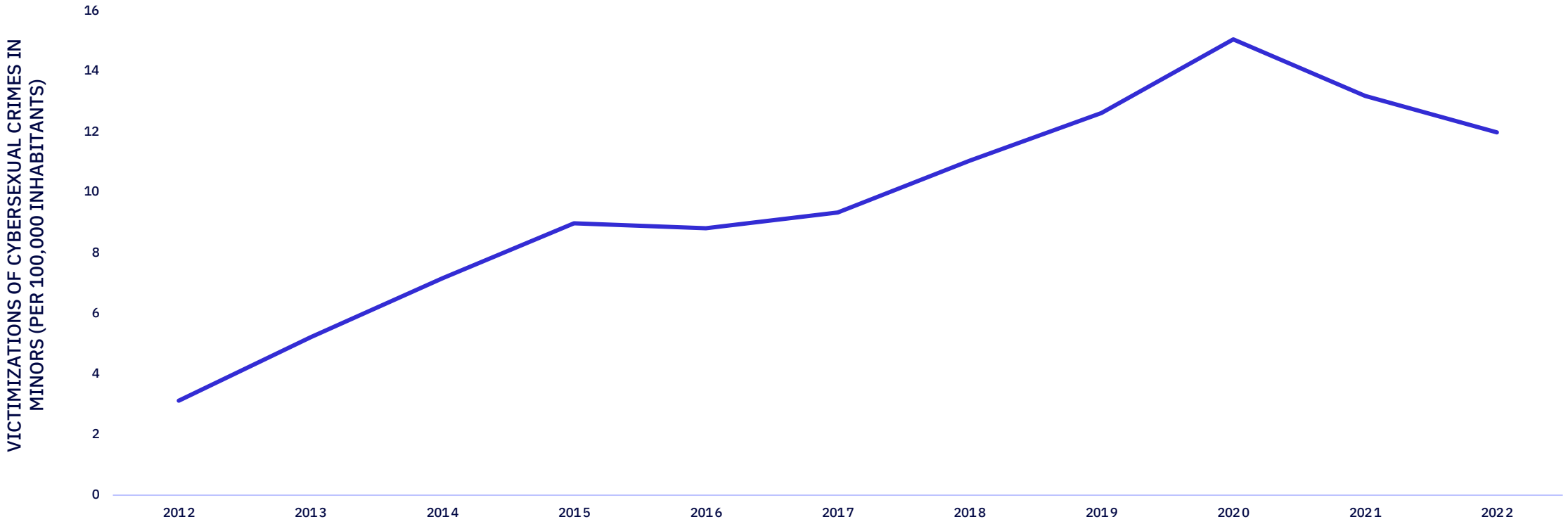
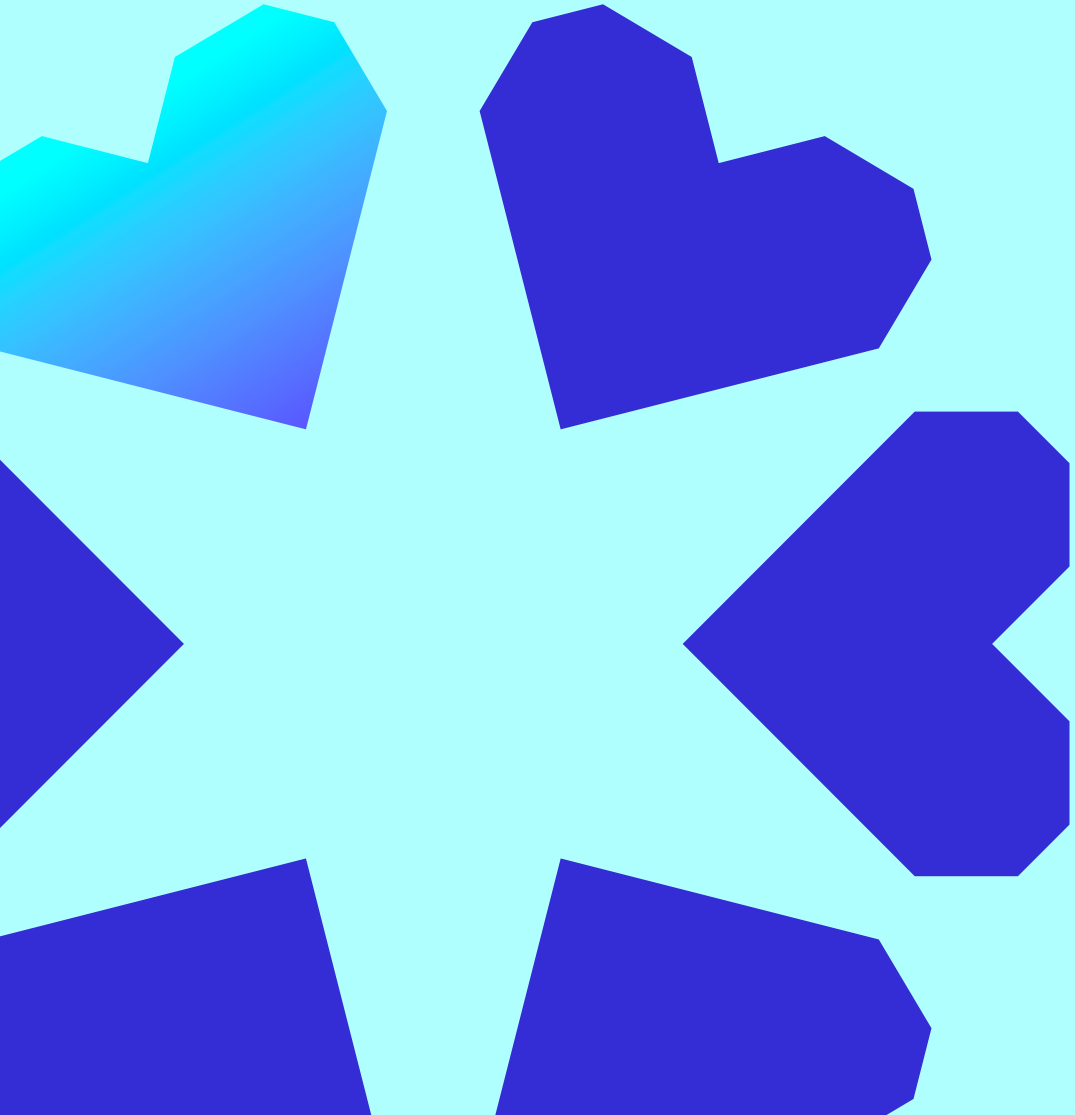
Analysis of Victimization of Minors in Cybercrimes *of a Sexual Nature 2012-2020*

Victimizations of sexual cybercrime in minors. The concept of victimization refers to the number of reported events by individuals who claim to be victims or have suffered harm due to a crime. It differs from the concept of 'victim' in that the latter refers to individual persons. This metric **experienced significant growth in minors from 2012 to 2020, following the trend of the other variables analyzed in this researc**h, with only a slight decrease observed in 2021-22. **The correlation of these phenomena with diagnoses of mental illnesses is also strong (0.74 out of 1)**, as the graph itself suggests.



https://estadisticasdecriminalidad.ses.mir.es/publico/portalestadistico/dam/jcr:bcd88e41-d513-4f15-8676-860c7980222f/02_02_Metodolog%C3%ADa_Hechos_Esclarecidos_.pdf
https://www.interior.gob.es/opencms/pdf/prensa/balances-e-informes/2021/Informe-delitos-contra-la-libertad-e-indemnidad-sexual-2021.pdf

Cyber Guardians Healthier Digital Lives



A Look into the Future & Conclusions

A look into the future: Artificial Intelligence.

Artificial intelligence is poised to radically transform the internet experience; how we interact with digital services or with each other will be very different from how we do it today. From the sophisticated transformation of our image in real-time, with even more advanced filters that could affect our self-esteem or perception of our body image, to new algorithms that increase levels of addiction or manipulate attention even more than what we are already experiencing. These technologies are not science fiction; they are already available and their commercial use will undoubtedly continue to increase. Unsurprisingly, they are already being used criminally.

Various authorities, from the Office of the Surgeon General in the US (OSG) to pediatric associations like the Spanish Pediatric Association or the American Academy of Pediatrics, are clearly indicating the dangers that children and young people face in this new scenario.

"Today's children and adolescents do not know a world without digital technology, ***but the digital world was not built with the healthy mental development of children in mind.*** *We need an approach that helps children both in the digital world and outside of it, that adapts to each child where they are, while* ***working to make the digital spaces they inhabit safer and healthier."***

– Sandy Chung, M.D., FAAP, President,
American Academy of Pediatrics

At CyberGuardians, we are convinced that a change of approach is possible, and that it must begin with the commitment of each of us. As concerned citizens who can provide the most assistance, in this case to children and adolescents, we encourage parents, educators, and other citizens to visit our website, to share this analysis to raise awareness levels about this issue, and if they find it positive, to support the digital campaign on Change.org that we have created to request legislative changes from Spanish and European authorities to ensure greater safety and healthier digital lives for young people.

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Annex

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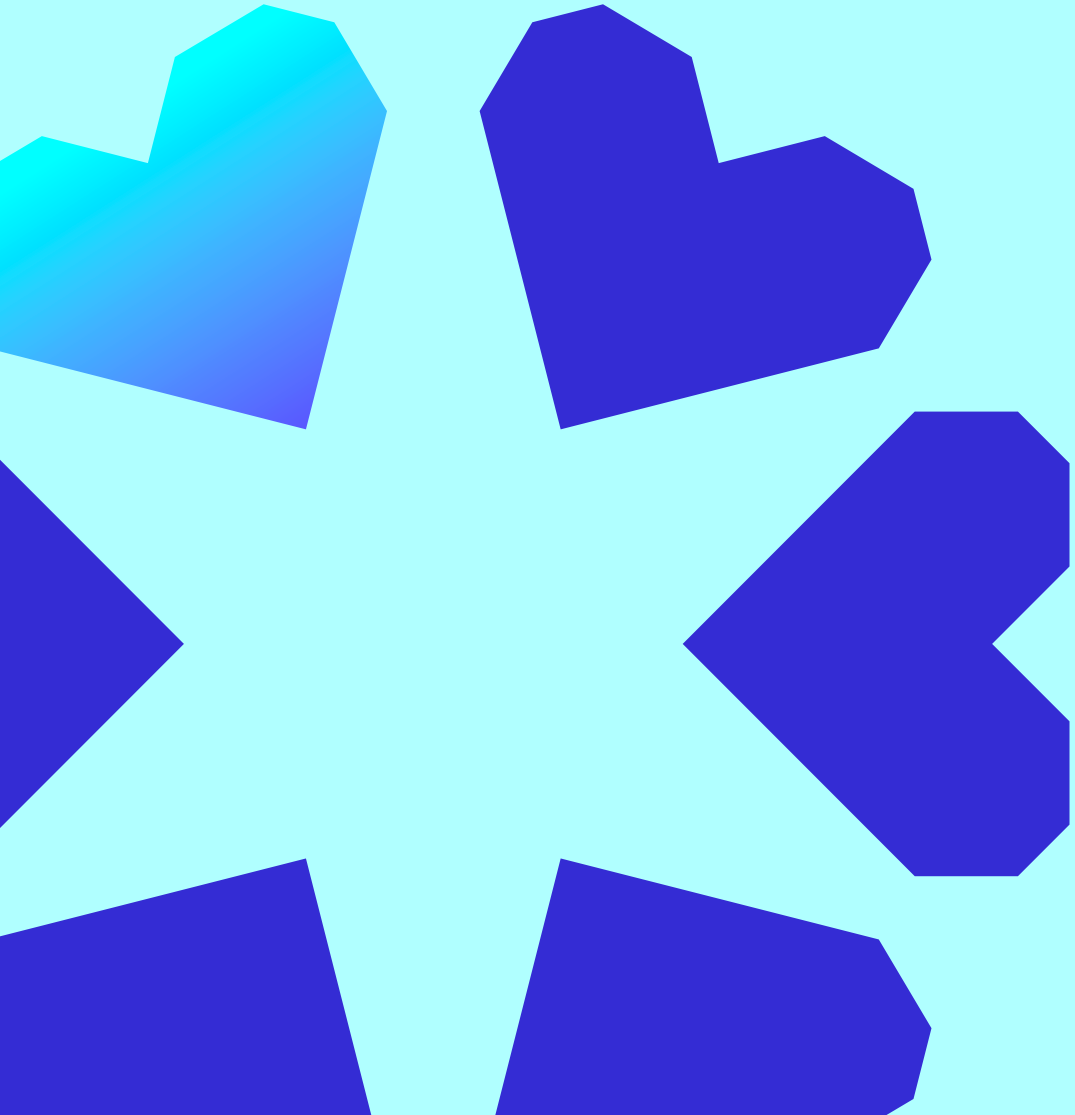


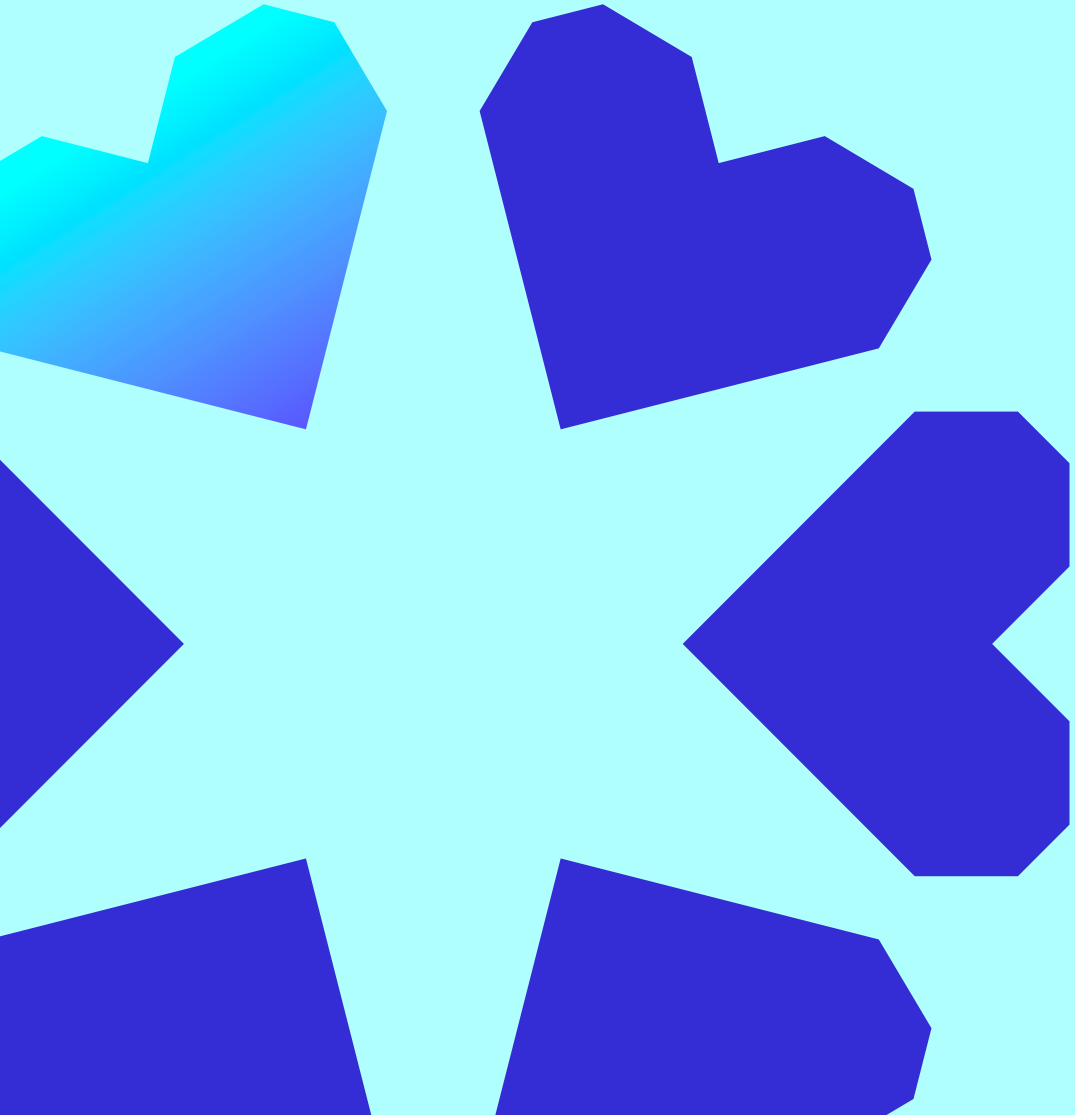
Background, scientific basis of the analysis, and main research questions

- This analysis is heavily inspired by the work of **Professor Jonathan Haidt**, a social psychologist at New York University. Haidt has been researching the profound mental health crisis in young people in preparation for his latest book *"The Anxious Generation",* recently published. Haidt's work, in collaboration with other researchers, has been instrumental in helping us establish the scope of this analysis and guide it to maximize its contribution to existing research. In particular, we would like to highlight three of Haidt's collaborative studies that we consider most interesting:
  - Haidt, J., Rausch, Z., & Twenge, J. **Adolescent mood disorders since 2010: A collaborative review.** Unpublished manuscript, NYU.
  - Haidt, J., Rausch, Z., & Twenge, J. **Social media and mental health: A collaborative review.** Unpublished manuscript, NYU.
  - Haidt, J., Rausch, Z. **Alternative Hypotheses to the Adolescent Mental Illness Crisis,** NYU.
- Professor Jonathan Haidt has stood out in his defense of a central idea: that social media is a primary driver of the global epidemic of mental illnesses among children and adolescents. In his work, Haidt has grouped possible alternative explanations to his main thesis to test its robustness, and systematically responded to each with data and logical reasoning: from the impact of increased drug consumption, the presence of environmental toxins or the use of new drugs, to changes in family models or international standards for coding mental illnesses (ICD or DSM in English). His blog and many of his articles are a good starting point for those seeking a deeper understanding of this issue.
- Jonathan Haidt has published the 5 rules for parents that he considers key to alleviating the negative effects of this crisis, and we find them of interest:
  1. Give children much more time to play with other kids. This play should ideally be outdoors, in mixed-age groups, with little or no adult supervision (which is how most parents grew up, at least until the 1980s).
  2. Seek more ways to integrate children into stable real-world communities. Social networks are not nearly as bonding or fulfilling.
  3. Do not give a smartphone as a first phone. Give them a phone or specialized watch only for spoken communication, not internet applications.
  4. Do not provide a smartphone until high school. This is easy to do if many of your child's friends' parents are doing the same.
  5. Delay opening accounts on almost all social media platforms until the start of high school (at the very least). This will be easier to achieve if we support lawmakers who are trying to raise the "internet majority" age from the current 13 years (without verification) to 16 years (with mandatory verification).

- It is also important to highlight the great utility of the study "IZA Institute of Labour Economics DP No. 15728 High Speed Internet and the Widening Gender Gap in Adolescent Mental Health: Evidence from Hospital Records" by Esther Arenas-Arroyo, Daniel Fernández-Kranzy, and Natalia Nollenberger from the Vienna University of Economics and Business, IZA, and IE University. This study is based on the analysis of hospital data from Spain and lays the groundwork for our study.
- In the updated version of the IZA study published in May 2023, it was detailed how the increase in mental health problems among adolescents in Spain had coincided with the rise in the use of digital media and social networks, with the most significant changes occurring among girls - who are more sensitive than boys to social interactions, especially during adolescence (LaFontana & Cillessen, 2010; Flook, 2011; Shih, 2006).
- The study also demonstrated that unrestricted or uncontrolled access to high-speed Internet (fiber) increases addictive Internet usage and significantly reduces the time adolescents dedicate to sleep, schoolwork, and socializing with family and friends. Finally, the study shows that uncontrolled Internet access harms the quality of the relationship between parents and daughters, especially when there were pre-existing conflicts.
- This study contains multiple findings of interest, but perhaps the most relevant for us has been its utilization of the variable speed in the deployment of fiber optic networks in Spanish provinces between 2007 and 2019 – crucial for high-speed Internet access – to analyze its effect on the diagnosis of mental health and behavioral cases in adolescents discharged from hospitals and establish a causal relationship.
    - The study demonstrates that the penetration of fiber optic networks, i.e., the possibility of accessing social networks and audiovisual content intensively, significantly increases the cases of mental health disorders (BMH, by its acronym in English) in adolescents. For every increase of one standard deviation (SD) in the penetration of fiber optics, there was a 13.3% increase in the cases of mental health disorders, with an increase in the incidence of anxiety disorders, mood disorders, substance abuse, self-harm, and suicide attempts. The study also provides evidence suggesting that access to high-speed Internet is a contributing factor to a significant increase in suicides or self-harm-related deaths among teenagers. It is important to note that the study assumes that teenagers have a device for Internet access and have no restrictions on the use of social networks and media.
    - In a simplified manner, the study can be explained as follows: it analyzed how, as the uneven penetration of fiber optic networks reached households, the cases of mental health disorders in adolescents increased, with the negative effects being delayed in those households without access to high-speed Internet. It is important to note, as will be seen in our study, that the ability of households to access fiber optic networks, and thus social media services based on videos and images, was unequal during the analyzed period, especially between 2012 and 2018.

- The IZA study points out that there is a growing body of scientific analysis that has established causal links between Internet access and the mental health of young people. The results are very robust to various sensitivity tests that reinforce the aforementioned causality. This IZA study complements and is consistent with Braghieri et al. (2022), who found that the gradual introduction of Facebook into US universities worsened the mental health of college students due to unfavorable social comparisons. Similarly, Nieto and Suhrcke (2021) found that access to digital television in the UK led to unhealthy habits and ultimately worsened the mental health of children. As the researchers indicate, their results are consistent with those of Braghieri et al. (2022), Golin (2022), and McDool et al. (2020), who have also documented a more negative effect of broadband Internet on girls than on boys.
- In addition to the studies mentioned above, we have reviewed over 100 scientific articles and popular science pieces, interviews, and reports featuring experts similar to those mentioned in this brief introduction. Some of these resources have been compiled on our website, in the "Knowledge Hub" section.
- **The results of all these studies have helped us understand and explain the significant deterioration of mental health among adolescents. They have also confirmed that there is a consensus in the scientific community regarding the causal relationship, not merely correlational, between the decline in mental health in children and adolescents and the indiscriminate and uncontrolled use of the Internet, especially from advanced mobile devices (such as smartphones and tablets) to access social networks and digital services designed to be addictive. These services base their business model on monetizing user attention through advertising exploitation and/or user data.**
- Despite all of the above, there was a set of questions and hypotheses that seemed very relevant to us and that were not entirely clarified in the case of Spain in any of the reviewed studies. These questions served as the initial inquiries for our analysis:
  - What was the evolution of mental health disorder levels prior to 2010?
  - What is the cost of this phenomenon for public coffers in Spain?
  - Could increased health awareness about mental health explain the variation in the number of diagnoses?
  - Are the results and hypotheses of all analyses, particularly the study by Arenas-Arroyo et al. (2023), confirmed in dates after 2018 and particularly in the immediate post-Covid-19 period?
  - How was this phenomenon reflected in suicide behavior patterns?
  - What relationship could be established with cybercrime?
  - What additional dangers could Artificial Intelligence represent in the deterioration of mental health in our youth?

Cyber Guardians Healthier Digital Lives



Details of Data Sources and Methodology

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Description of the process for conducting the analysis as well as the data sources used.

The data on diagnoses of mental illnesses from 1997 to 2021 were requested from the Ministry of Health.
Source: Ministry of Health. Registry of Specialized Care Activity - Minimum Basic Data Set (RAE-CMBD). Definition and code interpretation links: [provide links].
https://www.sanidad.gob.es/estadEstudios/estadisticas/estadisticas/estMinisterio/SolicitudCMBD.htm

- Definitions of data variables:
  https://www.sanidad.gob.es/estadEstudios/estadisticas/estadisticas/estMinisterio/SolicitudCMBDdocs/2018_ANEXO_solicitud_RAE_CMBD.pdf

- Diagnoses between 1997 and 2015 were given by the International Classification of Diseases ICD-9, and starting from 2016, diagnoses are classified by the ICD-10. Differences between data from 1997-2015 and 2016-2021 associated with the change of diagnosis codes are reconciled. Thus, all diagnosis codes related to mental illnesses from both ICD-9 and ICD-10 have been identified, and all primary diagnoses (when the diagnosis is the main reason for admission) as well as secondary diagnoses (unrelated to the main reason for admission) have been requested from 1997 to 2021.

- The different categories of mental illnesses selected in the search are:
  - Mental and behavioral disorders due to psychoactive substance use.
  - Schizophrenia, schizotypal, and delusional disorders.
  - Mood (affective) disorders.
  - Neurotic, stress-related, and somatoform disorders.
  - Personality disorders and behavior disorders in adults.
  - Disorders of psychological development.
  - Emotional and behavioral disorders that typically arise in childhood and adolescence.
  - Mental disorder, unspecified.

- All diagnoses of mental disorders are processed from 1997 to 2015 (ICD-9) and from 2016 to 2021 (ICD-10).
- The data is cleaned: date formats, null values, etc.
- The data formats of both CSV files containing diagnoses (CIE9 and CIE10) are standardized for integration. It is observed that, possibly due to a delay in the adaptation of some hospitals and autonomous communities to the change in classification from CIE9 to CIE10, the evolution of diagnoses between 2015 and 2016 reflects a punctual and non-homogeneous discontinuity in their distribution by autonomous communities. In order to eliminate distortion in the time series, the difference between the volume of diagnoses in January 2016 and the average of the previous January months in the historical series is calculated, and this difference is then applied to the following months, effectively and rigorously reconciling the data.
- All the data is integrated to have only one CSV file with all the diagnoses unified.
  - Duplicate entries are filtered out (e.g., diagnoses with identical record codes and admission dates).
  - With the integrated data from 1997 to 2021, three diagnosis tables are created:
  - Primary Diagnoses - Only primary diagnoses of mental illnesses are filtered, meaning when it is the main reason.
  - Secondary Diagnoses - Primary diagnoses of mental illnesses are excluded, leaving only those mental illness diagnoses detected when the primary diagnosis is another cause.
  - All Diagnoses (Unfiltered Data Table)Se combinan las distintas tablas con otras fuentes de datos para producir el informe.
- To calculate any data per 100,000 inhabitants, population data by age, year, and autonomous community were extracted from:
  Source: https://www.ine.es/jaxi/Tabla.htm?path=/t20/e245/p08/l0/&file=01003.px&L=0
- To measure the relationship between two sets of data, we use the correlation coefficient, which is interpreted as follows (in absolute values).
  - Coefficient between 0 and 0.1: no correlation
  - Coefficient between 0.1 and 0.29: weak correlation
  - Coefficient between 0.3 and 0.5: moderate correlation
  - Coefficient between 0.5 and 1: strong correlation

- Social Media Users Graph from 2004 to 2018 worldwide.
  Source: [Our World in Data](https://ourworldindata.org/rise-of-social-media)
- Smartphone Sales Graph from 2007 to 2023 worldwide.
  Source: [Statista](https://www.statista.com/statistics/263437/global-smartphone-sales-to-end-users-since-2007/)
- Physical Activity - To deduce levels of physical activity and study the correlation with mental illnesses, data on fractures and sprains from 1997 onwards have been requested from the Ministry of Health.
  Source: Ministry of Health. Registry of Specialized Care Activity (RAE-CMBD) - Definition and interpretation code links: [Ministry of Health](https://www.sanidad.gob.es/estadEstudios/estadisticas/estadisticas/estMinisterio/SolicitudCMBD.htm)
- Eating Disorders and Obesity - Data related to eating disorders and obesity have also been requested from the Ministry of Health.
  Source: Ministry of Health. Registry of Specialized Care Activity (RAE-CMBD) - Definition and interpretation code links: [Ministry of Health](https://www.sanidad.gob.es/estadEstudios/estadisticas/estadisticas/estMinisterio/SolicitudCMBD.htm)
- Broadband by Autonomous Community - Information on lines, accesses, subscribers, and base stations in Spain by autonomous community from 2007.
  Source: CNMC (National Commission of Markets and Competition). [CNMC](https://data.cnmc.es/telecomunicaciones-y-sector-audiovisual/conjuntos-de-datos/datos-provinciales/telecomunicaciones)
- Number of Households - To compare broadband data by household with the number of households, data on the number of households by autonomous community have been extracted.
  Source: INE (National Statistics Institute). [INE](https://www.ine.es/jaxi/Datos.htm?path=/t20/p274/serie/prov/p02/l0/&file=02006.px)
- Daily Internet Usage (at least 5 days a week) - Annual press release on the Survey on Equipment and Use of Information and Communication Technologies in Households since 2006.
  Source: INE (National Statistics Institute):
  [INE](https://www.ine.es/dyngs/INEbase/es/operacion.htm?c=estadistica_C&cid=1254736176741&menu=ultiDatos&idp=1254735976608) Example (2021): [INE](https://www.ine.es/prensa/tich_2021.pdf)
- Suicide Figures in Spain by Age - Epdata report on suicides in Spain since 1980 and requests for help due to suicidal ideation or attempts in minors since 2009.
  Source: Epdata (INE and ANAR Foundation): [Epdata](https://www.epdata.es/datos/cifras-suicidio-espana-datos-estadisticas/607?accion=2)
- Cost Analysis - Diagnosis costs are provided in the Ministry of Health's diagnosis database. The cost of each diagnosis is estimated based on the average cost of the Diagnosis-Related Groups (DRG) for the respective diagnosis and severity level. Only cases where mental illness is the primary diagnosis and not secondary have been considered to avoid overestimating the cost. Source: Ministry of Health

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About Us

This project has been carried out by researchers and analysts from the digital cyber-intelligence and risk analysis firm, **Alto Intelligence**, with the invaluable support of **Dr. Manuel Carnero (MD, PhD)** from the San Carlos Clinical Hospital, Surgeon, Researcher at CNIC, and Statistical Advisor to various national and international medical journals.

We are a **non-profit project dedicated to empowering healthier digital lives.** With this analysis, we seek to improve understanding of the effects of technology among the youth, fostering greater collaboration among parents, educators, researchers, and policymakers in defending children and adolescents against harms stemming from inappropriate or abusive use of social media and digital platforms. Our efforts have focused on understanding the current situation to prevent harms anticipated to arise from the proliferation of services based on generative artificial intelligence.

The mission of this project is twofold: **to expand knowledge** on this important topic and to **drive civil and policy actions** for regulatory changes that promote the mental well-being of our younger generations in an ever-evolving digital environment.

All data sources used in this project are public, and the main ones are detailed in the Annex of this document along with the methodology and scientific background of this study.
Our intention is to **encourage other organizations in other countries to conduct the same analysis with local data** to understand the extent to which we are experiencing the effects of a global phenomenon. Therefore, we offer the methodology and scripts used for the analyses in this study as “Open Source”.

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