



**UNIVERSIDAD DE LAS PALMAS DE GRAN CANARIA**

**PROGRAMA DE DOCTORADO: TURISMO, ECONOMÍA Y GESTIÓN**

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TESIS DOCTORAL

Health and risk behaviors among children and adolescents in  
Spain: examining the influence of individual, familiar and  
contextual factors

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Las Palmas de Gran Canaria, diciembre 2023



## AGRADECIMIENTOS

Esta tesis ha sido posible gracias a muchas personas, a las que agradezco de corazón su ayuda y apoyo.

El empuje inicial de una siempre práctica, optimista y resolutiva Patri Barber fue el que me decidió a embarcarme en esta aventura.

Mis directores de tesis, Juan Oliva y Laura Vallejo, han sido el *combo* perfecto de cercanía, conocimientos, orientación y dedicación a lo largo del proceso, permitiéndome además recorrerlo al ritmo que necesitaba. No podía haber tenido mejores directores.

Beatriz González López-Valcárcel, además de mi madre, ha sido el faro de mi carrera profesional desde sus inicios, incluso antes de darme cuenta, cuando nos traía a mi hermano Simón y a mí a “La Facultad” durante parte de nuestras vacaciones escolares, mientras ella trabajaba.

Además, agradezco al Ministerio de Sanidad y a la Universidad de Sevilla, y en concreto a Concepción Moreno-Maldonado e Inmaculada Sánchez Queija, habernos facilitado los microdatos de las encuestas que hemos utilizado en los tres capítulos de la tesis. A Inmaculada le agradezco también el trabajo realizado como co-autora del tercer artículo, con sus acertadas ideas y aclaraciones.

Quiero asimismo expresar mi gratitud a colegas como José María Labeaga y Luz María Peña, por los valiosos comentarios y sugerencias aportados al borrador del primer artículo, previo a su publicación.

Tampoco puedo olvidarme del apoyo recibido por mis compañeros de trabajo de Weber, a quienes agradezco hacerme crecer a nivel personal y profesional.

A mis amigos agradezco su continua motivación, y hacerme la vida más fácil y divertida.

A mi familia, la que está y la que ya no está, le debo gran parte de lo que soy, y le dedico este trabajo.

Finalmente, agradezco a Juan haber estado siempre ahí, cargado de amor, ánimos, paciencia y sonrisas que iluminan habitaciones.



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## SÍNTESIS

### Introducción

Esta tesis se centra en la salud y el bienestar de la juventud, como elemento de futuro primordial de nuestra sociedad. No sólo es importante contar con jóvenes sanos en el presente, sino también con adultos sanos en el futuro, y para ello las bases deben asentarse con tiempo. Comprender las conexiones entre la salud y el contexto social es un paso crucial para poder definir políticas adecuadas y garantizar resultados positivos.

Los comportamientos saludables de los niños y adolescentes en edad escolar y su contexto se están estudiando de una manera creciente en el marco del estudio colaborativo *Health Behaviour in School-aged Children* (HBSC) de la Organización Mundial de la Salud (OMS). Esta tesis doctoral pertenece a este campo de estudio, en la medida en que se han utilizado microdatos de varias oleadas de la encuesta HBSC en España para realizar los tres sub-estudios que incluye este trabajo.

Esta tesis pretende explorar la salud autopercebida y los comportamientos de riesgo de los niños y adolescentes en España, teniendo en cuenta su entorno familiar, amigos, colegio y comunidad. Para ello, se utilizaron métodos econométricos multinivel, anidados por colegio, para estudiar los efectos que varían entre grupos y estimar promedios grupales. En este sentido, trabajamos en la frontera entre la economía, la salud pública y la educación.

Los objetivos específicos de esta tesis son los siguientes: 1) analizar el impacto de la crisis económica vivida en España en 2008-2013 sobre la salud autopercebida y algunas conductas de riesgo de niños y adolescentes; 2) comprender mejor la relación entre el sobrepeso infantil y la situación laboral de los padres y madres en España, y; 3) explorar los factores que influyen en el acoso escolar en España, tratando de explicar la disminución observada en el *bullying* a lo largo del tiempo.

### Primer estudio

La literatura previa se había centrado principalmente en examinar las implicaciones de la recesión económica sobre la salud y los comportamientos de riesgo de la población adulta. Sin embargo, había menos trabajos centrados en el impacto en los jóvenes. Por este motivo, cobraba sentido explorar el potencial efecto de la crisis económica experimentada en España sobre los indicadores de salud y los factores relacionados con los estilos de

vida de niños y adolescentes, teniendo en cuenta las variables socioeconómicas familiares y los factores contextuales, y controlando por el entorno escolar y regional. El objetivo de este primer estudio fue investigar el efecto de la crisis económica experimentada en España entre 2008 y 2013 sobre diferentes medidas de salud autopercebida y diversas conductas de riesgo de niños y adolescentes.

Se utilizaron datos de cuatro oleadas (2002, 2006, 2010 y 2014) de la encuesta HBSC en España (n=77.651) para realizar distintos modelos de regresión logística y lineal multinivel para los problemas de salud, la salud autoreportada, la satisfacción vital, el tabaquismo, el consumo de alcohol y la ausencia de desayuno. La variación anual en las tasas regionales de desempleo se utilizó como *proxy* de la crisis económica. Se incluyó un conjunto creciente de variables de control, consistente en indicadores individuales, socioeconómicos y de relaciones familiares y entre iguales. Se estimaron *median odds ratios* para cuantificar la variación entre regiones y entre colegios.

Nuestros resultados confirmaron que el aumento en el desempleo experimentado durante el periodo de recesión económica podría haber empeorado el estado de salud y los estilos de vida de los niños y adolescentes. Sin embargo, el efecto dejó de ser estadísticamente significativo cuando se incluyeron indicadores de relaciones familiares y relaciones entre iguales, lo que sugiere la existencia de un efecto protector frente al impacto de la crisis. Nuestros resultados también muestran que las escuelas tuvieron un mayor efecto sobre la salud y los estilos de vida que las regiones.

Este estudio ofrece un nuevo esfuerzo para tratar de captar mejor el efecto de la crisis económica sobre la salud, la satisfacción vital y las conductas de riesgo de los niños y adolescentes en España, señalando la importancia del nivel socioeconómico familiar y de las relaciones entre padres e iguales.

## **Segundo estudio**

Un cambio social que se cita a menudo como posible factor indirecto del aumento de la prevalencia del sobrepeso y la obesidad infantil es la mayor proporción de mujeres trabajadoras, al provocar cambios significativos en las decisiones familiares relativas a la educación y el cuidado de los hijos. La literatura científica existente había encontrado resultados contradictorios en relación con la situación laboral de los progenitores y el exceso de peso infantil. El objetivo del segundo estudio fue contribuir a la comprensión de esta compleja relación. Se investigó si el sobrepeso/obesidad de niños y adolescentes



en España estaba relacionado con el empleo de los padres, considerando por separado las situaciones en las que: a) sólo uno de los progenitores (madre o padre) tiene trabajo; b) ambos progenitores tienen trabajo; o c) ninguno de los progenitores tiene trabajo.

En este caso, se analizaron los microdatos de las encuestas HBSC de 2010 y 2014 (n=32.694). Se aplicaron modelos de regresión logística y lineal multinivel para determinar la asociación entre el empleo de los progenitores y el peso autodeclarado de los hijos, teniendo en cuenta el efecto colegio y controlando por los factores socioeconómicos. Con el objetivo de identificar los posibles mecanismos de esta relación, también se exploró si los hábitos alimentarios (por ejemplo, el bajo consumo de fruta y el consumo de dulces) y las actividades de ocio (por ejemplo, ver pantallas y el sedentarismo) poco saludables entre los niños o adolescentes podían estar asociados con la situación laboral de sus progenitores, a través de modelos binarios multinivel separados para cada variable.

En la mayoría de los casos, las asociaciones significativas entre el peso de los jóvenes y la situación laboral de sus padres desaparecieron al ajustar los modelos por el nivel educativo y de renta familiar. Sin embargo, algunas asociaciones persistieron en algunos subgrupos analizados. En concreto, las niñas menores de 13 años que vivían en hogares en los que la madre era el único progenitor con empleo presentaban una mayor probabilidad de padecer obesidad y de notificar un índice de masa corporal elevado que el resto de subgrupos. Además, los varones que vivían en este tipo de hogares eran más propensos a adoptar estilos de vida poco saludables, sobre todo en cuanto a dieta y actividades de ocio.

Concluimos que ciertas características socioeconómicas de los padres tienen un efecto protector sobre el riesgo de obesidad de sus hijos. También observamos comportamientos menos saludables en los hogares donde habitan un padre que no trabaja y una madre trabajadora fuera del hogar, aunque la relación con la obesidad se limitaba a las niñas. Nuestros resultados identifican ciertas asimetrías que pueden derivar en un reparto inequitativo del cuidado de los hijos o de los resultados de dichos repartos.

### **Tercer estudio**

El acoso escolar es una preocupación mundial con implicaciones negativas duraderas tanto para los estudiantes como las comunidades escolares. Sin embargo, son poco frecuentes los estudios sobre *bullying* que consideren un enfoque multinivel. Asimismo,

otra aportación interesante del estudio es explorar los efectos del acoso y la victimización simultáneamente (es decir, en aquellas personas que responden al binomio acosador-víctima). Por tanto, el objetivo del tercer estudio fue caracterizar la victimización y la perpetración del *bullying* -individual y simultáneamente-; y explorar qué factores podrían estar relacionados con la disminución del acoso escolar experimentada en España durante la última década, lo que ha llevado a nuestro país a ser uno de los de menor prevalencia de este factor de riesgo en la OCDE, utilizando un enfoque multinivel.

Se utilizaron datos de las encuestas HBSC de España de 2014 y 2018 (n=64.886). El análisis se centró en diferentes variables de *bullying* percibido (ser acosado; acosar a otros; ser simultáneamente acosador y víctima) y cuatro tipos de *bullying* observado (físico, verbal, relacional, ciberacoso). Por un lado, se realizó un análisis descriptivo para comparar la situación en ambos años. Por otro lado, se ajustaron regresiones logísticas multinivel de efectos mixtos para cada variable de *bullying*, con los colegios como segundo nivel, controlando por características individuales, familiares y de contexto de los alumnos.

Nuestros resultados revelan que el acoso escolar experimentó un descenso consistente en todos los tipos de definiciones de *bullying* (observado, percibido, online) en España. La variable más significativa asociada a ser acosado fue haber acosado a otros alumnos, y viceversa. La probabilidad de declarar haber sido acosado disminuía a medida que los alumnos crecían, y aumentaba para los repetidores de curso, los inmigrantes y los niños con sobrepeso/obesidad. Los chicos de entre 10 y 12 años eran más propensos a ser víctimas de acoso que las chicas o los alumnos de más edad. El apoyo percibido por parte de amigos y familiares mostró un efecto protector sostenido y un aumento de la prevalencia a lo largo del tiempo. La variación no explicada entre colegios fue tan relevante como las características individuales de los estudiantes para entender la prevalencia del acoso escolar.

Concluimos que el acoso escolar experimentó un descenso en todos los subgrupos y regiones españolas. La percepción de un alto apoyo familiar y de amistades tuvo un efecto protector consistente contra el *bullying*. El diseño de intervenciones en este ámbito deben ir más allá de trabajar directamente con los niños o adolescentes e incluir en su abordaje el conocimiento del entorno escolar y los factores sociales de protección que rodean a los jóvenes.

## Conclusiones

Esta tesis doctoral pretende contribuir a la literatura existente sobre los factores relacionados con la salud y conductas de riesgo de niños y adolescentes. En concreto, pretendemos comprender mejor el papel de las características individuales, familiares y contextuales sobre la salud autopercebida y determinados factores de riesgo para el bienestar de la juventud, como la obesidad y el acoso escolar.

Una aportación de nuestro trabajo es el efecto protector sostenido que se ha encontrado para el contexto social de los niños y adolescentes sobre su salud y sus conductas de riesgo. Por lo tanto, es crucial potenciar una buena comunicación y relaciones con los miembros de la familia y los compañeros. Nuestros hallazgos también sugieren que el colegio tiene una influencia sobre los resultados de salud y los estilos de vida que puede ser incluso mayor que la de las características individuales del estudiante. Por lo tanto, las intervenciones exitosas deben abordar el fortalecimiento del entorno escolar.

Nuestras conclusiones pueden tener implicaciones para la prevención del acoso escolar y subrayan la necesidad de promover un clima escolar positivo. Otras implicaciones derivadas de este trabajo están relacionadas con la importancia de mantener políticas activas de empleo sólidas, así como políticas de protección social centradas en las familias monoparentales y los hogares menos pudientes. También sugerimos la necesidad de repartir más equitativamente la carga del cuidado entre ambos progenitores, ya que unas condiciones laborales mejor diseñadas para favorecer la conciliación entre la vida familiar y profesional pueden traducirse en mejoras sobre el bienestar de los niños.

Uno de los principales puntos fuertes de este trabajo fue la utilización de un conjunto de datos amplio, exhaustivo y representativo a escala nacional de niños y adolescentes en España. Utilizamos cinco oleadas de la encuesta HBSC, que abarcaban una muestra total de más de 117.000 estudiantes de casi 1.700 colegios. La amplia información contenida nos permitió analizar la salud y las conductas de riesgo, controlando al mismo tiempo por distintas covariables relevantes.

Nuestro trabajo tiene ciertas limitaciones. El diseño transversal del estudio HBSC limita la capacidad de realizar análisis longitudinales y establecer relaciones causales. El uso de datos autodeclarados por niños y adolescentes podría dar lugar a posibles problemas relacionados con la percepción, la precisión y las variables omitidas. La falta de preguntas homogéneas entre las diferentes oleadas nos impidió realizar una comparación más

amplia entre años para algunas variables. La falta de disponibilidad de variables detalladas adicionales también contribuye a las limitaciones.

A pesar de que estas limitaciones no permiten establecer relaciones de causalidad sólidas e indiscutibles, esta tesis ha perseguido la identificación de relaciones que capten el impacto de factores específicos sobre la salud y las conductas de riesgo de los adolescentes, señalando la importancia de la posición socioeconómica familiar, el apoyo social y el entorno escolar. Esperamos que este trabajo pueda servir de base para las políticas de promoción de la salud y educación sanitaria dirigidas a los jóvenes. Es importante diseñar e implementar políticas oportunas y holísticas para el bienestar de las poblaciones presentes y futuras.

Las investigaciones futuras podrían centrarse en la actualización de los análisis a lo largo del tiempo para considerar los efectos potenciales de la pandemia causada por la COVID-19. También sería aconsejable que las autoridades públicas convirtieran el estudio HBSC en una encuesta longitudinal. Ello permitiría explorar las consecuencias a corto, medio y largo plazo de los comportamientos actuales de los jóvenes y facilitar la identificación de relaciones causa efecto que reforzaran los resultados alcanzados en esta tesis.

## SUMMARY

### Introduction

This thesis focuses on the health and well-being of young people as a key element of the future for our society. It is not only important to have healthy young people in the present, but also healthy adults in the future, and for that, the foundations must be laid in time. Understanding the connections between health and social contexts is a crucial step in ensuring positive health outcomes and defining appropriate policies.

The health behaviors of school-age people and their context are increasingly studied within the framework of the World Health Organization (WHO) Health Behaviour in School-aged Children (HBSC) collaborative study. This PhD dissertation belongs to this field of study, insofar microdata from various waves of the HBSC survey in Spain were used for our three sub-studies.

This PhD dissertation aims to explore the self-perceived health and risk behaviors of children and adolescents in Spain, taking into account family, friends, school and community effects. In doing so, multilevel econometric methods nested by school were used to study effects that vary by groups and to estimate group level averages. In this regard, we work on the borderline between economics, public health and education.

The specific objectives of this thesis are the following: 1) to analyse the impact of the economic crisis experienced in Spain in 2008-2013 on the self-perceived health and some risk behaviors of children and adolescents; 2) to better understand the relationship between children's excess weight and parental employment status in Spain, and; 3) to explore the influencing factors of school bullying in Spain, trying to explain the observed decrease in bullying over time.

### First study

Previous literature had primarily concentrated on examining the implications of the economic recession on the health and risk behaviors of the adult population. However, less work focused on young people. Therefore, it was worth exploring the potential effect of the economic crisis experienced in Spain on health indicators and lifestyles factors among children and adolescents, taking into account family socioeconomic variables and contextual factors, and controlling for the school and regional environments. The objective of this first study was to investigate the effect of the economic crisis experienced

in 2008-2013 in Spain on different measures of self-perceived health and various risk behaviors of children and adolescents.

We used data from four waves (2002, 2006, 2010, and 2014) of the HBSC survey in Spain (n=77,651) to perform separate multilevel logistic and linear regression models for health complaints, self-rated health, life satisfaction, smoking, alcohol consumption, and breakfast skipping. Annual change in Spanish regional unemployment rates was used as a proxy of the economic crisis. An increasing set of control variables were included, consisting of individual, socioeconomic, and family and peer relationships indicators. Median odds ratios were estimated to quantify cross-region and cross-school variation.

Our results confirmed that the increase in unemployment experienced during the economic recession may have worsened children's and adolescents' health status and lifestyles. However, the effect was no longer statistically significant when indicators of family and peer relationships were included, suggesting a protective effect against the impact of the crisis. Our findings also show that schools had a larger effect on health and lifestyles than regions.

This study offers a new effort to better capture the effect of the economic crisis on children and adolescents' health, life satisfaction and risk behaviors in Spain, pointing out the importance of the family socioeconomic level and parental/peers relationships.

## **Second study**

One social shift often cited as a potential indirect contributor to the rising prevalence of overweight and obesity in children is the increased proportion of working women, leading to significant changes in family decisions regarding education and childcare. The existing scientific literature had found mixed results regarding paternal employment status and children's excess weight. The aim of the second study was to contribute to the understanding of this complex relationship. We investigated whether overweight/obesity among children and adolescents in Spain was connected with parental employment, considering separately the situations in which a) only one parent (mother or father) has a job, b) both parents have a job, c) neither of the parents has a job.

In this case, microdata from the 2010 and 2014 HBSC surveys were analyzed (n=32,694). Logistic and linear multilevel regression models were applied to assess the association between parental employment and children's self-reported weight status, accounting for school effects and controlling for socioeconomic factors. In order to identify the potential

mechanisms underpinning this relationship, we also explored whether unhealthy food habits (e.g. low fruit consumption and consumption of sweets) and leisure-time activities (e.g. screens viewing and sedentarism) among children may be associated with their parental employment status, through separated multilevel binary models.

In most cases, the significant associations between the weight of young people and their parents' work status disappeared once the models were adjusted for family wealth and education. However, certain associations remained persistent for some groups. Specifically, girls under 13 years-old living in households where the mother was the only employed parent exhibited a higher likelihood of experiencing obesity and reporting an elevated body mass index. Moreover, children in such households were more likely to adopt unhealthy lifestyles, particularly in terms of diet and leisure activities.

We concluded that some socioeconomic characteristics of parents have a protective effect on their children's risk of obesity. We also observed less healthy behaviors in households with a non-working father and a working mother outside the home, although the link with obesity was limited to girls. Our results identify certain asymmetries that may lead to inequitable sharing of childcare or childcare outcomes.

### **Third study**

Bullying is a worldwide concern with long-lasting negative implications for students and school communities. However, studies on bullying that consider a multilevel approach are rare. Another interesting contribution of this study is to explore the effects of bullying and victimization simultaneously (i.e., on those who respond to the bully-victim binomial). Therefore, the focus of the third study was to characterize bullying victimization and perpetration -individually and simultaneously-; and to explore what factors might be related to the decrease of bullying experienced in Spain during the last decade, which has lead our country as one of the OECD countries with the lowest prevalence of this risk factor, using a multilevel approach.

Data from the HBSC surveys for Spain in 2014 and 2018 were used (n=64,886). The analysis focused on different variables of perceived bullying (being bullied; bullying others; being simultaneously a bully and a victim) and four types of observed bullying (physical, verbal, relational, cyberbullying). A descriptive analysis was performed to compare the situation in both years. Multilevel mixed effects logistic regressions were

fitted for each bullying variable, with schools as second level, controlling by individual, family and context characteristics.

Our results revealed that school bullying experienced a decline that is consistent across all types of bullying definitions (observed, perceived, online) in Spain. The most significant variable associated with being bullied was having bullied other students, and vice versa. The likelihood of declaring being bullied declined as children get older, and increased for grade repeaters, immigrants, and overweight/obese children. Boys and children aged 10-12 years were more prone to be bully-victims than girls or older students. The perceived support of friends and relatives showed a sustained protective effect and an increased prevalence over time. The unexplained between-school variation was as relevant as student-level characteristics for understanding bullying prevalence.

We concluded that bullying experienced a decline across subgroups and Spanish regions. The perception of high family's and friends' support had a consistent protective effect against bullying. The design of interventions in this area must go beyond working directly with children or adolescents and include knowledge of the school environment and the protective social factors surrounding young people.

## **Conclusions**

This PhD dissertation is intended to contribute to the existing literature on health-related factors and risk behaviors of children and adolescents. Specifically, we aimed to better understand the role of individual, family and contextual characteristics on perceived health and certain risk factors for young people's well-being, such as obesity and bullying.

A contribution of our work is the sustained protective effect found for the social context of children and adolescents on their health and risk behaviors. It is therefore crucial to enhance good communication and relationships with family members and peers. Our findings also suggest that the school has an influence on health outcomes and lifestyles that can be even larger than that of the individual characteristics of the student. Successful interventions must therefore address the strengthening of the school environment.

Our findings may provide implications for bullying prevention and highlight the need for promoting a positive school climate. Other policy design implications derived from this work are related to the importance of maintaining strong active employment policies, as well as social protection policies focused on single-parent families and less affluent



homes. We also suggest the need for a more equally shared burden of caregiving between both parents, since better designed working conditions to promote the conciliation between family and professional life can translate into improvements in children's well-being.

One of the main strengths of this project was the utilization of a large, comprehensive, and national representative dataset of children and adolescents in Spain. We used five waves of the HBSC survey, encompassing a whole sample of more than 117,000 students from nearly 1,700 schools. The wide information contained allowed us to analyse health and risk behaviors, while controlling for relevant covariates.

Our work has certain limitations. The cross-sectional design of the HBSC study limits the ability to conduct longitudinal analyses and establish causal relationships. The use of self-reported data from children and adolescents might lead to potential issues concerning perception, accuracy and omitted variables. There was a lack of homogeneous questions among the different waves, hindering us from performing a wider comparison across years for some variables. Lack of availability for additional detailed variables further contributes to the limitations.

Although these limitations do not allow for strong and undeniable causal relationships to be established, this study has sought to identify relationships that capture the impact of specific factors on the health and risk behaviors of adolescents, pointing out the importance of the family socioeconomic position, social support and school environment. It is our hope that this work can inform health promotion and health education policies focused on young people. It is important to design and implement timely and holistic policies for the well-being of present and future populations.

Further research could focus on updating analyses over time to consider the potential effects of the COVID-19 pandemic. It would also be advisable for public authorities to convert the HBSC study into a longitudinal survey. This would make it possible to explore the short, medium, and long term consequences of current behaviors of young people and facilitate the identification of causal relationships that would reinforce the results achieved in this thesis.

**CHAPTER 1.**  
**INTRODUCTION**

## 1.1 Context

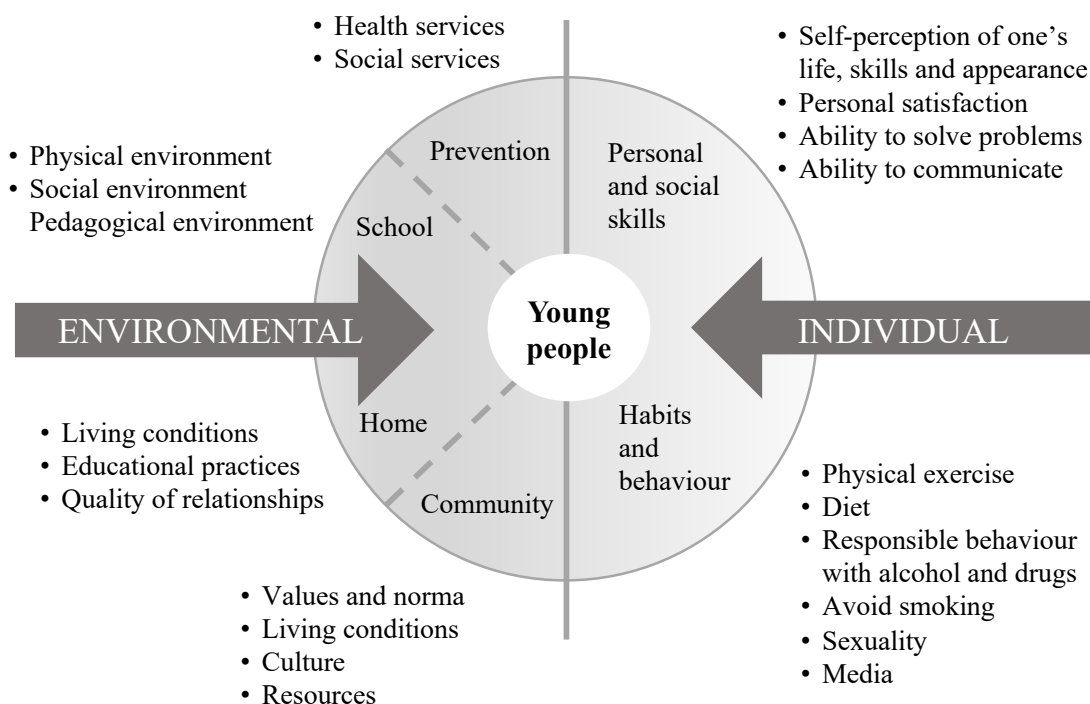
Health is one of the most precious assets for people, and it is fundamental for fostering resilient, productive, and robust societies. Public health is responsible for the protection and promotion of health, along with preventing diseases. These are objectives that every society should aspire to achieve, considering the diverse needs of all individuals, irrespective of their age, gender, social, cultural or economic standing (Ministerio de Sanidad, 2022).

Human development occurs intensively during the first two decades of life. Throughout these years, a person acquires the essential physical, cognitive, emotional, and social abilities that will determine for their future life health and well-being (Patton et al., 2016). Early investments in children's health, education and development has lifelong, intergenerational, and economic benefits (Clark et al., 2020). Childhood and adolescence are therefore public policy concerns of first magnitude, not only because of the importance of having healthy children in the present but also of having healthy adults in the future.

Individual, social and environmental factors determine the health and well-being of young people at different levels (Figure 1) (Martin and Arcand, 2005). The main determinants of adolescent health are structural factors such as national economic wealth, income inequality, and access to education (Viner et al., 2012). Within a same country, socioeconomic attributes, such as the economic level, the education background or the cultural and geographic environment have also a substantial impact on health determinants (Chelak and Chakole, 2023).

There are other protective and risky elements of children's everyday circumstances that impact both objective and subjective health and well-being. Families constitute the main protective and enabling setting (Irwin LG et al., 2007). The school children attend and the neighborhoods they live in are also relevant routine environments influencing perceived health and quality of life (Boardman and Saint Onge, 2005; Bundy et al., 2017).

Ultimately, the child's background and individual characteristics, including developmental stage, demographic, personality and self-esteem, also play a role in shaping health (Milenkova and Nakova, 2023; Wang et al., 2022).

**Figure 1. Key factors that determine health of children and adolescents**

Source: own elaboration from Martin (2005)

Parents and peers act as primary socializing agents for children and adolescents, and schools and homes are the primary settings for social exchange (Crosnoe, 2004). As such, these relationships, along with school and family characteristics have shown to influence academic performance, emotional well-being, health attitudes and risky behaviors (Frech, 2012). Young people are exposed on a continuous basis to risks to their health and well-being, including substances use (alcohol, tobacco, drugs), unhealthy diet, sedentariness, violent behavior, or psychological distress, among others.

The key factors are usually interrelated. The quality of relationships between parents and children and between parents and the school influences self-esteem and social functioning, which in turn impact on safe and healthy behaviors (McAdams et al., 2017). Low self-esteem is associated with problems such as alcohol and drug use, depression, teenage pregnancy, and learning disabilities (Fuentes et al., 2020).

Consequently, childhood development is shaped by a multifaceted conjunction of family, peer, school, community, media, and cultural influences (Viner et al., 2012). Therefore, the most effective actions for adolescent health and well-being are intersectoral, multilevel and multi-component (Patton et al., 2016).

### ***The HBSC survey***

The Health Behaviour in School-aged Children (HBSC) study stands as a distinctive cross-national research project on children and adolescents' health and well-being across Europe, North America and Asia. Starting in 1982, this school-based survey is conducted in collaboration with the World Health Organization (WHO) Regional Office for Europe. Until now, 51 countries have taken part in the study, bringing together over 450 network members (HBSC, 2023a). The aim of the study is threefold: to monitor young people's health and well-being; to understand the social determinants of health; and to inform policy and practice to improve young people's lives

According to the international protocol, the study collects data on health behaviors, health outcomes and social environments of children aged 11, 13, and 15. Some countries, such as Spain, extended this age range to include students aged 10, 12, and 14 year-old, as well as adolescents beyond compulsory education (>15 years old).

The questionnaire collects anonymized data on family relationships, peer relationships, school context, psychological adjustment, food and diet, substance use and physical activity. Surveys are being conducted every four years among pupils in schools, using self-report paper or electronic questionnaires. A consistent, standardised methodology is used in order to ensure that representative high-quality data are used. Each country/region selects a nationally representative sample of approximately 1,500 pupils per age group (totaling around 4,500). The questionnaires combine mandatory items, which are common in all countries, with optional items, nation-specific.

The most recent HBSC survey (2021/22), unpublished at the time of writing this thesis, was conducted across 44 countries and regions, and it included an optional set of questions that measured perceived impacts of the COVID-19 pandemic (HBSC, 2023a). Spain joined the HBSC network in 1984. Until then, nine waves have been conducted (from 1985/86 to 2021/22). The host institution is the Department of Developmental and Educational Psychology of the University of Seville (HBSC, 2022).

Thus, the HBSC study provides methodologically rigorous, comparative data about the social determinants of health and well-being among young people. With nearly 40 years of data and responses from over 1,300,000 children and adolescents, it provides a unique resource to compare the health and well-being of adolescents between countries and over time, although it does not allow longitudinal follow-up of the same subjects.

## 1.2 Justification of this research

There is growing societal interest in understanding the determinants of people's health and the need to address them through a multidisciplinary and intersectoral approach, with an emphasis on community involvement. At the same time, there is a rising social awareness regarding the economic repercussions of crises and the challenges of public health, which makes it possible to rethink investment in public health as a social investment for the future (Ministerio de Sanidad, 2022).

In an evolving public health landscape, gaining insight into the health and well-being of young people remains significant. Understanding the connections between their health and social contexts is a crucial step in ensuring positive health outcomes and defining appropriate policies. We also have to take into account that health and education are intrinsically linked. Education contributes to safeguarding health, and health maintains the conditions needed for learning (The Lancet Public Health, 2020). Furthermore, education is one of the most powerful tools for building an equitable and healthy society. However, not all learning is acquired in a formal school setting (Hahn and Truman, 2015). In this regards, educational policies and programs aimed to close gaps between subgroups need to consider empirical evidence concerning the effects of the different risk factors and behaviors.

The health behaviors of schooled adolescents and their context are being studied in the framework of the WHO HBSC collaborative study (HBSC, 2023a). This PhD dissertation belongs to this field of study, insofar microdata from various waves of the HBSC survey in Spain were used for our three distinct sub-studies. We analyzed three specific questions related to children and adolescent's health and lifestyle habits in Spain, taking into account family, friends, school and community. In doing so, multilevel econometric methods nested by school were used to study effects that vary by groups and to estimate group level averages (Hoffman and Walters, 2022). In this regard, we work on the borderline between economics, public health and education.

Periods of economic crisis have a heightened impact on health (Urbanos-Garrido and González López-Valcárcel, 2015). The macroeconomic effects of the global financial crisis were evident in Spain, and between 2008 and 2013 the country suffered one of the worst recessions in modern history until that date, with profound negative consequences in terms of economic growth, employment, public debt and public deficit (Royo, 2020).

Research publications have primarily concentrated on examining the implications of this economic recession on the health and risk behaviors of the adult population, yielding varied results (Bezruchka, 2009; Parmar et al., 2016). However, less work focused on young people. In this regard, it was worth exploring the effect of the economic crisis experienced in Spain on health indicators and lifestyles factors among children and adolescents, taking into account family socioeconomic variables and contextual factors, and controlling for the school and regional environments.

For its part, obesity during childhood is also a relevant health concern, given its increasing prevalence and long-lasting implications (Karnik and Kanekar, 2012). One social shift often cited as a potential indirect contributor to the rising prevalence of overweight and obesity in children is the increased proportion of working women, leading to significant changes in family decisions regarding education and childcare (Martin et al., 2018). The existing literature has found mixed results regarding paternal work and children's excess weight. Our aim was to contribute to the understanding of this complex relationship, following an approach that allows us to explore more deeply the relationships between socioeconomic circumstances and parental employment, and to account for the roles of both fathers and mothers as carers of their children.

School bullying is a leading cause of mental and health problems for victims, perpetrators and bystanders (Callaghan et al., 2019; UNESCO, 2018). It has therefore become a topic of growing interest for schools and families, but also for politicians (Hatzenbuehler et al., 2017). Thanks to the enforcement of anti-bullying policies, together with an increased social awareness and shifts in family and contextual factors, there has been a notable decline in bullying over time (Chester et al., 2015). In addition, there is an increasing evidence regarding the negative effects of the bullying phenomenon (McKay et al., 2022). However, studies on bullying using a multilevel design are scarce, and there is also a need to explore the effects of bullying and victimization simultaneously (i.e., the bully-victim subgroup), testing multilevel models (Marsh et al., 2023).

### 1.3 Objectives and structure of the thesis

The central theme of this thesis is the self-perceived health and risk behaviors of children and adolescents in Spain, taking into account individual, contextual and environmental factors. In this context, the school they attend serves as a key element for the analysis.

The specific objectives were the following:

- To analyse the impact of the economic crisis experienced in Spain in 2008 - 2013 on the self-perceived health and some risk behaviors of children and adolescents.
- To better understand the relationship between children's excess weight and parental employment status in Spain.
- To explore the influencing factors of school bullying in Spain, trying to explain the observed decrease in bullying over time.

The remaining sections of this research report are organized in the following way.

The second chapter of this document contains the first sub-study, which was published in January 2020 in the International Journal of Environmental Research and Public Health. Our objective was to investigate the effect of the economic crisis experienced in 2008-2013 in Spain on different measures of self-perceived health and various risk behaviors of children and adolescents. More concretely, we focused on health complaints, self-rated health, life satisfaction, smoking, alcohol consumption, and breakfast skipping. We used data from four waves (2002, 2006, 2010, and 2014) of the HBSC survey to perform multilevel regression models, considering a proxy of the economic crisis, and controlling for individual, socioeconomic, relational and contextual variables. The results are discussed in light of the theories and empirical evidence obtained in previous studies. Finally, the conclusions and implications of them are presented.

In the third chapter, our objective was to explore whether overweight and obesity (using the definition specified by the WHO) among children and adolescents in Spain were connected with their parents' employment status. We considered separately different situations in which only one parent has a job, both parents have a job, or neither of the parents has a job. This second sub-study of the PhD was published in BMC Public Health in July 2022. In this case, microdata from the 2010 and 2014 HBSC surveys were analyzed. We also aimed to determine the extent to which the school's environment was associated with a higher child's weight. Additionally, we explored whether unhealthy



food habits (e.g. low fruit consumption and consumption of sweets) and leisure-time activities (e.g. screens viewing and sedentarism) among children may be associated with their parental employment status, taking into account the socioeconomic context of the family. The obtained results are presented and discussed. Finally, the conclusions and implications are exposed.

Chapter 4 focuses on school bullying, as a one the key risk behaviors for health. Our objective was to investigate which factors were associated with the recent decreasing trend in bullying observed in Spain. For this purpose, using the HBSC 2014 and 2018 waves, we first characterised the different forms of bullying; and then we applied multilevel analyses that combine student-level, family-level and school-level variables to explain changes in the prevalence of different forms of bullying over time. We analyzed separately frequent bullying victimization and frequent bullying perpetration, as well as the specific subgroup of students who bully others and suffer from bullying at the same time. Traditional (i.e. physical, verbal and relational bullying) and cyberbullying were also considered in a separate manner, in order to gain details. The findings are presented and examined in the context of the available literature. Then, we outline some implications of the results and draw conclusions.

Finally, the last chapter of this PhD dissertation contains a conclusion that wraps up the research done during these last years. It briefly summarizes the main research questions and findings of the three sub-studies, highlighting some policy implications derived from them. We also provide recommendations for further research on the topic, emphasizing areas that could benefit from further exploration.

## **CHAPTER 2.**

### **THE EFFECT OF THE ECONOMIC CRISIS ON ADOLESCENTS' PERCEIVED HEALTH AND RISK BEHAVIORS: A MULTILEVEL ANALYSIS**

## **2.1 Introduction**

The global economic recession initiated at the end of the first decade of the 21st century had important macroeconomic effects in most developed countries. Spain was no exception, with a Gross Domestic Product (GDP) fall of almost 9% between 2008 and 2013, leaving high levels of debt and public deficit. The effects of the crisis quickly shifted to the level of employment. The unemployment rate of the general population rose from 7.9% in 2007 to 26.9% in 2013, with marked differences between regions, and the number of unemployed individuals increased by 4.5 million (Oliva Moreno, J et al., 2018).

There is an extensive body of literature focused on analyzing the impact of the economic crisis on the health and lifestyles of the population, with mixed findings (Bezruchka, 2009; Oliva Moreno, J et al., 2018; Parmar et al., 2016). Evidence suggests that the crisis had a greater effect on mental health than on the physical health of the population (Oliva Moreno, J et al., 2018; Parmar et al., 2016). Most studies are based on analyzing the impact on the health of adults, but there is less work focused on children or adolescents.

There is a virtuous circle between good childhood health and present and future well-being. Health in childhood and youth can mark future personal, social and academic development, and difficulties in adolescence can have important consequences in adult life (Patel et al., 2007; Sawyer et al., 2012). For its part, health risk behaviors include unhealthy lifestyle habits related to nutrition, lack of physical exercise and consumption of harmful substances (alcohol, tobacco, drugs), which can negatively affect pupils' school performance and health (Kipping et al., 2015, 2012).

The family is one of the most important determinants of children's development (Sleskova et al., 2006). In particular, family socio-demographic conditions have a relevant impact on the health and risk behaviors of children and adolescents. The educational level of the parents is related to adolescent lifestyles (Moreno Maldonado et al., 2016). Children of parents with lower educational levels have a higher risk of poor school performance and of reporting lower life satisfaction and self-perceived health than children of parents with a university degree (Padilla-Moledo et al., 2016). Family wealth also plays a crucial role in the well-being of adolescents and is a potential source of health inequalities. Adolescents from more affluent families show greater satisfaction with their

lives than those from less affluent families and feel healthier than those who report that their home has few resources (Oliva Moreno, J et al., 2018; Zaborskis et al., 2019).

The impact of the crisis on health may differ between adults and children. Adolescents spend much of their day in school. Their environment can play an important role in their well-being. Relationships with peers and their families may affect their mental health (Gariépy et al., 2016). Parental communication is one of the key ways in which the family can act as a protective health asset, helping young people to deal with stressful situations or adverse influences. Ease of parental communication and parental support are associated with positive body image, higher self-rated health, higher life satisfaction and fewer physical and psychological complaints (Fenton et al., 2010; Frasquilho et al., 2016b; Levin and Currie, 2010; Moreno et al., 2009). They are also less likely to participate in aggressive behaviors and substance use (Pickett et al., 2009). Schools may also have a significant effect on risk behaviors and mental health, both directly, through school rules, peer influences, social activities, teacher support and school connectedness, and indirectly by influencing student-level skills and knowledge (Deschesnes et al., 2003; Hale et al., 2014; West et al., 2004). The effects of unemployment on health and lifestyles can occur at both the individual and contextual levels (Catalano, 2009). For children, adult unemployment may have a dual effect. On the negative side, the fact that one or both parents lose their jobs or suffer the impact of the recession may psychologically affect the child (more stress, fear, worry) and significantly reduce family wealth (Frasquilho et al., 2017, 2016a, 2016b). On the other hand, children could also benefit, at least in the short term, from their parents' unemployment situation by being able to spend more time with them, being therefore more available to communicate, help, cook or control bad habits and influences (Bezruchka, 2009; Schaller and Zerpa, 2019). Previous research on parental employment and youth's well-being also suggests that parents' unemployment is associated with young people's lower well-being (Bacikova-Sleskova et al., 2015; Frasquilho et al., 2016b; Haisken-DeNew and Kind, 2012; Sleskova et al., 2006).

Parental unemployment has been found to have unintended consequences on the probability of having bad habits, such as drugs consumption, binge drinking or smoking. Having an unemployed father has been associated with a positive effect on the probability of binge drinking (Lundborg, 2002). The 'economic stress' mechanism links substance consumption to psychological reasons (Ayllón and Ferreira-Batista, 2018). On the

contrary, other studies indicate a positive relationship between unhealthy lifestyles and household budget, suggesting a procyclical relationship between macro-economic conditions and risk behaviors (Kokkevi, A et al., 2014; McClure et al., 2012; Ruhm, 2000).

In this context, it is worth exploring the effect of the economic crisis experienced in Spain on children and adolescents. We focus on analyzing the impact on health indicators as well as on lifestyles factors, as the latter might be a mechanism that explains changes in health that have accrued and/or will develop in the long run. The aim of this work was thus to analyze the possible impact of the recession on self-perceived health and some risk behaviors of the adolescent population in Spain, taking into account family socioeconomic variables and contextual factors, and controlling for the school and regional environments.

## **2.2. Materials and methods**

### *Study design*

Data were obtained from the Health Behavior in School-aged Children (HBSC), an international cross-sectional survey supported by the World Health Organization aimed at understanding young people's health-related behaviors, well-being, and developmental contexts (Currie et al., 2009). The responses were collected by means of standardized self-completed questionnaires, administered in school classrooms according to standard instructions (Currie, C et al., 2012). We used data from four consecutive HBSC waves (2002, 2006, 2010 and 2014) performed for Spain. Microdata were provided by the Spanish Ministry of Health, Consumption and Social Welfare (Ministerio de Sanidad, Consumo y Bienestar Social, 2019).

### *Sample*

The sample comprised 77,651 students aged between 9 and 21 years. 0.47% of the sample (n= 364) were adolescents older than 18 years old, who were still enrolled in secondary education because they repeated one or more school years during their life. The mean age of the sample was 14.35 years (SD:  $\pm 2.22$ ) with a balanced representation of boys and girls (49.18% boys and 50.82% girls). The students were enrolled at a total of 1,181 educational centers from the 17 Spanish Autonomous Communities (plus two

Autonomous Cities). Due to missing values of some of the included variables, the final sample sizes of the conducted models ranged from 53,543 to 56,507.

### *Data*

There are two sets of dependent variables, regarding health and lifestyles. Adolescent's health was measured in three alternative ways, by asking him/her about health complains, self-rated health status and life satisfaction (Table 1).

- Physical and psychological health complaints were measured using the HBSC symptom checklist. Pupils were asked how often in the past 6 months they had experienced somatic (headache; abdominal pain; backache; feeling dizzy) or psychological (feeling low; feeling irritable or bad-tempered; feeling nervous; and having difficulties in getting to sleep) symptoms. The response options for each item ranged from 'about every day' to 'rarely or never' (5 response options). A composite dichotomous index was created including these eight symptoms, coded as 1 when the child had rarely or never experienced any of the symptoms, and 0 otherwise. Additionally, two separate composite indexes were created for the four physical and psychological complains, following an analogue structure.
- The HBSC survey includes a question about the child self-perceived health, with four possible answers: excellent, good, fair or poor. We recoded the variable into a dichotomous one, being 1 excellent or good health, and 0 fair or poor health.
- The survey also includes a 10 points visual analogue life satisfaction scale, where the child was asked to indicate the step of the ladder at which he/she would place his/her life at present (from 0 to 10). The top of the ladder indicates the best possible life and the bottom, the worst.

Three risk behaviors were also analyzed: smoking, frequent alcohol consumption and absence of breakfast at weekdays. The variables were included individually in a dichotomous form, being 1 the bad habit and 0 the absence of it.

**Table 1.** Variables included in the analyses.

Area	Variables	Coding of the variables
<b>Dependent variables</b>		
<b>Health outcomes</b>	Self-rated health	1 if excellent or good, 0 otherwise
	Vital satisfaction scale	Continuous variable between 0 and 10, being 10 the best possible life
	Health complaints: 8 physical and psychological symptoms (headache; abdominal pain; backache; feeling dizzy; feeling low, irritable or nervous; difficulties in falling asleep)	1 if rarely or never affected by any of them, 0 otherwise
<b>Risk behaviors (lifestyle habits)</b>	Smoking	1 if frequently or occasionally smoking during the last year, 0 otherwise
	Alcohol consumption	1 if drinking any alcoholic beverage at least every week (beer, wine, spirits, alcopops or any other), 0 otherwise
	Absence of breakfast	1 if not eating breakfast every weekday, 0 otherwise
<b>Control variables</b>		
<b>Individual</b>	Gender	1 if boy, 0 if girl
	Age groups	Three dummies: 9-12 years; 13-16 years; 17 years and older
<b>Socioeconomic</b>	Family structure	1 if biparental, 0 otherwise
	Parents' work status	1 if both parents are working, 0 otherwise
	Family material wealth (FAS score)	Three dummies: high score; medium score; low score
<b>Family and peer relationships</b>	Family understanding	1 if the child feels that at least one of his/her parents understand him/her, 0 otherwise
	Family help	1 if the child feels that at least one of the parents help him/her, 0 otherwise
	Family knowledge	1 if the child feels that at least one of the parents knows a lot about his/her expenditures, friends, leisure time and night outings, 0 otherwise
	Family love	1 if the child feels that at least one of his/her parents is loving, 0 otherwise
	Physical fights	1 if the child was involved in at least one physical fight with peers in the last year, 0 if otherwise
	Bullying	1 if the child has bullied a peer at least once during the last year, 0 if otherwise
	Bullying victim	1 if the child was bullied by peers at least once during the last year, 0 if otherwise
<b>Variables used to anchor the multilevel analysis</b>		
<b>Contextual variables</b>	School	Dummies for each school: 272 for 2002, 377 for 2006, 133 for 2010 and 399 for 2014
	Region	18 dummies for each Spanish region (17 AACC and 1 for Ceuta and Melilla)

Of all the possible macroeconomic measures, we used unemployment as proxy of the economic crisis, as it is the most widely available indicator of economic difficulty, and previous research has shown that fluctuations in employment are more closely associated with short-term changes in health than are other economic indicators (Stuckler et al., 2009; Tapia Granados, 2005). Poor and vulnerable members of the population are most sensitive to unemployment, and could be missed by GDP measures. We used as proxy the annual relative changes in the regional unemployment rates for the four years included in the analysis. We also checked the robustness of our findings using the change in unemployment regional rates measured in absolute percentage points. The data were extracted from the Spanish National Institute of Statistics (Instituto Nacional de Estadística).

We included several control variables in the models. Besides individual measures such as age and gender, specific socioeconomic variables were employed, as well as variables about parental relationships and conflicts with peers. Socioeconomic measures include parents' working status (both parents are working), family structure (single versus two-parent households) and family material wealth. The family material wealth was assessed using the Family Affluence Scale (FAS) (Currie, C et al., 2012). A global score was calculated as the sum of the following individual item scores (Boyce et al., 2006; Currie et al., 2008): car ownership (No: 0 points; Yes, one: 1 point; Yes, two or more: 2); having one's own bedroom (No: 0 points; Yes: 1 point); number of computers/laptops at home (None: 0 points; One: 1 point; Two: 2 points; More than two: 3 points); and number of family holidays during the last year (None: 0 points; One: 1 point; Two: 2 points; More than two: 3 points). Using an additive score, the responses were recoded into three groups: low (0–2 points); medium (3-5 points), and high (6-9 points) family-wealth. Several indicators were also included in order to approximate family and peer relationships. Four variables aimed to measure if the child felt understood, supported, beloved and/or known by his/her parents. Regarding peers, three variables aimed to detect bullying (give or receive) or physical fights.

### *Statistical analysis*

Multilevel regression models were applied, as data were organized at more than one level: individual, school and region. These models were used to estimate separately the variance between pupils within the same school and region, and the variance between schools and regions. Separated models were performed for the three health outcome variables



(symptoms, self-rated health status and life satisfaction scale) and the three risk behavior variables (tobacco, alcohol consumption and absence of breakfast), in order to assess the impact of the economic crisis on each of them.

Due to the nature of the dependent variables, logistic multilevel regression models were fitted, except for the life satisfaction scale, where linear models were used. The fixed parts of the models are a linear function of individual- and contextual-level determinants. The random parts included three variance components between regions (level 3), schools (level 2) and students (level 1).

For each dependent variable, three models were fitted by stepwise regression. Model 1 assessed the association between the outcome variable and individual-level variables (gender, age group) as well as the crisis proxy, to analyze the region- and school-level variance. Model 2 added socioeconomic variables (family wealth, parental work and family structure) and Model 3 added family and peers relationship indicators (parental relationship and peers' conflicts).

For the multilevel linear regressions on vital satisfaction scale, residual intraclass correlation coefficients (ICC) were estimated. To quantify the cross-region and cross-school variation on health outcomes and risk behaviors of the multilevel logistic regressions, we calculated the median odds ratios (MOR) (Merlo et al., 2006). The MOR quantifies the variation between clusters by comparing two persons from two randomly chosen, different clusters. It allows to compare between two identical individuals (level 1) that belong to different groups (region and school). In our models, it shows the extent to which the individual probability of declaring good health or a risk behavior is determined by the region where the child lives or the school of attendance.

In all models, whether the differences were significant was assessed by using the Wald chi<sup>2</sup> test for each predictor. The analyses were performed using the Stata 14.2 program.

## **2.3 Results**

### *Descriptive statistics*

Table 1 and 2 provide a summary of the descriptive statistics. Almost half of the sample were boys (49.18%) and reported a high family affluence according to the FAS composite index (49.76%). The prevalence of several socioeconomic and relationships/conflicts indicators worsened in 2010: both parents working (68.9% in 2006 versus 66.8% in 2010), biparental familiar structure (82.8% vs 79.14%), physical fights with other

children (31.5% vs 33.2%) and parental knowledge (47.4% vs 46.1%) and love (87.6% vs 86.1%).

The relative change in the annual regional unemployment rates showed a different pattern over the analyzed years. The regional unemployment rates fell in relative terms an average of 7.48% between 2005 and 2006 and 7.43% between 2013 and 2014. However, they increased by 12.07% in 2010, with substantial differences among regions. During this year of economic crisis, the unemployment rate increased in all but one region, in a range of between 23.2% and -5.7%.

**Table 2.** Descriptive analysis of the independent variables.

		Year 2002	Year 2006	Year 2010	Year 2014	TOT AL
<b>Sample</b>	Number of children	13,552	21,811	11,230	31,058	77,651
	Number of schools	272	376	132	398	1,181
<b>Gender</b>	% Boys	49.59	48.13	49.39	49.65	49.18
	% Girls	50.41	51.87	50.61	50.35	50.82
<b>Age groups</b>	% Under 13 years	29.85	31.47	27.95	29.98	30.08
	% Aged 13-16 years	53.16	50.35	58.95	59.93	55.92
	% 17 years and older	17.00	18.18	13.10	10.09	14.00
<b>Economic level</b>	% Low family affluence	9.65	5.27	2.99	3.23	5.27
	% Medium family affluence	52.83	45.02	34.33	45.60	44.97
	% High family affluence	37.52	49.71	62.67	51.17	49.76
<b>Parental work status</b>	% Both parents working	62.61	68.88	66.75	62.81	65.08
	% Only one parent's working	35.19	29.24	30.53	32.64	31.81
	% None parent's working	2.20	1.87	2.72	4.55	3.11
<b>Family structure</b>	% Two-parent	85.92	82.76	79.14	80.23	81.80
	% Single-parent	9.59	10.97	11.46	13.04	11.61
	% Other family structure	4.49	6.27	9.40	6.73	6.59
<b>Family support</b>	% Parental understanding	44.98	69.96	69.90	70.66	65.72
	% Parental help	61.61	87.02	86.10	86.98	82.29
	% Parental knowledge	21.36	47.44	46.05	55.44	43.30
	% Parental love	62.04	87.60	86.13	86.92	82.53
<b>Peer behaviors</b>	% with physical fighting	36.45	31.52	33.17	28.87	22.57
	% Bullying others	31.25	20.11	20.15	17.58	21.33
	% Bullying victims	24.13	12.50	13.33	15.09	15.78
<b>Crisis proxy</b>	Regional unemployment rate annual change (%)	9.12	-7.48	12.07	-7.43	-1.73

Raw data on life satisfaction shows that it remained at mean levels of 6.87 by 2006 and 2010, improving up to 7.7 points by 2014. Regarding health status, 91.93% of the students reported an excellent or good health status in 2010 (3.56 percentage points more than in

2002). The proportion of students reporting good or very good health (no or few physical or psychological symptoms) dropped from 62.31% in 2006 to 61.41% in 2010 (Table 3).

**Table 3.** Descriptive analysis of the dependent variables.

		Year 2002	Year 2006	Year 2010	Year 2014	TOTAL
		(%)	(%)	(%)	(%)	(%)
<b>Health and life satisfaction</b>						
Health symptoms	Rarely/never had health symptoms	51.78	62.31	61.41	61.86	60.12
	Otherwise	48.22	37.69	38.59	38.14	39.88
Self-reported health	Excellent/good	88.37	91.23	91.93	91.85	91.06
	Fair/poor	11.63	8.77	8.07	8.15	8.94
Vital satisfaction Scale (mean scores)		6.57	6.87	6.87	7.70	7.13
<b>Lifestyles</b>						
Smoking	Yes	24.92	16.10	17.00	10.00	15.38
	No	75.08	83.90	83.00	90.00	84.62
Frequent alcohol consumption	Yes	17.57	18.29	16.09	7.11	13.42
	No	82.43	81.71	83.91	92.89	86.58
Breakfast during weekdays	5 days	69.24	73.36	61.85	74.61	71.44
	Less than 5 days	30.76	26.64	38.15	25.39	28.56

Regarding lifestyles, the prevalence of regular smoking increased slightly between 2006 and 2010, with a deep decrease in 2014. Breakfast during weekdays also showed a deterioration during 2010. By contrast, the prevalence of frequent alcohol consumption decreased two percentage points between 2006 and 2010, and more than halved by 2014.

#### *Multilevel analysis*

In accordance with the multilevel logistic regression models, girls presented a higher risk of reporting health complaints or a poorer health status compared with boys. Students aged 17 and older showed a higher risk of poor health than younger peers. Individuals living in more affluent households had a significantly higher probability of reporting better health (less health complaints) than those living in more deprived households. Belonging to a two-parent family structure is also related with better health outcomes. However, the fact that both parents have a job seems to have a slight positive effect on vital satisfaction and psychological health, but not on physical health or self-reported global health. The same results were observed when the symptoms were analyzed separately by dividing them into physical and psychological (see supplementary table 1).

The four variables regarding parental support showed a positive correlation with better health and vital satisfaction (especially parental knowledge, with odds ratios between 1.29 and 1.59). By contrast, being involved in fights and bullying other peers were linked to a lower probability of enjoying good health. Being victim of bullying by peers was a strong and significant risk factor for worse health and vital satisfaction (Table 4, Table 5).

The changes in regional unemployment were linked to a worse health status at Models 1 and 2. However, the economic crisis proxy was not statistically significant when incorporated in the most complex models that included family and peers relationships indicators (Models 3). The effect only remained significant at a 10% significance level for vital satisfaction. Conclusions of the analyses were robust when the change in unemployment regional rates was measured in absolute percentage points.

In the multilevel models on lifestyles, the effect of gender indicates that girls are more likely to smoke and skip breakfast, but are less likely to consume alcohol than boys. Being 17 and older is associated with a higher probability for each of the risk behaviors considered. Family affluence decreases the risk of smoking and missing breakfast, but do not have an effect on alcohol consumption (Model 2). The variables related with a better communication with parents (Models 3) were significantly associated with good lifestyles. By contrast, the variables regarding fights or bullying peers presented a higher risk of following these three unhealthy habits. The effect of the economic crisis remained statistically significant in all models for smoking and absence of breakfast, suggesting a positive association between increases in unemployment rate and higher risk of that bad habit. However, the size of the effect was considerably reduced when controlling for family and peers relationship indicators. The effect on alcohol consumption was no longer significant when such covariates were added.

Findings of random intercepts suggest that schools had a higher effect on health and lifestyles than regions. After adjusting for family and peer relationship indicators (model 3), all intraclass school and region correlation coefficients (ICC and MOR) were slightly reduced in the regressions on health outcomes and smoking. MORs indicate that the school level explained between 25% and 38% of the total variance for health symptoms. School-level variance was larger for frequent alcohol consumption (MOR of 2.24 – 2.35) than for the other dependent variables, suggesting that the school environment has the largest effect on alcohol consumption.

**Table 4.** Results from the multilevel logistic regressions on health complaints, self-rated health and life satisfaction (odds ratios / coefficients).

	8 health complaints (logistic)			Self-rated health (logistic)			Life satisfaction scale (linear)		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Boy	2.196*** (0.041)	2.192*** (0.041)	2.645*** (0.054)	1.630*** (0.051)	1.609*** (0.051)	1.812*** (0.060)	0.146*** (0.015)	0.136*** (0.015)	0.194*** (0.015)
Aged 13-16	0.590** (0.015)	0.594*** (0.015)	0.627*** (0.017)	0.457*** (0.021)	0.465*** (0.021)	0.487*** (0.024)	- 0.776*** (0.022)	- 0.752*** (0.022)	- 0.671*** (0.022)
Aged 17 and older	0.451*** (0.015)	0.457*** (0.015)	0.451*** (0.136)	0.334*** (0.018)	0.345*** (0.019)	0.345*** (0.020)	- 1.081*** (0.031)	- 1.040*** (0.031)	- 0.979*** (0.029)
FAS_medium		1.327*** (0.060)	1.220*** (0.056)		1.504*** (0.091)	1.330*** (0.082)		0.400*** (0.036)	0.282*** (0.035)
FAS_high		1.471*** (0.067)	1.292*** (0.060)		1.997*** (0.125)	1.640*** (0.105)		0.665*** (0.037)	0.481*** (0.035)
Both parents working		1.032 (0.020)	1.040* (0.021)		1.037 (0.034)	1.040 (0.034)		0.045*** (0.016)	0.045*** (0.015)
Two-parent family structure		1.370*** (0.037)	1.278*** (0.036)		1.444*** (0.060)	1.325*** (0.056)		0.430*** (0.022)	0.337*** (0.021)
Parental understanding			1.269*** (0.028)			1.219*** (0.043)			0.389*** (0.017)
Parental help			1.218*** (0.035)			1.530*** (0.062)			0.432*** (0.022)
Parental knowledge			1.479*** (0.033)			1.588*** (0.063)			0.360*** (0.017)
Parental love			1.242*** (0.035)			1.307*** (0.053)			0.390*** (0.021)
Fighting with peers			0.642*** (0.015)			0.710*** (0.026)			- 0.192*** (0.017)
Bullying			0.752*** (0.019)			0.818*** (0.031)			- 0.120*** (0.019)
Bullying victim			0.520*** (0.015)			0.668*** (0.028)			- 0.526*** (0.021)
Unemployment rate change	0.470*** (0.059)	0.482*** (0.059)	1.062 (0.132)	0.548*** (0.098)	0.578*** (0.100)	1.338 (0.241)	- 1.834*** (0.155)	- 1.769*** (0.153)	-0.242* (0.127)
Constant	1.621*** (0.056)	0.874** (0.052)	0.639*** (0.042)	17.296*** (0.913)	7.291*** (0.618)	4.752*** (0.452)	7.608*** (0.044)	6.683*** (0.058)	5.803*** (0.055)
Observations	53,543	53,543	53,543	56,238	56,238	56,238	55,789	55,789	55,789
Wald chi2 test	2,371	2,583	4,833	676	928	2009	1,754	2,742	8,997
LR test	383.6	345.6	178.2	146	115	81	2,213	2,165	1,115
MOR/ICC (region)	1.11	1.11	1.08	1.13	1.14	1.13	0.008	0.007	0.004
MOR/ICC (school)	1.32	1.30	1.25	1.38	1.34	1.28	0.077	0.076	0.045

Standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. The models include dummies for the missing values of relationships/conflicts indicators. No.groups: 18 regions; 1,181 schools. Odds ratios and MOR for the logistic regression models and coefficients and ICC for the linear models.

**Table 5.** Results from the multilevel logistic regressions on lifestyle habits (odds ratios).

	Smoking			Alcohol consumption			Absence of breakfast		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Boy	0.751*** (0.019)	0.751*** (0.019)	0.579*** (0.016)	1.517*** (0.043)	1.514*** (0.042)	1.256*** (0.037)	0.627*** (0.012)	0.628*** (0.013)	0.591*** (0.012)
Aged 13-16	9.585*** (0.608)	9.610*** (0.610)	8.822*** (0.575)	12.048*** (1.002)	12.107*** (1.008)	10.739*** (0.917)	2.132*** (0.058)	2.122*** (0.058)	1.958*** (0.058)
Aged ≥17	21.318*** (1.467)	21.387*** (1.475)	21.982*** (1.566)	35.715*** (3.139)	36.017*** (3.169)	35.044*** (3.177)	2.704*** (0.096)	2.681*** (0.095)	2.490*** (0.095)
FAS_medium		0.894** (0.051)	0.943 (0.055)		1.054 (0.069)	1.095 (0.074)		0.780*** (0.035)	0.825*** (0.038)
FAS_high		0.844*** (0.049)	0.917 (0.055)		1.066 (0.072)	1.137* (0.078)		0.722*** (0.033)	0.790*** (0.036)
Both parents working		1.077*** (0.029)	1.066** (0.030)		1.082*** (0.032)	1.071** (0.032)		0.987 (0.020)	0.983 (0.021)
Two-parent family structure		0.738*** (0.027)	0.801*** (0.030)		0.990 (0.042)	1.064 (0.047)		0.736*** (0.020)	0.764*** (0.022)
Parental understanding			0.913*** (0.027)			0.912*** (0.029)			0.840*** (0.019)
Parental help			0.881*** (0.031)			0.972 (0.039)			0.849*** (0.024)
Parental knowledge			0.442*** (0.014)			0.533*** (0.018)			0.753*** (0.018)
Parental love			0.836*** (0.029)			0.778*** (0.030)			0.913*** (0.026)
Fighting with peers			2.224*** (0.067)			1.943*** (0.064)			1.226*** (0.029)
Bullying			1.621*** (0.051)			1.600*** (0.055)			1.128*** (0.029)
Bullying victim			0.752*** (0.030)			0.697*** (0.031)			1.053* (0.031)
Unemployment rate change	8.493*** (2.039)	8.557*** (2.057)	2.701*** (0.635)	3.424*** (1.087)	3.472*** (1.102)	0.872 (0.276)	3.660*** (0.470)	3.605*** (0.460)	2.049*** (0.286)
Constant	0.022*** (0.002)	0.032*** (0.004)	0.044*** (0.005)	0.009*** (0.001)	0.008*** (0.001)	0.012*** (0.002)	0.261*** (0.013)	0.452*** (0.031)	0.636*** (0.048)
Observations	56,359	56,359	56,359	55,200	55,200	55,200	56,507	56,507	56,507
Wald chi2 test	2,177	2,255	4,210	2,159	2,166	3,414	1,593	1,773	2,371
LR test	1,594	1,591	1,122	2,760	2,725	3,398	511	504	538
MOR (region)	1.38	1.39	1.37	1.48	1.48	1.53	1.18	1.18	1.18
MOR (school)	1.87	1.87	1.76	2.35	2.35	2.24	1.32	1.31	1.33

Standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. The models include dummies for the missing values of relationships/conflicts indicators. No.groups: 18 regions; 1,181 schools. Odds ratios and MOR for the logistic regression models and coefficients and ICC for the linear models.

## **2.4. Discussion and conclusions**

According to our results, it seems that the economic crisis is inversely related to good health and life satisfaction when controlling for individual and socioeconomic variables. However, the link between higher regional unemployment and poorer health disappears when family and peers relationships indicators are considered, suggesting a protective effect against the negative impact of the economic crisis. A similar result was found for frequent alcohol consumption. The observed detrimental effect of the economic crisis on life satisfaction, smoking and absence of breakfast remained, but was substantially reduced when controlling for these indicators. A possible explanation to this pattern could be that tobacco and food consumption are more linked to the family income than alcohol, which is an unhealthy lifestyle that could depend on a larger extent on friends and the school context. However, this result should be considered with caution, since we were only able to analyze this alcohol variable, but not others like binge drinking.

In fact, the second relevant finding is that the school environment has an influence on health outcomes and lifestyles, especially on alcohol consumption. We found that intraclass correlation decreased for health outcomes and smoking after controlling for family and peers relationship indicators, suggesting that at least some of the identified region and school-level variance is due to parental and peers influences.

The present study contributes to the existing literature by expanding the research on the protective effect of the family and good relationships with other children against the economic crisis than hindered self-reported health and healthy lifestyles among children and adolescents. The HBSC survey has been widely used to analyze the effect of socioeconomic determinants on self-perceived health and well-being among young people (Currie, C et al., 2012; Frasquilho et al., 2016a; Karademas et al., 2008; Kokkevi, A et al., 2014; Moore et al., 2018; Richter et al., 2009). However, to our knowledge, this is the first time that it was used to measure the potential impact of the economic crisis on health and lifestyles, considering jointly the different environment influence levels: individuals, families, schools and regions.

Previous studies on the detrimental health effects of an economic recession on teenagers highlighted a complex causal chain between economic, social, and individual relationships (Pfoertner et al., 2014). Young people's health and well-being decline was found to be anchored to parents' unemployment (Frasquilho et al., 2017, 2016a; Sleskova

et al., 2006). The effects of both paternal and maternal job losses on child health have been associated with declines in child health in the short-run. Paternal job loss was associated with increases in depression and anxiety, while maternal job loss reduced the incidence of infectious illnesses (Schaller and Zerpa, 2019). At a macroeconomic level, higher rates of precarious employment in a region have a negative effect on people's mental health, likewise lower health spending per capita (Ruiz-Pérez et al., 2017). However, according to other studies, the negative shift of the recent recession on the employment market has not affected adolescents' psychological health complaints (Pfoertner et al., 2014).

Social protection and cultural importance of families might protect adolescents from economic downturns (Pfoertner et al., 2014). Previous studies have demonstrated the existence of environmental influences (family, school and friends) on the subjective health and mental health of adolescents (Bond et al., 2007; Jiménez-Iglesias et al., 2017; Jose, PE et al., 2012; Moore et al., 2018). Parents, teachers and family were sources of support most consistently found to be protective against depression in children and adolescents, whereas findings were less consistent for support from friends (Gariépy et al., 2016). They have been presented as a protective factor of adolescents' well-being against adversity caused by parental unemployment (Moreno-Maldonado et al., 2019). Other protective factors are family autonomy and control, family and school sense of belonging, and social support at home and school (Morgan et al., 2012). School is an ideal place to improve the health and well-being of today's children and tomorrow's adults, but it can also be a source of anxiety and bad behaviors. In line with other studies, we have shown that health risk behaviors have relatively higher school-level variance compared to other health outcomes, although the causal mechanisms are difficult to be established (Hale et al., 2014; West et al., 2004). Multilevel analyses performed in Wales using the HBSC survey have revealed that family relationships also protect from harmful substance use (Desousa et al., 2008; Moore et al., 2018).

Our findings should be interpreted with caution because of several methodological limitations. The use of self-reported data on health status and socioeconomic welfare may be affected by the adolescents' subjective perception. The cross-sectional design of the study limits causal inference; although we used four consecutive waves of the same survey, with disaggregated microdata, no temporal follow-up of the same children could be done. Other limitation is related to the lack of homogeneous questions among the four



waves, hindering us from using other relevant variables such as the urban/rural habitat, the parents' educational level or the consumption of drugs. Also, available data prevented us from using a detailed measure of binge drinking. Lastly, other proxies of the economic crisis could have been used, and some effects of the economic crisis on health may not be observable in the short term but in a longer period of time.

Despite these limitations, this study presents a new effort to better capture the effect of the economic crisis on adolescents' health, life satisfaction and risk behaviors, pointing out the importance of the family socioeconomic position and parental/peers relationships. Childhood is of particular interest for public policies, because of its special vulnerability and because the consequences of childhood deprivation may be perdurable throughout life (Oliva et al., 2018). The effects of the crises depend to a large extent on social protection policies, on the safety net of the Welfare State and on the structuring of social and family networks (Oliva Moreno, J et al., 2018).

Therefore, some policy implications derived from this work are related to the importance of maintaining strong active employment policies, as well as social policies focused on single-parent families and less affluent homes. Also, attention should be paid to reducing inequalities between schools, which can be a focus of poor health and unhealthy habits for life. Lastly, given the importance of the child's social environment, efforts should be made to enhance family communication and support and to avoid bullying.

In conclusion, economic crisis may have devastated aggregate and individual effects on the population health and well-being. Our results confirm that the increase in unemployment experienced in Spain during the recession may have worsened adolescents' health status and lifestyles. However, the child's social network seems to play an important protective role against the effects of the economic crisis. The conclusions derived from the work may be relevant to provide more evidence on the importance of designing and implementing public policies that try to alleviate the negative consequences on the well-being of present and future populations, preventing social inequalities and social exclusion. In the future, it would be desirable to make further progress in understanding the short, medium, and long-term health consequences of this recent economic crisis on the young population. Also, it may be desirable to examine the relationship between the school context and wider community processes.

## **CHAPTER 3.**

**ASSOCIATION BETWEEN MATERNAL AND PATERNAL EMPLOYMENT AND THEIR CHILDREN'S WEIGHT STATUS AND UNHEALTHY BEHAVIORS: DOES IT MATTER WHO THE WORKING PARENT IS?**

### **3.1 Introduction**

An escalating global epidemic of overweight and obesity -“globesity”- is taking over many parts of the world (WHO, 2022), representing serious challenges for public health (Williams et al., 2015) due to its association with several chronic diseases (Chooi et al., 2019). Obesity during childhood is a major health concern, given its growing prevalence and long-term health consequences (Karnik and Kanekar, 2012). In 2016, over 340 million children and adolescents aged 5-19 were affected by overweight or obesity worldwide (WHO, 2020a). In Europe, although the prevalence may have stabilized (Garrido-Miguel et al., 2019), the differences between countries are especially striking, with a prevalence that ranges from more than 40% in southern Europe to less than 10% in northern Europe (Ahrens et al., 2014). In Spain, despite the traditional Mediterranean diet, 28.6% and 10.3% of children between 2 and 17 years old are categorised as overweight and obese, respectively (Ministerio de Sanidad, Consumo y Bienestar Social, 2017). The prevalence of obesity among children shows a marked social gradient in Spain; 15.4% of children in the lowest social class are affected by obesity compared to 5.4% in the highest social class (Instituto Nacional de Estadística, 2020a).

The direct cause of obesity is an energy imbalance between calories consumed and calories expended. This simple explanation is related to deep and complex social and technological changes which indirectly affect both diet and physical activity (at school, at work, at home and in leisure time) (Cawley, 2004; Cutler et al., 2003; French, 2003; French et al., 2001; Lakdawalla and Philipson, 2009). One of the social changes that is commonly referred to as a potential indirect cause of the increased overweight and obesity in children is the higher proportion of working women (Martin et al., 2018). This implies major changes in family decisions about the division of time between paid work, domestic work and leisure, where “domestic work” includes both the time devoted to preparing meals and the time spent on the education and care of the children, among other tasks.

However, there are competing theoretical arguments about the direction of the relationship between parental employment and childhood overweight or obesity. Theoretically, parents who have a job would have less time to prepare meals with fresh food and supervise the quality and frequency of their children's food intake. Skipping breakfast, eating fast food, and a quicker eating pace are all positively associated with childhood obesity (Brown et al., 2015). Also, less parental supervision may discourage their children's physical activity in early ages, leading to higher body mass index (BMI)

(Datar et al., 2014). However, having a job is also associated with higher income and educational levels, which are in turn linked to lower BMI.

In fact, the existing literature has found conflicting results in this area. There is certainly a body of studies that have identified a positive and significant relationship between maternal employment and the probability of children to be affected by overweight or obesity (Brown et al., 2010; Datar et al., 2014; Fitzsimons and Pongiglione, 2019; Li et al., 2019; McDonnell and Doyle, 2019; Meyer, 2016; Miller and Han, 2008; Morrissey et al., 2011). However, in other studies this result is tempered by the characteristics of the job and the number of hours worked, showing a lower effect or even a non-statistically significant relationship when these factors are controlled for (Agiro and Huang, 2020; Greve, 2011; Gwozdz et al., 2013; Hesketh et al., 2007; Martin et al., 2018; Miller and Chang, 2015). In addition, the increased involvement of fathers in raising children has been linked with a decreased likelihood that their children would become obese (Wong et al., 2017), which might offset any potential detrimental effect of the increase in maternal paid working hours. In fact, other studies have found that socioeconomic characteristics are more relevant determinants of children's weight status (Agiro and Huang, 2020; Ahmad et al., 2018; Ajejas Bazán et al., 2018; Martínez-Vizcaíno et al., 2015; Moraeus et al., 2012; Posso et al., 2014; Poulsen et al., 2018; Vaquera et al., 2018). Moreover, the school environment has also been found to play a significant role in tackling obesity and promoting healthy lifestyles among children and adolescents (Ortega Hinojosa et al., 2018; Story et al., 2009; Wafa and Ghazalli, 2020; Wang et al., 2010). Schools might create environments in which children eat healthfully and engage regularly in physical activity, leading to physical, emotional, and social benefits (Soares and Davó-Blanes, 2019; Story et al., 2009). They can also raise awareness and understanding of health risks (e.g. bullying and smoking), increase self-esteem and resistance to social pressure and promote healthy social relationships (Hale et al., 2014). Disadvantaged and low academic performing schools are doubly burdened with additional risks, such as higher obesity risk (Ortega Hinojosa et al., 2018). There has been an emphasis on “whole school” interventions on health, which go beyond individual-focused education, and involve changes to schools' overall organization, teaching, discipline, school health services, policies, culture, and extra-curricular activities (Fletcher et al., 2008; Shackleton et al., 2016).

Our objective was to contribute to the understanding of the complex relationship between children's excess weight and parental employment. We investigated whether overweight/obesity among children and adolescents in Spain is connected with parental employment, considering separately the situations in which a) only one parent (mother or father) has a job, b) both parents have a job, c) neither of the parents has a job. This approach allows us to explore more deeply the relationships between socioeconomic circumstances and parental employment, and to account for the roles of both fathers and mothers as carers of their children. Our analyses also aimed to determine the extent to which the school's environment is associated with a higher weight. We also examined whether several unhealthy behaviors among children may be associated with parental employment status, taking into account the socioeconomic context of the family.

### **3.2. Methods**

#### *Sample*

We used microdata from two consecutive waves of the Health Behaviour in School-Aged Children (HBSC) survey performed for Spain, for the years 2010 and 2014. Data were provided by the Spanish Ministry of Health, Consumption and Social Welfare (Ministerio de Sanidad, Consumo y Bienestar Social, 2019). HBSC is an international standardized cross-sectional survey supported by the WHO and aimed at understanding young people's health-related behavior, well-being, and developmental contexts (Currie et al., 2009). In accordance with standard instructions and sampling procedures, responses were collected by means of standardised self-completed questionnaires administered in school classrooms, supported by teachers (Currie, C et al., 2012; Roberts et al., 2009). The students were enrolled at a total of 532 representative educational centres in the 17 Spanish Autonomous Communities (plus two Autonomous Cities).

Our sample consisted of 32,694 students aged between 9 and 21 years belonging to biparental families (i.e., children who reported living with their father and mother; 79.93% of the whole sample), and was designed to allow the analysis of the working status of fathers and mothers separately.

### *Variables*

The outcome variable of our study was excessive weight among children/adolescents, and our calculations were based on the Body Mass Index computed from the weight and height data provided by the students. For adults, overweight is defined as having a BMI of 25 kg/m<sup>2</sup> or higher (obesity as BMI  $\geq$ 30 kg/m<sup>2</sup>) (WHO, 2020b). However, BMI in childhood changes substantially with age, and a wide variety of definitions of excess body fat in children are in use (Cole et al., 1995; Flegal and Ogden, 2011). For this study, we used the definitions of obesity and overweight specified by the WHO (WHO, 2020c), using their cut-off points for BMI by sex and age, established at +1 Standard Deviation (SD) for overweight and +2SD for obesity. The consistency of the results was tested by using, as an alternative measure of obesity and overweight, the cut-off points for BMI proposed by Cole et al. (2000) (Cole, 2000). We considered three dependent variables: obesity in a binary form (=1 if obesity, and 0 otherwise), obesity together with overweight in a binary form (= 1 if overweight or obesity, and 0 otherwise), and BMI in a linear form. Outliers (BMI<12 or BMI>36) were excluded from the analysis (n=295 or 1.01% of the initial database) (WHO, 2021).

Our explanatory variable of greatest interest was parental working status, which was based on responses directly reported by the children. We considered working parents as those whose children reported to “*have a job*”, while non-working parents might include different situations: he/she is sick, retired or a student; he/she is looking for a job; he/she cares for others or stays at home full time (househusband/housewife). Based on this information, and in order to explore the role of fathers' and mothers' working status separately, we defined parental employment taking into account four different situations: both parents had a job, only the father had a job, only the mother had a job, neither parent had a job at the time the survey. When only one of the parents had a job, we considered the non-employed parent as the most likely main caregiver of the child.

Several individual factors such as the child's age, sex, number of siblings and parents' country of birth were used as control variables, as well as dummy variables related to socioeconomic circumstances, the survey's wave year and the region of residence of the child (Table 6).

**Table 6.** Variables included in the main and auxiliary analysis

Area	Variables	Coding of the variables
<b>Dependent variables (main analysis)</b>		
	Obesity	1 if the child is affected by obesity, 0 otherwise
	Obesity / overweight	1 if the child is affected by obesity or overweight, 0 otherwise
	BMI	Continuous variable between 12 and 35 kg/m <sup>2</sup>
<b>Dependent variables (auxiliary analysis)</b>		
	Low fruit consumption	1 if the child usually doesn't eat fruit every day of the week, 0 otherwise
	Consumption of sweets	1 if the child usually eats sweets or chocolate every day, 0 otherwise
	Screens viewing	1 if the child usually watches TV, uses the computer/tablet or plays with the console for 4 hours or more per day, 0 otherwise
	Sedentarism	1 if the child didn't feel physically active at least twice per week in the last 7 days, 0 otherwise
<b>Independent variables</b>		
<b>Variables of interest</b>		
	<b>Parents' working status</b>	Both parents have a job (dual-earner households) Only the father has a job Only the mother has a job Reference category: Neither of the parents has a job
<b>Control variables</b>		
<b>Individual</b>	Sex	1 if boy, 0 if girl
	Age	Continuous variable between 9 and 21 years old
<b>Socioeconomic</b>	Parents' educational level	Both parents have university education (completed or not) Both parents have a primary level of education or no studies Reference category: the remaining situations (both parents have secondary studies or each of them has a different educational level).
	Family material wealth (FAS score)	1 if the child belongs to a family with medium or low wealth (less than 6 points at the FAS scale), 0 otherwise
	Parents' origin	1 if both parents were born in Spain, 0 otherwise
	Siblings	Number of siblings
<b>Region</b>		18 dummies for each Spanish region (17 Autonomous Communities and 1 for Ceuta and Melilla, the two Spanish Autonomous Cities)
<b>Variables used to anchor the multi-level analysis</b>		
<b>Contextual variable</b>	School attended by the child	Dummies for each school: 133 for 2010 and 399 for 2014

Socioeconomic factors included the educational level of the parents and the family's material wealth. The latter was assessed using the Family Affluence Scale (FAS) (Currie, C et al., 2012). An overall score was calculated as the sum of the following individual scores (Boyce et al., 2006; Currie et al., 2008): car ownership (No: 0 points; Yes, one: 1 point; Yes, two or more: 2); having one's own bedroom (No: 0 points; Yes: 1 point); number of computers/laptops at home (None: 0 points; One: 1 point; Two: 2 points; More than two: 3 points); and number of family holidays during the past year (None: 0 points; One: 1 point; Two: 2 points; More than two: 3 points). Using an additive score, the responses were divided into three groups, following previous studies (Boyce et al., 2006): low (0–2 points); medium (3–5 points), and high (6–9 points) family wealth.

Besides the main analysis, auxiliary models were used to explore the underlying mechanisms or obesogenic behaviors that might explain childhood obesity/overweight. We tested whether unhealthy food habits (low fruit consumption and consumption of sweets) and leisure-time activities (screens viewing and sedentarism) among children were affected by their parental working status (Table 7).

### **3.3. Results**

#### *Descriptive analysis*

4.3% of the boys and 2.1% of the girls in the sample were affected by obesity. Most (58.2%) of the biparental families were considered as having high material wealth under the FAS measure. However, less than 19% of the families had both parents with university education. Regarding the work status, in 63.6% of the families both parents had a job, compared to 26.5% in which only the father had a job and 5.9% in which only the mother had a job. Almost 85% of the families were formed by parents born in Spain (Table 7).

Overweight and obesity prevalences varied by age group, sex and socioeconomic characteristics. The child's weight status was associated with his/her parents' economic and educational level ( $p < 0.001$ ). The prevalence of obesity was lowest among children who reported having two employed parents. Children with only a working father showed a lower prevalence of obesity than children with a working mother only (3.21% versus 4.15%) (Table 7).



**Table 7.** Prevalence of the sample characteristics and presence of obesity or overweight among the children (biparental families, 2010-2014)

		Prevalence	% with obesity	Pearson Chi2 test	% with overweight	Pearson Chi2 test
Sex	Boys	49.87	4.29	p=0.000	18.38	p=0.000
	Girls	50.13	2.08		11.53	
Age groups	Under 13 years	29.96	4.68	p=0.000	18.65	p=0.000
	Between 13 and 15 years	46.78	2.67		14.04	
	16 years and older	23.78	2.34		12.22	
Economic level	Low family affluence	2.20	4.06	p=0.000	15.23	p=0.001
	Medium family affluence	39.60	3.98		16.10	
	High family affluence	58.21	2.65		14.16	
Parental working status	Both parents have a job	63.62	2.94	p=0.000	14.77	p=0.850
	Only the father has a job	26.53	3.21		15.03	
	Only the mother has a job	5.94	4.15		15.35	
	Neither of the parents has a job	3.91	4.97		15.37	
Parental educational level	Both of university level	18.66	2.10	p=0.000	12.77	p=0.000
	Both of secondary level or each parent of a different level	59.86	2.86		14.74	
	Both of primary level or less	21.48	4.12		16.22	
Parents' origin	Both parents born in Spain	84.73	3.04	p=0.013	14.59	p=0.000
	One parent born in Spain	5.33	3.17		17.33	
	Neither of the parents born in Spain	9.94	4.08		16.71	
Siblings	Only child	15.22	3.12	p=0.000	16.32	p=0.007
	One brother/sister	60.28	2.93		14.93	
	Two brothers/sisters	16.44	3.56		14.48	
	Three or more brothers/sisters	8.06	4.47		13.27	

There are large and statistical significant associations between the family's wealth and the work status of parents. In wealthy biparental families, more than 69% of the households had two working parents, whereas this rate drop to 56% among medium- or low-wealth families. The proportion of wealthy families with a working mother and a non-working father almost halves that of less wealthy families (3.90% versus 7.86%). The educational background of parents is also closely linked to their work status (Table 8).

In addition, children's reported reasons why fathers do not have a job were different from the reasons provided for non-employed mothers. According to the children's self-report, 67.98% of mothers in biparental families who do have a job are housewives or take care of others, while this proportion is 4.75% among non-working fathers.

**Table 8.** Prevalence of families' socioeconomic level, by parents' work status (biparental families, 2010-2014)

	% Both parents have a job	% Only the father has a job	% Only the mother has a job	% Neither of the parents has a job	
High wealth (FAS 3) (n=12,242)	69.47	24.81	3.90	1.82	100%
Medium or low wealth (FAS 1 or FAS_2) (n=8,744)	55.63	30.10	7.86	6.42	100%
Pearson Chi2 test	p=0.000				
Both parents with university education (n=5,508)	78.25	17.50	3.32	0.93	100%
Both parents with secondary level education or each parent with a different level (n=17,492)	63.10	27.46	6.13	3.32	100%
Both parents with primary education or less (n=6,234)	50.22	32.72	8.39	8.66	100%
Pearson Chi2 test	p=0.000				

*Regression analyses of children's weight status*

Sex and age are significant variables in all models (Supplementary table 2). Being a boy is related to a higher risk of being affected by obesity or overweight than being a girl. Older children and children born to Spanish parents are less likely to be overweight or to have a higher BMI. A higher number of siblings is associated with a lower BMI and risk of overweight.

Living in households where neither of the parents has a job is associated with higher BMI values and a higher risk of being a child with obesity than living in dual-earner households (see Model 1 in Table 9). This result is retained when the model controls for family wealth (Model 2), but it disappears when we include additional controls for parental educational level (Model 4). In the simplest models (Model 1), we observe that children in households where only the mother has a job have a higher risk of obesity and higher BMI values than children whose both parents have a job. However, this result disappears after controlling for educational level and family wealth. Compared with living in a dual-earner household, households where the father is the only employed parent have not significantly different outcomes regarding children's obesity. When using Cole's alternative way of measuring obesity and overweight, the association of parental working status was not significant even in the simplest models (Supplementary table 3).

**Table 9.** Multilevel regression models on children's weight status

	Obesity				Obesity / overweight				BMI (linear)			
	Model 1	Model 2	Model 3	Model 4	Model 1	Model 2	Model 3	Model 4	Model 1	Model 2	Model 3	Model 4
Only the father has a job	1.029 (0.086)	1.005 (0.084)	0.977 (0.082)	0.962 (0.081)	1.022 (0.039)	1.009 (0.038)	0.991 (0.038)	0.983 (0.037)	0.013 (0.042)	-0.001 (0.042)	-0.027 (0.042)	-0.036 (0.042)
Only the mother has a job	1.320** (0.186)	1.259 (0.178)	1.231 (0.174)	1.188 (0.168)	1.093 (0.075)	1.065 (0.073)	1.051 (0.072)	1.031 (0.071)	0.218*** (0.078)	0.189** (0.078)	0.168** (0.078)	0.148 (0.078)
None of the parents have a job	1.560*** (0.249)	1.438** (0.230)	1.363 (0.220)	1.285 (0.208)	1.184** (0.100)	1.134 (0.096)	1.096 (0.093)	1.063 (0.091)	0.258*** (0.098)	0.211** (0.098)	0.164 (0.098)	0.131 (0.099)
Medium-low family affluence		1.497*** (0.130)		1.418*** (0.124)		1.246*** (0.050)		1.205*** (0.049)	0.245*** (0.046)		0.201*** (0.046)	
Parents' high educational level			0.657*** (0.076)	0.677*** (0.079)			0.785*** (0.038)	0.798*** (0.039)			-0.325*** (0.051)	-0.308*** (0.051)
Parents' low educational level			1.373*** (0.122)	1.334*** (0.119)			1.202*** (0.051)	1.183*** (0.050)			0.215*** (0.049)	0.197*** (0.049)
Spanish parents	0.837 (0.081)	0.847 (0.082)	0.839 (0.082)	0.847 (0.082)	0.820*** (0.038)	0.826*** (0.038)	0.819*** (0.038)	0.824*** (0.038)	-0.247*** (0.054)	-0.239*** (0.053)	-0.247*** (0.053)	-0.240*** (0.053)
MOR (school)	1.53	1.51	1.50	1.48	1.31	1.30	1.29	1.29	0.020	0.019	0.018	0.018
Wald Chi2 test	265	288.7	303.3	320.4	642.1	672.5	700.3	721.4	3285	3339	3428	3463

Odds ratios for obesity and obesity+overweight, and coefficients for BMI

Robust seeform in parentheses. \*\*\* p<0.01, \*\* p<0.05.

All models were also adjusted for gender, age, number of siblings, region and year. Models 2 and 4 were also adjusted for the missing variables of the family's socioeconomic level. Models 3 and 4 were also adjusted for the missing variables of the parent's educational level. Only biparental families considered. N=27,598. 532 schools.

Reference categories: both parents have a job; high family affluence; parents' medium educational level; non-Spanish parents

**Table 10.** Multilevel regression models on children's obesity/BMI, by sex and age group

	Boys under 13		Girls under 13		Boys 13-15 years old		Girls 13-15 years old		Boys ≥16 years old		Girls ≥16 years old	
	Obesity	BMI	Obesity	BMI	Obesity	BMI	Obesity	BMI	Obesity	BMI	Obesity	BMI
Only the father has a job	1.159 (0.180)	0.101 (0.112)	1.123 (0.272)	0.158 (0.108)	1.051 (0.169)	-0.124 (0.093)	0.731 (0.169)	0.070 (0.084)	0.667 (0.177)	-0.189 (0.121)	0.693 (0.234)	-0.217 (0.126)
Only the mother has a job	1.270 (0.386)	0.105 (0.233)	3.504*** (1.144)	0.870*** (0.210)	1.067 (0.297)	-0.260 (0.170)	0.828 (0.338)	0.425*** (0.159)	1.049 (0.438)	0.116 (0.216)	0.429 (0.268)	0.061 (0.206)
None of the parents have a job	1.638 (0.559)	0.424 (0.302)	0.743 (0.476)	0.019 (0.290)	1.972** (0.564)	0.308 (0.225)	0.311 (0.195)	-0.048 (0.194)	1.617 (0.670)	0.024 (0.256)	1.182 (0.549)	0.342 (0.245)
Medium-low family affluence	1.442** (0.240)	0.299** (0.122)	1.298 (0.351)	0.212 (0.116)	1.258 (0.209)	0.254** (0.102)	1.545 (0.358)	0.243*** (0.090)	1.551 (0.399)	0.140 (0.130)	1.502 (0.514)	0.045 (0.134)
Parents' high educational level	0.712 (0.150)	-0.234 (0.127)	1.108 (0.327)	-0.240 (0.125)	0.544*** (0.126)	-0.455*** (0.109)	0.607 (0.212)	-0.371*** (0.105)	0.641 (0.238)	-0.356** (0.151)	0.576 (0.320)	-0.474*** (0.163)
Parents' low educational level	1.474** (0.287)	0.559*** (0.149)	1.552 (0.443)	0.349** (0.144)	1.193 (0.199)	0.197 (0.106)	1.379 (0.307)	0.220** (0.094)	1.064 (0.273)	0.047 (0.134)	1.631 (0.477)	0.233 (0.129)

Odds ratios for obesity and coefficients for BMI. Robust seeform in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ .

All models were adjusted for region, parents' origin, number of siblings, year, family affluence, parents' educational level, the missing variables of the family's socioeconomic level and the missing variables of the parents' educational level. Only biparental families were considered.

Reference categories: both parents have a job; high family affluence; parents' medium educational level.

With regards to socioeconomic and environmental factors, we observe a significant association of family's wealth/education and the school environment with children's weight status. Children and adolescents in poorer households are more likely to have obesity and/or overweight in every model. Parents with higher education have a protective influence over their children's weight status; the children of parents with university degrees are less likely to be affected by obesity/overweight and have lower BMI values, while the opposite is true for children whose parents have only primary education or less.

According to the MOR values obtained from the models, if children move to a school with a higher probability of obesity/overweight, their risk of having obesity and/or overweight will (in median) increase between 1.29 and 1.53 times. This impact is slightly greater than the household wealth effect estimated in the models.

Separate analyses by sex and age groups reveal similar patterns, with some exceptions. Girls under 13 years old show a significantly higher risk of being affected by obesity or having a greater BMI when their mothers are the only working parent, even after controlling for the socioeconomic and educational level of their family. The effect of belonging to this type of household on continuous BMI is also significant and quantitatively greater among older girls (aged between 13 and 15 years old), whereas the effect among boys is not significant. Boys aged between 13 and 15 years old with two working parents have a significant lower risk of obesity than those who reported living in households where neither of the parents has a job (Table 10).

*Auxiliary models: regression analyses on unhealthy lifestyles*

According to the auxiliary models used for the potential correlated factors of excess weight in children, sedentarism is found to be significantly higher in households other than those where both parents were employed, after controlling for household socioeconomic characteristics (Table 11). Children living in households where only the mother has a job are less likely to eat fruit daily, and are more likely to eat sweets and view screens daily than children who belong to families with other work characteristics, even after controlling for family wealth and education.

**Table 11.** *Multilevel regression models on unhealthy lifestyles (Odds ratios)*

	Low fruits consumption	Sweets consumption	Screens viewing	Sedentarism
Only the father has a job	1.038 (0.030)	1.052 (0.042)	1.029 (0.050)	1.143*** (0.040)
Only the mother has a job	1.121** (0.061)	1.165** (0.083)	1.197** (0.104)	1.247*** (0.078)
None of the parents have a job	1.037 (0.071)	1.147 (0.098)	1.191 (0.125)	1.352*** (0.101)
Medium-low family affluence	1.190*** (0.038)	0.986 (0.043)	0.985 (0.044)	1.161*** (0.044)
Parents' high educational level	0.631*** (0.021)	0.916 (0.047)	0.672*** (0.046)	0.872*** (0.040)
Parents' low educational level	1.202*** (0.041)	1.130*** (0.050)	1.179*** (0.063)	1.230*** (0.047)
Spanish parents	1.047 (0.038)	0.842*** (0.041)	0.781*** (0.046)	0.834*** (0.035)
Observations	30,427	30,240	18,727	29,840
Number of groups	532	532	526	532
Wald Chi2 test	677	253	215	1191
MOR (school)	1.26	1.33	1.40	1.20

seEform in parentheses. \*\*\* p<0.01, \*\* p<0.05. All models were adjusted for region, parents' origin, number of siblings, year, family affluence, parents' educational level, the missing variables of the family's socioeconomic level and the missing variables of the parents' educational level. Only biparental families were considered. Reference categories: both parents have a job; high family affluence; parents' medium educational level.

Frequent consumption of fruit and physical activity are linked to wealthy families, while a lower educational background of the parents seems to be a negative factor for all analyzed correlated factors of their child's obesity. Children of Spain's native parents are also less likely to undertake unhealthy behaviors that can lead to obesity than children of non-Spanish parents. In these models, the residual heterogeneity between schools (MOR 1.20-1.40) is found to be of greater relevance than the impact of family wealth.

### 3.4. Discussion and conclusions

Our results indicate that family's socioeconomic characteristics are determining factors of obesity and unhealthy habits among children. In most cases, these factors outweighed the detrimental effect that the potential lower parental supervision expected in households with working parents might have on children's weight and obesogenic behaviors. However, in some cases, the labour participation of mothers was found to be linked to higher children's obesity and unhealthy habits when mothers were the only providers of

the households, suggesting that the availability of a non-working father did not offset the impact of maternal employment. To our knowledge, this is the first study that examines the underlying factors that affect children's weight status, differentiating by parental work status and including the potential effect of the school as an additional level of analysis.

Our results confirm that, in line with previous studies, family's educational level (Ajejas Bazán et al., 2018; Moraesus et al., 2012; Poulsen et al., 2018) and income are highly associated with childhood obesity (Agiro and Huang, 2020; Costa-Font and Gil, 2013; Posso et al., 2014), as well as the school environment (Ortega Hinojosa et al., 2018; Story et al., 2009; Wafa and Ghazalli, 2020; Wang et al., 2010). In Spain, an immigrant background has also been associated with obesity among children (Vaquera et al., 2018).

The findings that maternal employment is not associated with children's weight status or unhealthy behaviors when both parents are employed but, for at least some subgroups, working mothers are associated with a higher prevalence of child's obesity and unhealthy habits when they are the only providers of the household is striking. This may reinforce the conclusions of other studies claiming that mothers, even when they are working outside the home, assume greater responsibility for child care and home management than fathers do (Bianchi, 2000; Meyer, 2016). In addition, a closer look at the characteristics of biparental households with only a working mother indicates that these families are likely to be categorized as having limited financial resources, suggesting that unobserved socioeconomic factors might also play a role in the observed association.

The detrimental association of a non-working father on children's weight and lifestyles, while observing that having a non-working mother is not associated with poorer outcomes also deserves further discussion. This finding might suggest that having a mother as main caregiver may have a greater positive influence on children's weight and lifestyles than having a father as main caregiver. However, our results should be interpreted in the light of the socioeconomic context at the time the data was collected. Both in 2010 and in 2014 the difference in the level of unemployment between men and women was the smallest in the history of Spain. This was due to the more severe impact of the economic crisis on sectors that employ more men than women. As a result, the unemployment rate among men increased from 6.4% in 2007 to 25.6% in 2013 (Instituto Nacional de Estadística, 2020b). This suggests that non-working fathers in our data might in some cases represent newly unemployed men affected by the past recession. In fact, in our data children

reported that 59% of non-working fathers were looking for a job, while this proportion was 29% among non-working mothers (however, around 10% of children did not know the reason why their parent did not have a job). The potential benefits of the expected increased involvement of fathers in their children's raising might be fewer in such circumstances.

Our study has certain limitations that should be mentioned. First, given the nature of the data used, it is difficult to establish a causal relationship between parents' work status and children's BMI, as parental labour force is likely to be correlated with a number of factors that are also related to children's weight (e.g. education background, parent's BMI, etc.). Second, our analyses are based on the information contained in the HBSC cross-sectional surveys, which albeit of being the richest source of data on children's health in Spain, the information provided is limited (i.e. there was no information on the number of working hours) and self-reported. Therefore, our estimates might be affected by measurement errors and by omitted variables bias, making causal inferences problematic. Regarding measurement errors, children and adolescents completed the questionnaires on their own using an online platform at their school centres with support from school teachers. However, the self-reported nature of the data might lead to some discrepancies with reality regarding height, weight, family structure and parents' work status and educational level, as well as regarding the elements needed to estimate family affluence, dietary behavior, leisure-time habits, etc, especially among younger children. A previous study analyzed the validity of self-reported height and weight data within the framework of the HBSC study conducted in Estonia and found a small and age-decreasing underestimation of overweight/obesity prevalences when compared with measured anthropometric data (Aasvee et al., 2015). In Spain, obesity and overweight prevalences estimated by the Spanish National Health Survey in 2012 showed very similar values for the age groups included in the HBSC (Ministerio de Sanidad, Consumo y Bienestar Social, 2015). Regarding the role of omitted variables, the factors included as control variables in our models might only be a subset of all possible factors related to employment and child's outcomes. For instance, parents' own health and weight status might affect their ability to have a job and be correlated with their children's obesity outcomes. Therefore, we might expect some degree of endogeneity to affect our estimates.



Finally, the reasons why fathers do not have a job seem to be different from the reasons for non-working mothers. This, together with our finding indicating that employed mothers might be linked to higher children's obesity and unhealthy habits when they are the only working parent in the household, emphasises the need for a more balanced sharing of child's care between men and women might weaken the documented link between maternal employment and children's unhealthy behaviors and weight. Our results suggest the need for a new social contract in which the burden of caregiving is equally shared, so that the participation of either parent in the employment market does not involve a risk for their children's health. Conditions of employment must also favour the conciliation between family and professional life. According to the European Job Quality Index, which is "a measure that encompasses a broad range of work and employment characteristics, including wages, non-wage aspects, and collective interest representation" (Piasna, 2017), Spain has the third worst position in this ranking. The socioeconomic and educational gradient which we observed in children's obesity and unhealthy behaviors, as well as the effect of the school environment, also point towards the need to act at the root of the observed inequalities in children's weight status. On this matter, the evidence shows that complex obesity prevention interventions acting on multiple targets, settings, and risk factors appear both to be more effective and to lower health inequalities than individual actions (Elinder et al., 2018; Venturelli et al., 2019).

In conclusion, our findings indicate that once we control for family wealth and education, the observed association between a working mother and her children's risk of obesity disappears, except for younger girls living in households where the mother had a job and the father did not. Unhealthy behaviors were also observed in households where the mother was the only employed parent. This study highlights the need for more complete research into the way in which obesity develops in young people, and into the roles that working and non-working parents have in their children's development. Further studies should be undertaken, including the use of time, to analyse the relationship between family members, and to discern whether the results may change over time or working regimes. It would also be desirable to explore a larger number of potential causes of obesity to assess the importance of reverse causality between education, income, and obesity, and to determine the nature of childcare among biparental families. Further research is also needed to widen the analysis to other types of families, although more information about additional caregiving would be needed.

## **CHAPTER 4.**

### **UNRAVELLING FACTORS LINKED TO THE DECREASE OF SCHOOL BULLYING IN SPAIN**

## 4.1 Introduction

School bullying is usually conceptualized as a deliberate and repetitive aggression, intended to cause harm to a peer, within the context of an asymmetric power relationship (Olweus, 2010; UNESCO, 2018). Traditional bullying behaviors include physical, verbal and relational harassment (Stassen Berger, 2017). Cyberbullying usually refers to bullying via electronic forms of contact or communication (Olweus and Limber, 2018).

Such victimization has been acknowledged as a worldwide concern with serious and long-lasting implications for victims, bullies, and school communities (OECD, 2017). There is a strong relationship between bullying victimization and mental health problems (Moore et al., 2017; Ossa et al., 2023). It can increase the risk of depression, suicide ideation, psychosomatic disorders and eating disorders (de Oliveira Galvão et al., 2023; Geoffroy et al., 2023; Gini and Pozzoli, 2013; Nansel et al., 2001). It may also lead to an increased substance use (Lee et al., 2022; Moore et al., 2017) and hinder the academic achievement and engagement (Laith and Vaillancourt, 2022; Molina-Muñoz et al., 2023; OECD, 2017). Longitudinal studies have shown that bullying is not a transitory school issue, but a public health problem with consequences that entail a significant cost to society (Olweus, 2013).

In recent decades, policy makers have become increasingly concerned about bullying. Several policies and programs have been established at different levels to try to prevent and contain bullying, with a whole-school approach (Hatzenbuehler et al., 2017; Terry, 2018). In the last years there has been a considerable drop in bullying, although prevalence rates vary substantially across countries (Cosma et al., 2020). According to UNESCO data, 35 out of 71 nations with available trend data have seen a decrease in bullying prevalence, while 23 remained unchanged and 13 have seen an increase (UNESCO, 2018).

Data from the Health Behaviour in School-aged Children (HBSC) study is used by institutions such as UNESCO to monitor the bullying trend in Europe and North America (HBSC, 2023b). According to this study, rates of bullying range from 1.5% in Iceland to 30% in Lithuania. Out of 45 countries, Spain is currently the second country with the lowest level of school bullying, having experienced a significant decline between the two most recent waves of the data, i.e., 2014 and 2018 (Inchley et al., 2020). The disparities in bullying levels and trends across countries highlight the need for a more in-depth

examination of the characteristics and interventions adopted by countries experiencing a declining trend (Chester et al., 2015).

Despite the lower prevalence of bullying, the social perception of the problem may have remained or even gained priority (Blanco-Castilla and Cano-Galindo, 2019; Pérez-Virtus and Larrondo-Ureta, 2018). Complementarily, the scientific literature on the negative effects of bullying has grown in volume and consistency (McKay et al., 2022; Moore et al., 2017), and there is an increased interest in contextual factors involved, since school violence is also highly affected by the social, institutional and community context (Francis et al., 2022; Saarento et al., 2015). However, relatively few studies have approached the bullying phenomenon using a multilevel design, and more research has been called for in this sense (Saarento et al. 2015). In addition, there is also a need to explore the effects of bullying and victimization simultaneously, testing multilevel models (Marsh et al., 2023).

This study aims to explore the factors associated with school bullying that might explain the observed recent decreasing trend in Spain. More specifically, the objectives of this paper are two-fold: a) to characterise children and adolescents who bully and who are bullied -individually and simultaneously; and b) to explain changes in the prevalence of bullying over time, by applying multilevel analyses that combine school-level, family-level and student-level variables.

## **4.2 Methods**

### **2.1 Sample**

To answer the outlined research questions, we used the most recent available data from the HBSC survey for Spain, namely the 2014 and 2018 waves. The data comprised responses given by a representative sample of 64,886 students aged between 10 and 18 years old that were recruited via a random multistage sampling stratified by conglomerates.

### **2.2 Variables**

The analysis was performed on two different types of bullying measures, similarly to previous research in this area (Sánchez Queija et al., 2017; Theriot et al., 2005). *Perceived bullying* was analyzed from two questions that directly asked students about bullying victimization (*victims*) and bullying perpetration (*bullies*) in the past two months. A joint variable was created to reflect the subgroup who have simultaneously

bullied others and suffered from bullying (*bully-victims*). Additionally, *observed bullying* was built asking participants about specific bullying behaviors that included traditional (physical, verbal or relational mistreatment) and cyberbullying (Table 12).

All bullying questions offer a five-tier Likert scale answer: no bullying during the last two months, once or twice, two to three times per month, about once per week, or several times per week. Accordingly with conventional cut-offs (Olweus, 2013), responses were recoded as 0 (never or once-twice in the last two months) and 1 (2-3 times per month or more) for each bullying variable.

We also analyzed individual, family and contextual characteristics of the interviewed students (Table 13). Individual level variables included gender, age group, grade repetition, immigrant status, and weight status. Having siblings, and the educational level and labour status of parents were considered proxies of family characteristics with potential influence on bullying. As a wider contextual framework, the habitat (urban/rural) and ownership (private/public) of the school was considered, as well as the level of friends' and family's support, and the degree of satisfaction with his/her family. Finally, the geographic environment was proxied by a set of regional dummies comprising the 17 autonomous communities (AC) responsible for establishing and managing educational policies within their respective territories, in addition to a dummy for the two autonomous cities (Ceuta and Melilla) in Spain (Table 13).

### **2.3 Statistical analysis**

First, a descriptive analysis of the different bullying variables was performed to compare the situation in 2014 and 2018. The characteristics of the interviewed students and their families and school environments were also compared, as well as the prevalence of perceived bullying among subgroups. To check whether there have been changes over time in the prevalence of each variable, Pearson's chi<sup>2</sup> tests were applied.

Secondly, multilevel mixed effects logistic regression analyses over bullying victimization and over bullying perpetration were estimated using the whole sample (combining 2014 and 2018 data). In order to account for the nested data structure, where students belonging to the same school cannot be treated as independent of each other's, we used multilevel models with schools as second level. These models account for variability across schools and control for school-level effects. The individual, family and context characteristics were included as control variables in each analysis. In this pooled

analysis, the survey year (dummy for 2018=1; 2014=0) along with interaction effects between survey year and regions were also incorporated as predictors. The inclusion of these variables allows us to test whether there has been a significant change in the prevalence of bullying over time and whether the trends have been different across regions in Spain. We controlled for missing values by creating dummies for each category and introducing them as additional independent variables.

Thirdly, similar multilevel logistic regression analyses were fitted for each dependent variable of perceived bullying (bullying perpetration, bullying victimization) for the year 2014 and for the year 2018 separately. Analogue separate models were also performed using the simultaneous “bully-victim” group as dependent variable and for the four specific types of observed bullying described above. The same individual, family and context characteristics were included as control variables in each model, whereas schools were also included as second level. These models allow us identifying the set of factors associated with school bullying at each year separately. We preferred this approach rather than using fully interacted models (i.e. a pooled model with a year dummy variable interacted with all explanatory variables) because it makes the interpretation of the effects easier. The model for students that were bullied contained bullying perpetration as an independent variable, and the model for students that have bullied contained bullying victimization as an independent variable.

To quantify the between-school variation in bullying in the models, median odds ratios (MOR) were computed (Merlo et al., 2006). LR tests were used to test whether cases were correlated within clusters. The level of significance of the analysis was set at  $p < 0.05$ . All analyses were performed using Stata 14.0.

**Table 12. Descriptive statistics of perceived and observed bullying**

Category	Question	Categories	Prevalence	
			Year 2014	Year 2018
Perceive being bullied	How often have you been bullied at school in the past couple of months?	Never	84.91	87.96
		Once-twice	9.75	8.25
		≥2-3 times per month	5.34	3.79
Perceive bullying others	How often have you taken part in bullying another student(s) at school in the past couple of months?	Never	82.42	87.86
		Once-twice	12.35	9.54
		≥2-3 times per month	5.23	2.60
Observed physical bullying	How often have you been hit, kicked, pushed, shoved around or locked indoors by other students in the past couple of months?	Never	89.45	92.19
		Once-twice	5.62	5.42
		≥2-3 times per month	4.93	2.39
Observed verbal bullying	How often have other students called you names, made fun of you or teased you in a hurtful way in the past couple of months?	Never	71.22	74.18
		Once-twice	18.10	18.38
		≥2-3 times per month	10.68	7.44
	How often have other students made sexual jokes or gestures to you in the past couple of months?	Never	70.34	71.43
		Once-twice	18.31	19.76
		≥2-3 times per month	11.35	8.81
Observed relational bullying	How often have other students left you out of things on purpose, excluded you from their group of friends or completely ignored you in the past couple of months?	Never	78.91	80.58
		Once-twice	12.50	13.55
		≥2-3 times per month	8.59	5.87
	How often have other students told lies or spread false rumors about you and tried to make others dislike you in the past couple of months?	Never	79.07	84.52
		Once-twice	11.50	9.59
		≥2-3 times per month	9.43	5.89
Cyber-bullying	How often have you been cyberbullied (e.g., someone sent mean instant messages, wall postings, emails and text messages or created a website that made fun of me or someone took unflattering or inappropriate pictures of you without permission and posted them online) in the past couple of months?	Never	89.01	94.84
		Once-twice	6.44	3.84
		≥2-3 times per month	4.55	1.32

Note: statistically significant changes ( $p < 0.001$ ) between both years were found in all bullying variables analyzed.

**Table 13. Descriptive statistics of the individual, family and contextual characteristics**

Scope	Definition	Variables	Prevalence		p Chi2
			Year 2014	Year 2018	
Gender	=1 if male; =0 if female	Male	49.65	50.09	0.245
		Female	50.35	49.91	
Age group	=1 if aged 10-12; =0 otherwise (age 1) (*)	Aged 10-12	29.98	29.60	0.276
	=1 if aged 13-14; =0 otherwise (age 2)	Aged 13-14	31.88	30.29	<0.001
	=1 if aged 15-16; =0 otherwise (age 3)	Aged 15-16	28.06	27.14	0.007
	=1 if aged 17-18; =0 otherwise (age 4)	Aged 17-18	10.09	12.96	0.000
Individual characteristics	=1 if the child is not in the grade that corresponds to his or her age; =0 otherwise	Grade repeater	7.61	7.02	0.003
	=1 if the child wasn't born in Spain; =0 otherwise	Born abroad	10.27	8.20	<0.001
	=1 if the child was born in Spain; =0 otherwise (*)	Born in Spain	84.88	83.11	<0.001
		Missing country of origin	4.85	8.68	<0.001
	=1 if the child has a normal weight according to the WHO criteria; =0 otherwise (*)	Normal weight	69.94	73.32	<.0001
	=1 if the child has overweight according to the WHO criteria; =0 otherwise	Overweight	13.24	12.84	0.109
	=1 if the child has obesity according to the WHO criteria; =0 otherwise	Obesity	2.88	3.33	0.002
	Missing weight	13.94	10.57	<0.001	
School characteristics	=1 if the school is private or charter; =0 if public school	Private school	47.26	48.42	<0.001
	=1 if urban school; =0 if rural school	Urban school	49.74	50.00	<0.001
Family characteristics	=1 if the child has one or more siblings; =0 otherwise	Siblings	82.60	84.44	<0.001
	=1 if both parents have tertiary education; =0 otherwise	Parents with high education	17.25	24.29	<0.001
	=1 if the parents of the child have a medium level of education; =0 otherwise	Parents with medium education	56.31	40.00	<0.001
	=1 if both parents have no or only primary education; =0 otherwise (*)	Parents with low education	19.65	9.91	<0.001
		Missing parents' education	6.78	25.79	<0.001
	=1 if both parents are working; =0 otherwise	Working parents	57.10	60.81	<0.001
	=1 if just one of the parents is working; =0 otherwise (*)	Just one parent working	29.67	18.95	<0.001
=1 if none of the parents are working; =0 otherwise (*)	Not working parents	4.14	1.72	<0.001	
	Missing working parents	9.09	18.52	<0.001	



Grade of support and satisfaction	=1 if the child feels a low friends' support (1-2.9 points); =0 otherwise (*)	Low friends' support	6.95	5.38	<0.001
	=1 if the child feels a medium friends' support (3-5 points); =0 otherwise	Medium friends' support	17.94	14.05	<0.001
	=1 if the child feels a high friends' support (5.1-7 points); =0 otherwise	High friends' support	59.49	77.78	<0.001
		Missing friends' support	15.62	2.79	<0.001
	=1 if the child feels a low family' support (1-2.9 points); =0 otherwise (*)	Low family' support	6.96	3.68	<0.001
	=1 if the child feels a medium family' support (3-5 points); =0 otherwise	Medium family' support	14.04	14.01	0.921
	=1 if the child feels a high family' support (5.1-7 points); =0 otherwise	High family' support	73.01	81.89	<0.001
		Missing family support	5.72	0.40	<0.001
	=1 if the child declares low family's satisfaction (0-4 points); =0 otherwise (*)	Low family's satisfaction	5.62	3.63	<0.001
	=1 if the child declares medium family's satisfaction (5-8 points); =0 otherwise	Medium family's satisfaction	28.02	34.98	<0.001
=1 if the child declares high family's satisfaction (9-10 points); =0 otherwise	High family's satisfaction	59.17	60.86	<0.001	
	Missing family satisfaction	7.18	0.52	<0.001	
Region	=1 if the AC is Andaluca; =0 otherwise (*)	AC1	6.37	7.58	<0.001
	=1 if the AC is Aragón; =0 otherwise	AC2	5.27	4.16	<0.001
	=1 if the AC is Asturias; =0 otherwise	AC3	4.32	4.49	0.263
	=1 if the AC is Baleares; =0 otherwise	AC4	7.18	6.45	<0.001
	=1 if the AC is Canary Islands; =0 otherwise	AC5	4.01	5.24	<0.001
	=1 if the AC is Cantabria; =0 otherwise	AC6	7.51	3.79	<0.001
	=1 if the AC is Castilla León; =0 otherwise	AC7	4.23	3.45	<0.001
	=1 if the AC is Castilla Mancha; =0 otherwise	AC8	7.59	6.99	0.002
	=1 if the AC is Catalonia; =0 otherwise	AC9	8.58	9.75	<0.001
	=1 if the AC is Comunidad Valenciana; =0 otherwise	AC10	4.70	6.32	<0.001
	=1 if the AC is Extremadura; =0 otherwise	AC11	8.61	5.69	<0.001
	=1 if the AC is Galicia; =0 otherwise	AC12	5.49	3.69	<0.001
	=1 if the AC is C. Madrid; =0 otherwise	AC13	3.66	8.83	<0.001
	=1 if the AC is Murcia; =0 otherwise	AC14	5.72	4.49	<0.001
	=1 if the AC is Navarra; =0 otherwise	AC15	6.39	6.07	0.077
	=1 if the AC is Basque Country; =0 otherwise	AC16	4.17	6.83	<0.001
	=1 if the AC is Rioja; =0 otherwise	AC17	4.03	3.8	0.106
	=1 if the AC is Ceuta/Melilla; =0 otherwise	AC18	2.15	2.38	0.044

(\*) used as reference category at the regression models

The last column shows the results of Pearson's chi2 tests applied to check for changes over time in the prevalence of each variable.

### 4.3 Results

#### *The phenomenon of bullying and its evolution*

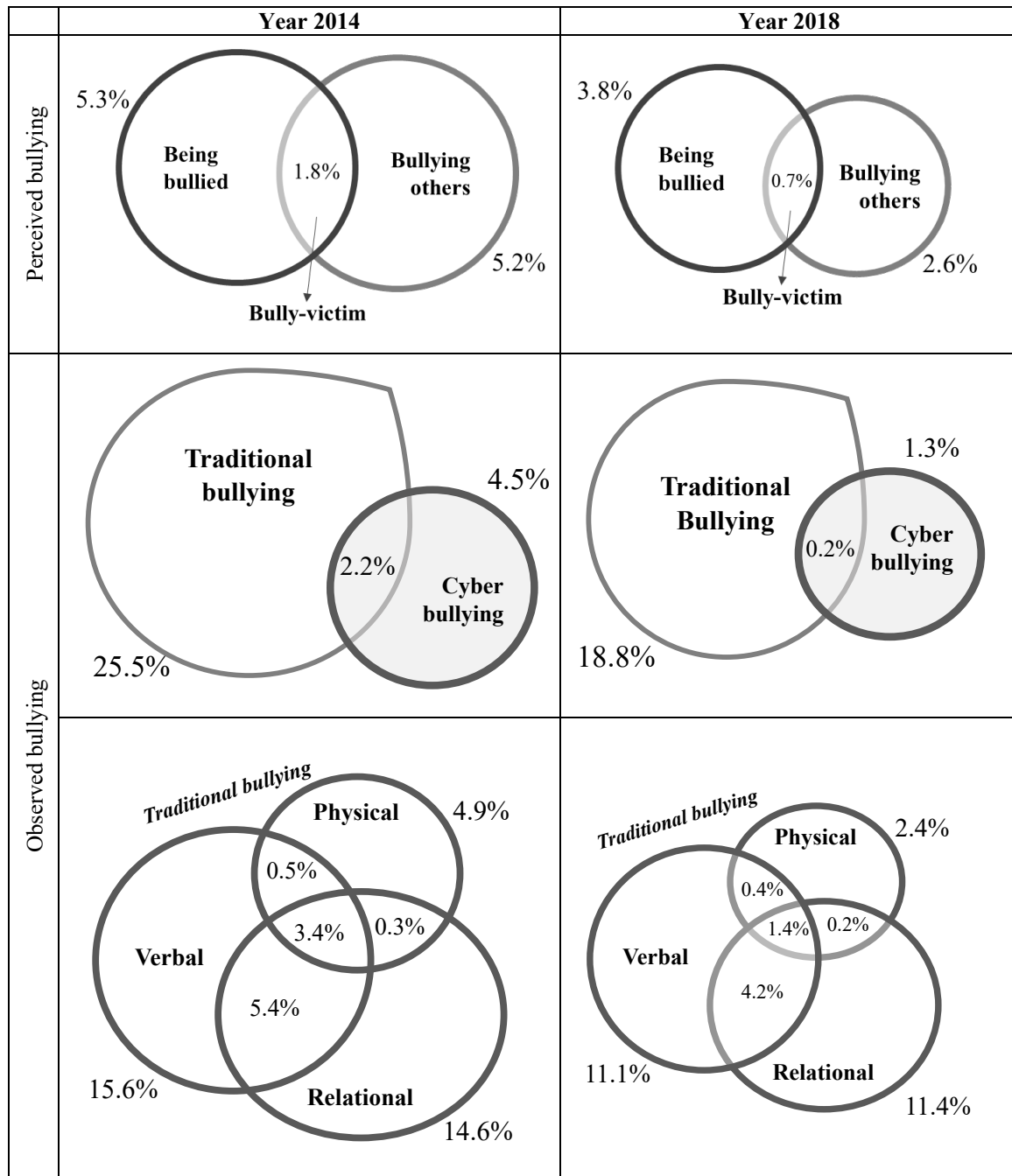
The phenomenon of bullying has followed a decreasing evolution over the last years in Spain. According to the HBSC data, the proportion of children/adolescents who perceived to have been bullied by others fell from 5.3% in 2014 to 3.8% in 2018 ( $p < 0.001$ ). The prevalence of perceived bullying perpetration decreased in a stepped manner, from 5.2% to 2.6% ( $p < 0.001$ ). Accordingly, the subgroup of students who perceived to be bully-victims diminished from 1.8% to 0.7% ( $p < 0.001$ ) (Figure 2).

On the other hand, in 2014, almost one out of four adolescents (25.5%) reported suffering from at least one form of observed traditional bullying. Moreover, 4.5% of students suffered from observed cyberbullying. A subgroup of 2.2% of the students suffered from both types of observed bullying at the same time. In 2018, traditional bullying decreased to 18.8%, and cyberbullying exhibited a more pronounced decline to 1.3% of interviewed pupils.

Within traditional observed bullying, verbal bullying was the most frequent in 2014, with 15.6% of students experiencing it, while 14.6% suffered from relational bullying and 4.9% from physical victimization. Moreover, 5.4% of the adolescents reported have been bullied both verbally and relationally. In 2018, the prevalence of physical bullying was particularly reduced, down to 2.4% of respondents. Verbal bullying decreased more than relational bullying, which became the most frequent, with 11.4% of the answers. The subgroup suffering from all three types of observed traditional bullying at the same time diminished from 3.4% of the sample in 2014 to 1.4% in 2018.

Being bullied was most frequent among boys than girls. Younger adolescents suffered bullying more frequently than older students. The prevalence of perceived bullying victimization experienced a statistically significant drop between 2014 and 2018 among all groups analysed, except for obese adolescents, those with not working parents, those with low and medium family support and those low family satisfaction (Table 14). Perceived bullying perpetration was also more frequent among boys than girls. It decreased between the two years in all subgroups analyzed.

**Figure 2. Prevalence of perceived and observed bullying in Spain, in 2014 and 2018**

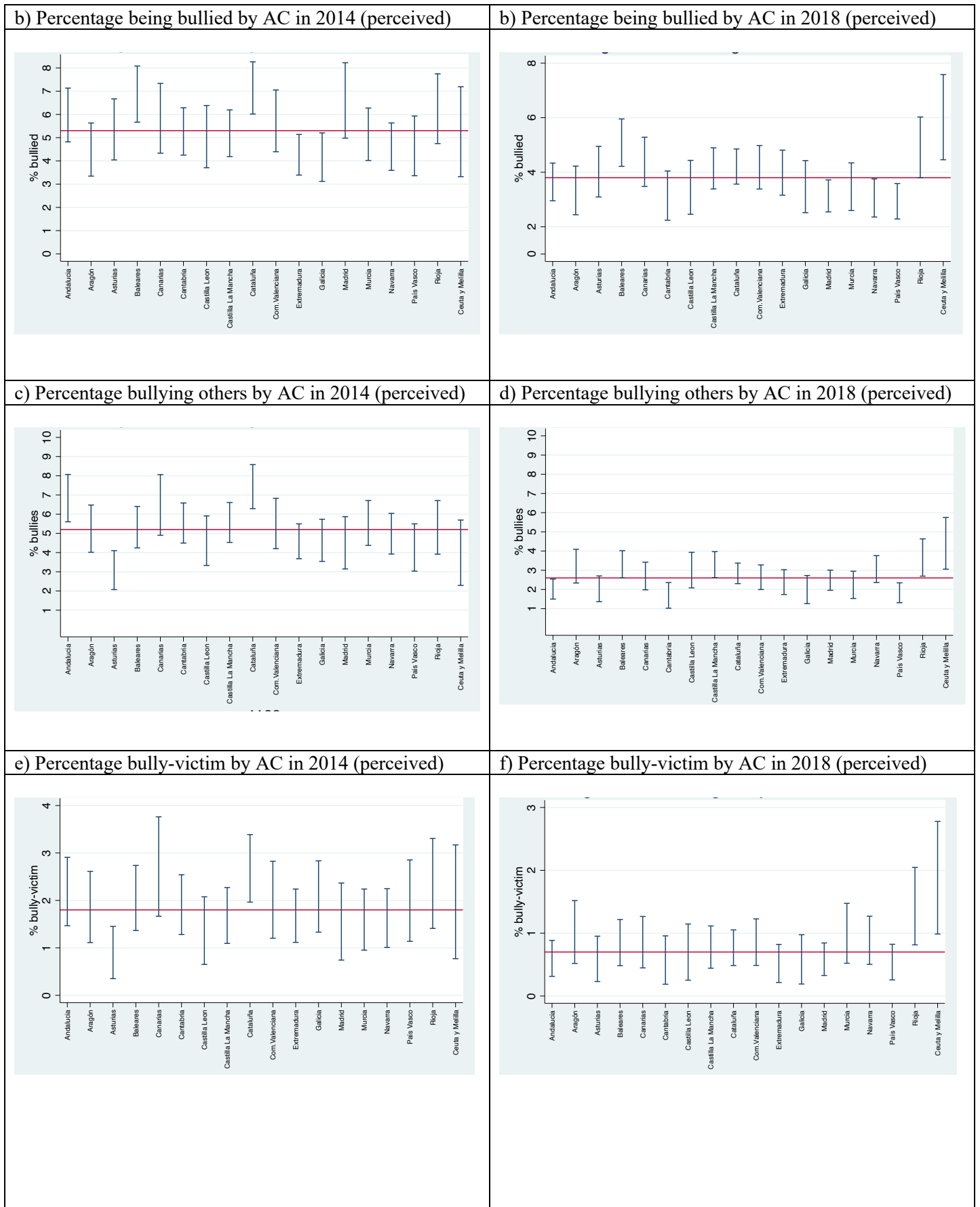


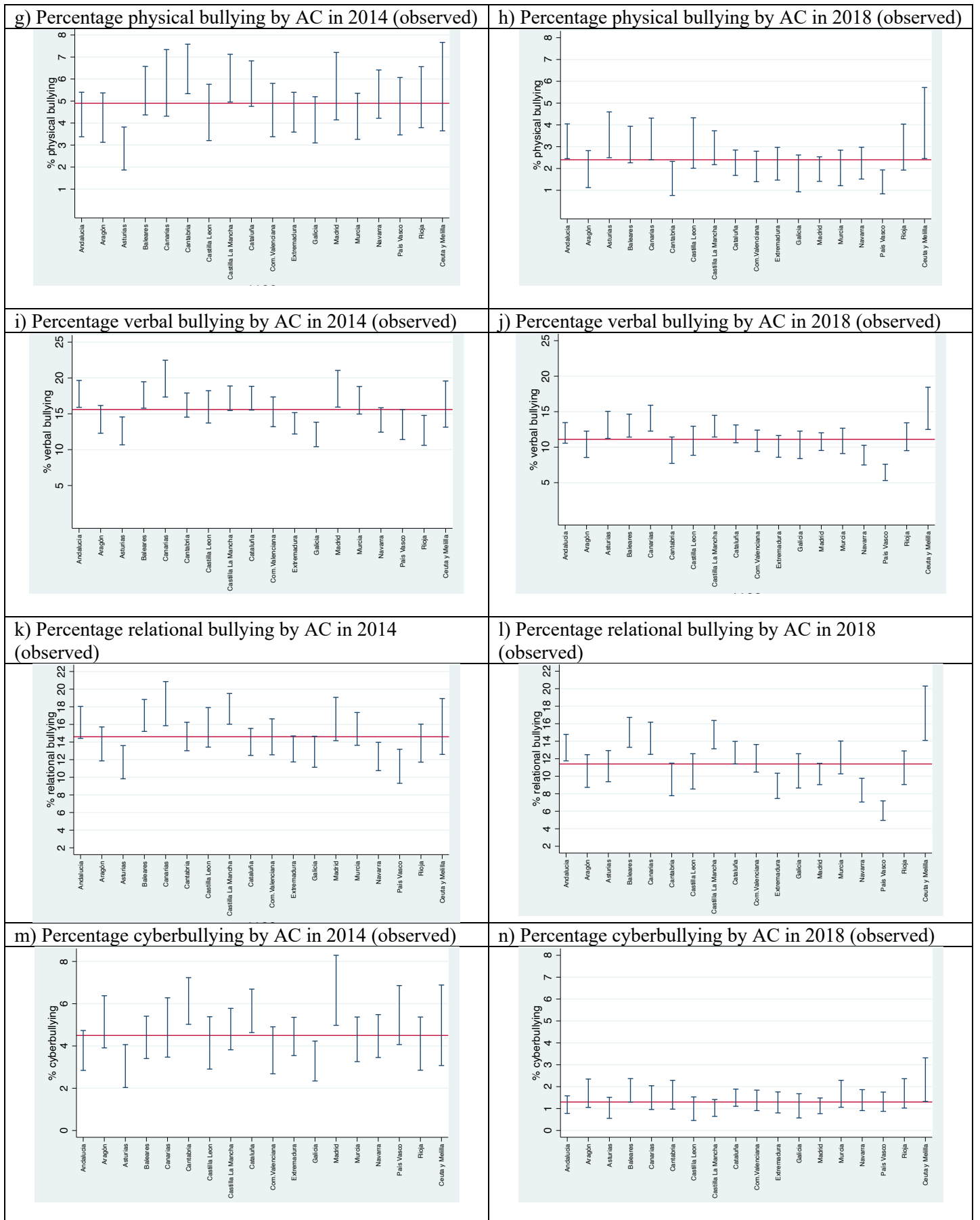
**Table 14. Descriptive statistics of being bullied and bullying others, by individual, familiar and contextual characteristics**

Scope	Variables	% Being bullied (perceived)			% Bullying others (perceived)		
		Year 2104	Year 2018	Diff Pr (Z>z)	Year 2104	Year 2018	Diff Pr (Z>z)
Individual characteristics	Male	6.50	4.19	<0.001	6.95	3.22	<0.001
	Female	4.22	3.40	0.0010	3.59	1.97	<0.001
	Aged 10-12	6.55	4.87	<0.001	5.03	2.28	<0.001
	Aged 13-14	5.82	4.09	<0.001	6.12	2.66	<0.001
	Aged 15-16	4.28	2.83	<0.001	4.96	2.82	<0.001
	Aged 17-18	3.36	2.64	0.0351	3.97	2.68	0.0009
	Grade repeater	7.49	5.13	0.0005	8.14	4.64	<0.001
	Not grade repeater	5.18	3.69	<0.001	5.01	2.44	<0.001
	Born in Spain	5.03	3.42	<0.001	4.95	2.36	<0.001
	Born abroad	7.78	6.38	0.0205	7.30	5.72	<0.001
	Normal weight	4.61	3.21	<0.001	4.72	2.30	<0.001
	Overweight	6.67	4.76	0.0001	5.68	2.82	<0.001
	Obesity	9.48	8.56	0.7151	8.73	3.68	<0.001
School characteristics	Private school	5.26	3.84	<0.001	5.20	2.74	<0.001
	Public school	5.38	3.77	<0.001	5.26	2.51	<0.001
	Urban school	5.12	3.93	<0.001	4.98	2.62	<0.001
	Rural school	5.61	3.66	<0.001	5.55	2.57	<0.001
Family characteristics	Having siblings	5.39	3.71	<0.001	5.33	2.70	<0.001
	Unique child	5.08	4.24	0.0197	4.83	2.03	<0.001
	Parents with high education	4.62	2.92	<0.001	3.99	1.92	<0.001
	Parents with medium education level	5.00	3.13	<0.001	5.27	2.35	<0.001
	Parents with low education	6.24	3.42	<0.001	5.88	2.29	<0.001
	Both parents working	5.02	3.01	<0.001	4.98	2.18	<0.001
	Only one parent working	5.21	4.03	0.0020	5.24	2.77	<0.001
None of the parents working	6.16	6.95	0.7406	6.09	3.64	0.0119	
Grade of support and satisfaction	Low friends' support	14.48	11.50	0.0020	10.21	5.91	<0.001
	Medium friends' support	8.36	6.45	0.0001	7.58	4.15	<0.001
	High friends' support	3.35	2.75	0.0010	3.90	2.06	<0.001
	Low family' support	9.44	9.79	0.6318	10.31	6.12	<0.001
	Medium family' support	7.03	6.54	0.1776	6.82	4.72	<0.001
	High family' support	4.51	3.01	<0.001	4.36	2.04	<0.001
	Low family's satisfaction	11.40	10.26	0.1615	10.53	5.43	<0.001
	Medium family's satisfaction	6.03	4.67	<0.001	5.94	3.26	<0.001
	High family's satisfaction	4.29	2.84	<0.001	4.21	2.00	<0.001

The generalized reduction of perceived bullying was also observed at the regional level, although some heterogeneity was found (Figure 3). In 2014, perceived bullying victimization ranged from 4.1% in Galicia to 6.8% in Baleares. Four years later, it ranged from 2.9% in the Basque Country to 5.9% in Ceuta/Melilla. The drop was statistically significant in most regions (Table 13). Regarding bullying perpetration, Andalucia showed the greatest progress over time.

Figure 3. Prevalence of bullying in Spain, by AACC, in 2014 and 2018





### ***Factors associated with bullying***

#### *Pooled analysis*

The pooled analysis for the whole sample was conducted for the perceived bullying variables. Data showed that in 2018 there was a significant reduction in the probability of being bullied (OR: 0.92), and specially of having bullied others (OR: 0.74) compared to 2014. The parametric tests carried out on the interaction between the year and the AC revealed that the drop in bullying did not show different regional trends, but the drop in bully perpetration was significantly different across regions.

Moreover, according to the MOR values obtained, if adolescents move to a school with a higher likelihood of being bullied, their risk of perceiving bullying victimisation will (in median) increase by 19%. For bullying perpetration, the impact of the school was greater, i.e. 33% (Table 15).

#### *Being bullied and bullying others in 2014 and in 2018*

As in the pooled model, the main variable associated with being bullied was having bullied other students in the same period (OR: 11.2 in 2014). In 2018, the effect was slightly reduced (to 8.8), but it was still by far the most relevant factor. The likelihood of declaring being bullied declined as participants get older. Perceiving being a victim was also positively and significantly associated with repeating grade, immigrant background, a higher Body Mass Index (BMI), lower levels of friends' or family's support and lower family's satisfaction (Table 16).

Some variables ceased to have a significant effect on being bullied in 2018 -gender, urban area of the school, and medium level of parental education-. By contrast, the variables that became significant were having siblings, having two working parents, and perceiving high parental support. These four variables reduced the risk of being bullied and all increased significantly their prevalence in the 2018 sample compared to 2014 (Table 16). Regarding the variables that maintained their significance in both years, a lower prevalence of some of the variables that raised the risk of perceived bullying (i.e., born abroad and overweight), and a higher prevalence of those that lower the risk of bullying (i.e., high family support) was observed.

Similarly, having been bullied was the variable most clearly associated with bullying others, although its effect decreased between 2014 and 2018. Being male and grade repeater was associated in both years with bullying perpetration. The variables that ceased

to have a significant effect on bullying others in 2018 were being 13-14 years old (which increased the likelihood of being an abuser in 2014), being 17-18 years old (which reduced the risk), being obese (which increased the risk), having moderate family support (which reduced the risk), and having medium or high family satisfaction (which reduced the risk). Conversely, new variables emerged as significant factors that increased the likelihood of bullying others in 2018, such as being 15-16 years old, attending a private school, having siblings, and having been born abroad.

MOR were higher for 2018 than for 2014; and higher for bullying perpetration than for victimization. MOR for bullying perpetration had a greater magnitude than ORs for most individual-level characteristics, suggesting that unexplained between-school variation was as relevant as student-level characteristics for understanding bullying prevalence. The LR tests vs. logistic models indicated that it would be a mistake to ignore the multilevel nature of bullying.

#### *Subgroup of bully-victims in 2014 and in 2018*

Given the strong association between bullying others and being bullied, it was of particular interest to examine the bully-victim subgroup. Boys were more prone to be bully-victims than girls in both waves, although the gender gap decreased in 2018. The youngest group of adolescents were more likely to belong to this group than older students. In 2018, immigrants and obese adolescents, as well as adolescents with low family and peers support, had a higher likelihood to be bully-victims than in 2014, while the opposite was true for grade repeaters. Having two working parents showed a protective effect only in 2018 (Table 17).

The unexplained between-school variation was higher in 2014 than in 2018. It was also higher for the bully-victim subgroup than for bullying victimization and perpetration individually.

#### *Types of observed bullying in 2014 and in 2018*

Some relevant differences in terms of types of observed bullying were detected. Boys were more likely to suffer from physical bullying than girls, while the opposite was true for relational bullying. A change in trend was observed for cyberbullying in this sense. Younger adolescents continued to be the age subgroup with higher likelihood to be physically bullied. However, in 2018, 13-14 years old participants were more prone to



suffer from verbal bullying. No clear age associations were found for cyberbullying. For its part, obese adolescents were more likely to be victims of verbal, relational and cyberbullying in 2018 than normal weight students (Table 18).

For verbal and relational bullying, the association with some of the explanatory variables disappeared during the time period, such as immigrant status, overweight, private ownership, or higher education levels of parents.

In 2018, cyberbullying seemed to no longer be related with older age, nor with school habitat, repeating grade, or parents' education level. By contrast, obesity became a significant variable. Other factors, such as immigrant status, friend and family support or satisfaction maintained generally their significance.

**Table 15. Multilevel logistic regression models for perceived bullying victimization and bullying perpetration (pooling years 2014 and 2018). Odds ratios**

	<b>Being bullied</b>		<b>Bulling others</b>
Bulling others	10.172***	Being bullied	10.140***
Male	1.125***	Male	1.735***
Aged 13-14	0.713***	Aged 13-14	1.161**
Aged 15-16	0.464***	Aged 15-16	1.062
Aged 17-18	0.384***	Aged 17-18	0.938
Grade repeater	1.375***	Grade repeater	1.374***
Born abroad	1.362***	Born abroad	1.314***
Overweight	1.286***	Overweight	1.019
Obesity	1.734***	Obesity	1.228*
Private school	1.098*	Private school	1.169***
Urban school	0.966	Urban school	0.888**
Siblings	0.937	Siblings	1.175***
Parents with high education	0.896	Parents with high education	0.897
Parents with medium education	0.900*	Parents with medium education	1.074
Both parents working	0.875***	Both parents working	0.956
Medium friends' support	0.619***	Medium friends' support	0.945
High friends' support	0.318***	High friends' support	0.719***
Medium family' support	0.967	Medium family' support	0.793***
High family' support	0.730***	High family' support	0.566***
Medium family's satisfaction	0.663***	Medium family's satisfaction	0.861*
High family's satisfaction	0.476***	High family's satisfaction	0.713***
Year 2018	0.921**	Year 2018	0.743***
Prob > chi2 year*AC	0.7296	Prob > chi2 year*AC	0.0292
LR test vs. log model (p>chi2)	0.1033	LR test vs. log model (p>chi2)	<0.001
MOR (school)	1.19	MOR (school)	1.33

All models include controls for AC and the missing variables of place of birth, weight, parents' educational level, parents' working status, perceived support and satisfaction. Reference year: 2014. Sample of 64,886 students and 909 schools. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

**Table 16. Separate multilevel logistic regression models for bullying victimization and bullying perpetration, for the year 2014 and the year 2018. Odds ratios**

	Being bullied (perceived)			Bullying others (perceived)	
	Year 2014	Year 2018		Year 2014	Year 2018
Bullying others	11.245***	8.797***	Being bullied	11.238***	8.761***
Male	1.215***	1.055	Male	1.865***	1.588***
Aged 13-14	0.707***	0.702***	Aged 13-14	1.163*	1.139
Aged 15-16	0.506***	0.420***	Aged 15-16	0.921	1.233**
Aged 17-18	0.366***	0.379***	Aged 17-18	0.731**	1.157
Grade repeater	1.460***	1.312***	Grade repeater	1.434***	1.345***
Born abroad	1.295***	1.424***	Born abroad	1.178*	1.421***
Overweight	1.250***	1.309***	Overweight	0.992	1.048
Obesity	1.347**	2.070***	Obesity	1.361**	1.119
Private school	1.068	1.136*	Private school	1.070	1.292***
Urban school	0.869**	1.040	Urban school	0.886	0.876
Siblings	1.073	0.833**	Siblings	1.028	1.393***
Parents with high education level	0.869	0.983	Parents with high education level	0.826*	1.021
Parents with medium education level	0.836**	1.018	Parents with medium education level	1.027	1.182
Both parents working	1.001	0.753***	Both parents working	1.017	0.871
Medium friends' support	0.591***	0.640***	Medium friends' support	0.974	0.902
High friends' support	0.277***	0.361***	High friends' support	0.766***	0.669***
Medium family' support	0.976	0.910	Medium family' support	0.700***	0.872
High family' support	0.872	0.602***	High family' support	0.579***	0.529***
Medium family's satisfaction	0.687***	0.653***	Medium family's satisfaction	0.768**	1.052
High family's satisfaction	0.525***	0.442***	High family's satisfaction	0.623***	0.879
Observations	25,441	39,445	Observations	25,441	39,445
LR test vs. log model (p>chi2)	0.2709	0.0279	LR test vs. log model (p>chi2)	0.0005	0.0001
MOR (schools)	1.11	1.22	MOR (schools)	1.28	1.41

All models were controlled by AC and by missing variables of place of birth, weight, parents' educational level, parents' working status, perceived support and satisfaction. 398 schools in 2014 and 510 in 2018. \*\*\*p<0.01, \*\*p<0.05, \*p<0.1

**Table 17. Separate multilevel logit regression models for being bully-victim, for the year 2014 and the year 2018. Odds ratios**

	<b>Bully-victim (perceived)</b>	
	<b>Year 2014</b>	<b>Year 2018</b>
Male	2.115***	1.581***
Aged 13-14	0.918	0.722**
Aged 15-16	0.644***	0.551***
Aged 17-18	0.503***	0.667*
Grade repeater	1.507**	1.473**
Born abroad	1.410**	1.752***
Overweight	1.219	1.084
Obesity	1.819***	2.308***
Private school	1.075	1.591***
Urban school	0.784**	1.104
Siblings	1.336**	1.232
Parents with high education level	0.728*	0.712
Parents with medium education level	0.953	0.876
Both parents working	1.139	0.622***
Medium friends' support	0.737**	0.528***
High friends' support	0.251***	0.250***
Medium family' support	0.557***	0.761
High family' support	0.561***	0.414***
Medium family's satisfaction	0.563***	0.810
High family's satisfaction	0.459***	0.718
Observations	25,441	39,445
LR test vs. log model (p>chi2)	0.0003	0.0645
MOR (schools)	1.52	1.44

All models were controlled by AC and by the missing variables of place of birth, weight, parents' educational level, parents' working status, perceived support and satisfaction. 398 schools in 2014 and 510 in 2018. \*\*\*p<0.01, \*\*p<0.05, \*p<0.1

**Table 18. Separate multilevel logit regression models for observed traditional bullying and cyberbullying, for the year 2014 and the year 2018. Odds ratios**

	Physical bullying		Verbal bullying		Relational bullying		Cyberbullying	
	Year 2014	Year 2018	Year 2014	Year 2018	Year 2014	Year 2018	Year 2014	Year 2018
Male	2.030***	1.928***	1.223***	1.051	0.921**	0.672***	1.762***	0.831**
Aged 13-14	0.702***	0.831*	0.853***	1.131**	0.780***	0.968	1.034	1.000
Aged 15-16	0.522***	0.712***	0.616***	0.867**	0.555***	0.664***	0.903	1.000
Aged 17-18	0.364***	0.501***	0.465***	0.745***	0.452***	0.496***	0.701***	0.932
Grade repeater	1.487***	0.984	1.211***	1.170**	1.262***	1.504***	1.531***	1.329*
Born abroad	1.471***	1.427***	1.161**	1.094	1.267***	1.071	1.297***	1.343**
Overweight	1.098	1.128	1.294***	1.055	1.209***	1.091	1.064	1.077
Obesity	1.477***	1.356*	1.666***	1.664***	1.569***	1.346***	1.048	1.604**
Private school	1.019	0.884	1.107**	1.060	1.115**	1.021	0.905	0.990
Urban school	0.798***	1.110	0.935	0.959	0.886***	0.902**	0.852**	0.894
Siblings	1.134	1.026	0.965	0.940	0.964	0.975	1.165*	1.175
Parents with high education level	0.752***	1.025	0.867**	0.926	0.805***	1.030	0.678***	1.153
Parents with medium education level	0.915	0.986	0.882***	0.968	0.938	1.120	0.768***	1.124
Both parents working	1.066	0.814**	0.996	0.942	0.929*	0.858***	1.113	0.881
Medium friends' support	0.679***	0.636***	0.773***	0.727***	0.631***	0.719***	0.727***	0.537***
High friends' support	0.285***	0.406***	0.423***	0.487***	0.329***	0.408***	0.284***	0.318***
Medium family' support	0.872	0.852	1.069	0.942	1.085	0.993	0.903	0.814
High family' support	0.664***	0.571***	0.803***	0.587***	0.801***	0.626***	0.664***	0.456***
Medium family's satisfaction	0.697***	0.852	0.781***	0.856*	0.729***	0.650***	0.614***	0.716**
High family's satisfaction	0.575***	0.697*	0.530***	0.582***	0.493***	0.430***	0.550***	0.583***
Observations	25,266	27,029	25,143	27,026	25,029	27,024	24,970	39,411
LR test vs. log model ( $p > \chi^2$ )	<0.001	0.0655	<0.001	<0.001	0.0002	0.0045	0.0007	-
MOR (schools)	1.37	1.31	1.20	1.26	1.19	1.19	1.31	1.00

All models were controlled by AC and by the missing variables of place of birth, weight, parents' educational level, parents' working status, perceived support and satisfaction. 398 schools in 2014 and 510 in 2018. \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$

## 4.4 Discussion and conclusions

In the last decade, bullying has progressively gained attention in the media, educational contexts, and public administrations, as a frequent and preventable behavior with serious consequences on health, quality of life and academic outcomes on those who are directly involved as victims and/or as bullies. Furthermore, the implications of bullying extend to entire peer groups and school communities. Bystanders, i.e. students who witness bullying, are likely to become more aggressive and truant and less engaged with their peers and school (Janosz et al., 2008). Also, bullying in the school class has been shown to be associated with deteriorated subjective health for the class as a whole (Meilstrup et al., 2015; Modin et al., 2015).

Spain is one of the OECD countries with the current lowest level of school bullying (Inchley et al., 2020). Despite the regressive trends in bullying experienced in Spain during the last years, there are still many children and adolescents being bullied. Over one in four students have reported in the present study to be involved in some type of observed bullying. A proportion of 3.8% students that has perceived being bullied is equivalent in absolute terms to over 160,000 children/adolescents aged between 10 and 18 years old being bullied in Spain in 2018. That year, 77 suicides were recorded in this age group in Spain (INE, 2018). This is therefore an urgent matter which concerns society as a whole and demands effective political action.

In this work, we aimed to describe and shed light on the underlying factors explaining the recent reduction of bullying observed in Spain between 2014 and 2018, from a multilevel school perspective. From our knowledge, this is the first study to perform a multilevel analysis on bullying in Spain.

According to our results, a greater reduction in physical compared to verbal-relational bullying and in cyberbullying compared to traditional bullying was observed. This trend may indicate that policies might have focused more on visible and newest bullying than on other types of bullying, which may be more difficult for adults to detect. It was also observed that the proportion of students who reported to have bullied has decreased more markedly than the proportion of bullied students, i.e., it seemed that bullying perpetration has been concentrated in a lower volume of adolescents, who probably bully a higher number of peers (previously the ratio was almost 1:1). In addition, it might be that the

social concern surrounding this phenomenon has led to fewer students recognizing themselves as bullies.

This paper has also tried to characterise bullies and victims and to identify the factors that might explain the observed drop in bullying over time in Spain. Male gender was positively associated with perceived bullying perpetration and suffering from physical bullying, while girls were more prone to suffer from relational bullying. The gender association with cyberbullying has changed over time: boys were more likely to suffer it in 2014, while the opposite was true in 2018. In addition, significant gender differences in the prevalence of observed verbal bullying and perceived being bullied disappeared in 2018. Having obesity, an immigrant status, or being a grade repeater were factors associated with a higher risk of most types of observed bullying, and this remained so in the latter year with some exceptions. In particular, being overweight and born abroad were no longer significant factors for verbal and relational bullying in 2018. Attending a private school and a school in a rural area were associated with higher risks for certain types of bullying. However, most of these effects have also become non-significant in 2018. Interestingly, the protective effect of parental educational level observed in 2014 in most models became non-significant in 2018, while having both parents working became a significant factor in 2018. Higher levels of friends' or relative's support and family satisfaction were found to be strong significant factors against being bullied in both years.

With regards to bullying perpetration, we observed a change of the age gradient effect (15-16 years old seemed to be more prone to bully others than younger students in 2018), and obesity was no longer a risk factor in 2018, whereas attending a school with private ownership was. The protective effect of high support by friends and family remained.

A specific subgroup deserved special attention - those students who bully and who suffer from bullying at the same time-. In this regard, the victim paradox underlines that physically bullied victims tend to identify with bullies and may actively participate as bullying perpetrators in the future, becoming bullies themselves (Dulmus et al., 2006). The prevalence of this subgroup was reduced by more than half in these four years, in line with the decrease in the number of bullies and bullied. Boys aged 10-12 years-old, grade repeaters, born abroad and students with obesity have a significant higher risk of being bully-victims. The effect of attending a private school and the effect of having both

parents working became significant only in 2018. High family's and friends' support were factors associated with a lower risk of belonging to the bully-victim group in both years.

In fact, as noted, the perception of having friends' and family's support were the factors that consistently over time and across all types of bullying victimization and bullying perpetration were found to significantly reduce the risk of this phenomenon. The percentage of adolescents reporting to perceive high levels of support from friends and family have also significantly increased over the period of analysis. This finding indicates the role of these factors in explaining the observed reduction of bullying in Spain, over and above (and possibly inter-connected with) the specific regional and local policies aimed at addressing this problem.

The school has also shown to be a relevant factor. The likelihood of being involved in bullying is also highly determined by the school the child/adolescent attends, with unexplained variation between schools being as relevant as some student-level characteristics. This result highlights the need to promote educational interventions in classrooms to prevent bullying.

Regarding the effect of specific regulation and implementation of anti-bullying policies, we found that while the dropping trend in the prevalence of being bullied was not significantly different across ACs – that held competencies in education matters in Spain - the decline in the prevalence of bullying perpetration differed across regions. In addition to central regulations, each region has adopted specific school regulations, programmes, and protocols for action against bullying, as well as specific regulations concerning regional bullying observatories (Ministerio de Educación y Formación Profesional, 2023). It is difficult to know whether the regions that pioneered such initiatives did so because of a greater awareness of bullying among political leaders or because of a higher prevalence of bullying than the national average, or a confluence of both. This heterogeneity, together with the fact that changes in regional governments may also imply changes in the priority of public policies, depending on the ruling party, and the absence of detailed information on the budgetary effort involved in the effective implementation of school coexistence and anti-bullying programmes, pose strong barriers to understanding the extent of public policies in the observed bullying reduction figures between regions. A promising future line of analysis would be to analyse in detail the effects of the programmes implemented in each region and study their similarities and differences, in order to build on the best experiences and discard those that are not

effective. However, this will require an effort on the part of public decision-makers to generate the necessary information to evaluate the results of their interventions.

Many of our results are in line with previous studies. It is well established that boys suffer in general more school bullying than girls, and they are also more likely to perpetrate both traditional and cyberbullying (Cosma et al., 2022; Wang and Chen, 2023). Entrenched gender role models may result in boys to rely more on physical forms of bullying, whereas girls tend to engage in a bullying more based around social relationships (Card et al., 2008; Smith et al., 2019).

For its part, there is evidence about the age-related decline in bullying. Some studies also pointed out that students experience more bullying victimization in elementary schools than in middle schools, and that in turn there is more bullying in middle schools than in high schools (Garmy et al., 2018; Saarento et al., 2015). This trend could be explained by factors related to the students' physical and psychosocial development, as well as differences in the social and academic environment at the different school levels (Craig et al., 2009). However, other studies found small or trivial effect sizes related to both gender and age trends in bullying behaviors (Zych et al., 2015).

Any person who is different from the majority is particularly vulnerable to bullying victimization (Llorent et al., 2016). This is the case of adolescents speaking a foreign language at home (Garmy et al., 2018), recently arrived immigrant students (OECD, 2017), overweighted adolescents (Lian et al., 2018), students who have repeated grades (Wang and Chen, 2023), a different physical aspect (Islam et al., 2022), or adolescents with lower economic and social status (UNESCO, 2018).

Findings from former studies also underlined the causal effect of bullying victimization on bullying perpetration (Nie et al., 2022). It is also well stated that being highly supported by parents, siblings and peers during adolescence may be a protective factor of bullying (Biswas et al., 2022; Lucas-Molina et al., 2022; Zych et al., 2019).

It is also important to distinguish between effects at the individual student level and effects at the classroom level, since that can play a crucial role in either promoting or preventing bullying. In fact, some studies concluded that as long as there is a pro-bullying classroom climate, individual student-level interventions are unlikely to be effective (Marsh et al., 2023). Hence, a more accurate understanding of bullying requires to consider the broader social ecology of the school community (Espelage et al., 2014),



including teacher attitudes, classroom practices, and the wider school environment. Some examples of classroom level interventions that can act as potential mediators of bullying are the student's affection towards their teachers, frequency of appraisal from teachers, social cohesion among peers, or a better perceived school climate (Sabramani et al. 2021; Hensums et al. 2022; Nie et al. 2022; Pabayo et al. 2022).

Several limitations of this work should be highlighted. First, the data analyzed are self-reported information from children/adolescents, which entails potential issues concerning perception and accuracy, especially regarding individual (e.g., BMI) and socioeconomic characteristics (e.g., education and working status of parents). Regarding perception of bullying variables, it was found that the proportion of adolescents who reported having been bullied was much lower than those who report observed bullying. As has been previously discussed (Sánchez Queija et al., 2017), this might indicate that children/adolescents may not fully realise that their experiences constitute bullying, but when asked specific questions they are more capable of disclosing their bullying experiences. This finding emphasises the need to take into account questions asking adolescents directly about having bullying experiences as well as specific questions on behaviors that entail bullying. Second, the analysis makes use of a comprehensive set of variables that characterise individuals, their families, and their school and contextual environments, but there might be other relevant factors that we have not included, particularly individual factors such as moral disengagement (Menesini et al., 2003) or coping strategies (Potard et al., 2022). Third, the methodology applied in our analyses might only be capable of identifying associations rather than causal effects, and some observed relationships might be affected by endogeneity bias. Lastly, the HBSC is a very interesting and comprehensive cross-sectional survey. However, it would be advisable for the public authorities to provide the necessary means and resources to convert it into a longitudinal survey, in order to be able to identify whether the children who mistreat today were victims of bullying several months ago or in previous academic years.

Future research could explore other surveys (e.g., PISA) to study to what extent additional variables such as truancy might have an effect on bullying and vice versa. It will also be of interest to analyse the most recent situation in Spain, in order to assess the evolution of bullying over a longer period of time, and to analyse the potential impact of the Covid-19 on bullying behaviors. Finally, it would be relevant to evaluate the relationship of anti-

bullying policies at regional and school level on bullying, ideally through longitudinal studies that follow students over time.

In conclusion, school bullying in Spain have experienced a decline that is consistent across all types of bullying definitions (observed, perceived, online) in Spain. Our analyses show that some characteristics of bullies and bullying victims have changed over time, while some others have retained their relevance. In particular, the perception of family's and friends' support have a consistent protective factor more salient than other family characteristics such as parental working status and educational level. It is also noteworthy the school effect on the bullying behavior of their students.

**CHAPTER 5.**  
**CONCLUSIONS**

This PhD dissertation is intended to contribute to the existing literature on health-related factors and risk behaviors for young people's well-being. Specifically, the project aimed to better understand the role of individual, family and contextual characteristics on perceived health and certain risk factors, such as obesity or bullying, among others. We have used a comprehensive survey (the HBSC study) to widen the evidence, in this case for Spain, from a triple point of view.

The first sub-study explored the effect of the economic crisis on children and adolescents. Multilevel models were applied for alternative measures of perceived health and well-being, as well as to different unhealthy behaviors, such as smoking, alcohol consumption, and breakfast skipping, using regional unemployment rates as a proxy of the economic recession experienced in Spain between 2008 and 2013. Our results confirm that the increase in unemployment during the recession may have worsened adolescents' health status and lifestyles. However, we have also shown the protective effect of the children's social network against the negative effects of the crisis. To our knowledge, this is the first time that the HBSC survey was used to measure the potential impact of the economic crisis on health and lifestyles, considering jointly different environment influence levels.

The second sub-study delved into the home environment of children and adolescents in relation to a specific risk factor such as overweight and obesity. More specifically, we explored through multilevel regression models whether there were differences in the child's weight status according to the parent with whom the child stays at home (i.e. who the working parent outside the home is). Our findings indicate that having a mother as main caregiver may have a greater positive influence on children's weight and lifestyles than having a father as main caregiver, at least for some subgroups of children. To the best of our understanding, this is the first time to investigate the underlying factors influencing children's excess weight, while distinguishing between parental work status and considering the potential impact of the school as an additional level of analysis.

The focus of the third sub-study was to obtain an accurate picture of what factors might be related to the decrease of bullying experienced in Spain during the last decade, which has lead Spain as one of the OECD countries with the lowest prevalence of this risk factor. We showed that the different variables of perceived and observed bullying experienced a decline that was consistent across subgroups and Spanish regions over time. The multilevel analysis performed suggested that being bullied by other students was highly associated with having bullied other students, and vice versa. The likelihood of declaring

bullying victimization declined as children get older, and increased for grade repeaters, immigrants, and overweight/obese children. As far as we know, this is the first study to perform a multilevel analysis on bullying in Spain. Another interesting contribution was to explore the effects of bullying and victimization simultaneously (i.e. on those who respond to the bully-victim binomial).

A contribution of our work is the sustained protective effect that the social context of adolescents has on their health and risk behaviors. We have shown that a high perceived support of friends and relatives might play a major role in protecting against the economic crisis, bullying, obesity, and harmful substance use. Our results are aligned with the extensive published work on the protective nature of family-level factors for adolescent health, with increasing evidence that parenting behaviors predict positive outcomes (Desousa et al., 2008; Michaelson et al., 2021; Moore et al., 2018). It is therefore crucial to enhance good communication and relationships with family members and peers.

A common element of this thesis is the multilevel regression analysis performed at the three sub-studies, using schools as a second level of analysis. Schools are the environment where children and adolescents spend most of their day, make friends and develop physically, mentally and emotionally. Yet, it is also a setting where young people are exposed to influences potentially detrimental to their health. Therefore, schools are in a unique position to provide health-enhancing policies and programs. Our findings suggest that the school the child attends has an influence on health outcomes and lifestyles that can be even larger than that of the individual characteristics of the student. The design of interventions in this area must therefore go beyond working directly with children and adolescents and include knowledge of the school environment and the protective social factors surrounding young people. Also, attention should be paid to reducing inequalities between schools, which can be a focus of poor health and unhealthy habits for life.

Our findings may provide implications for bullying prevention and highlight the need for promoting positive school climate. Students at the end of primary education may require more attention than older ones, and diversity education activities may protect vulnerable students against specific types of bias-based bullying. Other policy implications derived from this work are related to the importance of maintaining strong active employment policies, as well as social protection policies focused on single-parent families and less affluent homes. We also suggest the need for a more equally shared burden of caregiving between both parents, so that the participation of either parent in the employment market

does not involve a risk for their children's health. Working conditions better designed to promote the conciliation between family and professional life can translate into improvements in children's well-being.

One of the main strengths of this project was the utilization of a large, comprehensive, and national representative dataset of children and adolescents in Spain. We used five waves of the HBSC survey, from 2002 to 2018, encompassing a whole sample of more than 117,000 students from nearly 1,700 schools. The wide information contained allowed us to analyse health and risk behaviors, while controlling for relevant covariates in the family and school setting. Lastly, the international comparability of data allows to compare our results with those from other countries.

Our work has certain limitations that have to be addressed. The cross-sectional design of the HBSC study limits the ability to conduct longitudinal analyses of data and establish causal relationships. Also, some observed relationships might be affected by endogeneity bias. The use of self-reported data from children and adolescents might lead to potential issues concerning perception, accuracy and omitted variables. Lack of availability for additional detailed variables, such as family economic wealth, working hours, or the child's personality, among others, further contributes to the limitations. Lastly, there was a lack of homogeneous questions among the five waves, hindering us from performing a wider comparison across years.

Although these limitations do not allow for strong and undeniable causal relationships to be established, this study has sought to identify relationships that capture the effect of certain factors on adolescents' health and risk behaviors, pointing out the importance of the family socioeconomic position, the social support and the school environment. This study brings together three interrelated areas, such as economics, public health, and education. It is our hope that this work can inform health promotion and health education policies focused on young people. The conclusions derived from the work may be relevant to provide more evidence on the importance of designing and implementing timely and holistic policies for the well-being of present and future populations.

Further studies should be undertaken to update the analyses over time. All this work is pre-pandemic, but in the future, it would be relevant to analyze the potential effect of the COVID-19 pandemic on the health risk behavior of young people, and its possible impact on health. It would also be advisable for the public authorities to convert the HBSC study

into a longitudinal survey. This would make it possible to explore the short, medium, and long term consequences of current behaviors of young people and facilitate the identification of causal relationships that would reinforce the results achieved in this thesis. The survey could also be improved by adding qualitative data to provide a deeper understanding of risk behaviors among adolescents, making sure the homogeneity of questions across waves.

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# APPENDIX



## Supplementary materials

**Supplementary table 1.** Results from the multilevel logistic regressions on health complaints (odds ratios).

	4 physical health complaints			4 psychological health complaints		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Boy	2.227*** (0.043)	2.226*** (0.043)	2.546*** (0.052)	1.826*** (0.033)	1.821*** (0.033)	2.166*** (0.042)
Aged 13-16	0.681*** (0.017)	0.684*** (0.017)	0.705*** (0.019)	0.591*** (0.014)	0.596*** (0.014)	0.063*** (0.016)
Aged 17 and older	0.572*** (0.019)	0.574*** (0.019)	0.560*** (0.020)	0.423*** (0.014)	0.429*** (0.014)	0.427*** (0.015)
FAS_medium		1.320*** (0.059)	1.245*** (0.056)		1.230*** (0.055)	1.116** (0.051)
FAS_high		1.358*** (0.061)	1.240*** (0.057)		1.397*** (0.062)	1.206*** (0.056)
Both parents working		1.013 (0.020)	1.016 (0.021)		1.044** (0.020)	1.052*** (0.021)
Two-parent family structure		1.292*** (0.035)	1.220*** (0.034)		1.336*** (0.036)	1.247*** (0.034)
Parental understanding			1.168*** (0.026)			1.317*** (0.028)
Parental help			1.197*** (0.034)			1.231*** (0.035)
Parental knowledge			1.288*** (0.029)			1.484*** (0.032)
Parental love			1.126*** (0.032)			1.272*** (0.036)
Fighting with peers			0.684*** (0.016)			0.643*** (0.015)
Bullying			0.870*** (0.022)			0.742*** (0.018)
Bullying victim			0.585*** (0.016)			0.548*** (0.015)
Unemployment rate change	0.627*** (0.078)	0.639*** (0.078)	1.009 (0.126)	0.432*** (0.050)	0.441*** (0.050)	1.008 (0.118)
Constant	1.885*** (0.061)	1.133** (0.066)	0.983 (0.064)	1.237*** (0.042)	0.717*** (0.042)	0.488*** (0.032)
Observations	54,902	54,902	54,902	54,463	54,463	54,463
Wald chi-squared test	2,055	2,184	3,491	1,919	2,126	4,631
Likelihood Ratio test	320.5	294.9	189.3	315.3	291.3	150.3
Median Odds Ratio (region)	1.09	1.09	1.09	1.11	1.11	1.09
Median Odds Ratio (school)	1.30	1.30	1.25	1.28	1.27	1.22

Standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. The models include dummies for the missing values of relationships/conflicts indicators. No.groups: 18 regions; 1,181 schools.

**Supplementary table 2.** Multilevel regression models on children BMI (Full models) Coefficients

	Model 1	Model 2	Model 3	Model 4
Sex (boy)	0.477*** (0.036)	0.480*** (0.036)	0.486*** (0.036)	0.487*** (0.036)
Age	0.549*** (0.010)	0.548*** (0.010)	0.541*** (0.011)	0.540*** (0.011)
Only the father has a paid job	0.013 (0.042)	-0.001 (0.042)	-0.027 (0.042)	-0.036 (0.042)
Only the mother has a paid job	0.218*** (0.078)	0.189** (0.078)	0.168** (0.078)	0.148 (0.078)
None of the parents have a paid job	0.258*** (0.098)	0.211** (0.098)	0.164 (0.098)	0.131 (0.099)
Spanish parents	-0.247*** (0.054)	-0.239*** (0.053)	-0.247*** (0.053)	-0.240*** (0.053)
Number of siblings	-0.040** (0.020)	-0.042** (0.020)	-0.042** (0.020)	-0.043** (0.020)
Medium-low family affluence		0.245*** (0.046)		0.201*** (0.046)
Missing_family affluence		0.114** (0.049)		0.094 (0.049)
Year 2014	-0.206*** (0.068)	-0.229*** (0.070)	-0.191*** (0.069)	-0.211*** (0.071)
Region 2	-0.510*** (0.126)	-0.497*** (0.125)	-0.497*** (0.123)	-0.488*** (0.123)
Region 3	-0.345** (0.169)	-0.344** (0.168)	-0.319 (0.166)	-0.320 (0.165)
Region 3	-0.287 (0.149)	-0.285 (0.148)	-0.301** (0.146)	-0.298** (0.145)
Region 5	0.135 (0.163)	0.132 (0.161)	0.142 (0.159)	0.139 (0.158)
Region 6	-0.420*** (0.151)	-0.416*** (0.149)	-0.408*** (0.147)	-0.405*** (0.146)
Region 7	-0.650*** (0.146)	-0.646*** (0.145)	-0.649*** (0.143)	-0.646*** (0.142)
Region 8	-0.277** (0.136)	-0.277** (0.135)	-0.300** (0.133)	-0.298** (0.133)
Region 9	-0.438*** (0.151)	-0.420*** (0.150)	-0.437*** (0.147)	-0.423*** (0.147)
Region 10	-0.232 (0.145)	-0.222 (0.144)	-0.227 (0.142)	-0.219 (0.141)
Region 11	-0.420*** (0.137)	-0.410*** (0.136)	-0.422*** (0.134)	-0.413*** (0.134)
Region 12	-0.158 (0.136)	-0.155 (0.135)	-0.154 (0.133)	-0.151 (0.133)
Region 13	-0.601*** (0.159)	-0.587*** (0.158)	-0.560*** (0.155)	-0.550*** (0.154)
Region 14	0.028 (0.150)	0.025 (0.149)	-0.009 (0.147)	-0.009 (0.146)
Region 15	-0.443*** (0.153)	-0.439*** (0.151)	-0.432*** (0.149)	-0.429*** (0.148)
Region 16	-0.361** (0.152)	-0.356** (0.150)	-0.329** (0.148)	-0.327** (0.148)
Region 17	-0.801*** (0.172)	-0.792*** (0.171)	-0.802*** (0.168)	-0.795*** (0.167)
Region 18	0.512**	0.551**	0.560***	0.590***

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	(0.222)	(0.220)	(0.217)	(0.216)
Parents' high educational level			-0.325***	-0.308***
			(0.051)	(0.051)
Parents' low educational level			0.215***	0.197***
			(0.049)	(0.049)
Missing educational level			-0.024	-0.023
			(0.087)	(0.087)
Constant	12.731***	12.658***	12.861***	12.793***
	(0.186)	(0.186)	(0.200)	(0.201)

Robust seeform in parentheses. \*\*\* p<0.01, \*\* p<0.05

**Supplementary table 3.** Multilevel regression models on children weight status measured by Cole et al (Odds ratios)

	Obesity				Obesity + overweight			
	Model 1	Model 2	Model 3	Model 4	Model 1	Model 2	Model 3	Model 4
Only the father has a paid job	1.054 (0.100)	1.036 (0.099)	0.996 (0.095)	0.986 (0.095)	1.011 (0.038)	0.999 (0.038)	0.978 (0.037)	0.971 (0.037)
Only the mother has a paid job	1.111 (0.191)	1.071 (0.184)	1.031 (0.178)	1.005 (0.173)	1.090 (0.074)	1.063 (0.073)	1.046 (0.071)	1.027 (0.070)
None of the parents have a paid job	1.365 (0.258)	1.281 (0.244)	1.195 (0.229)	1.145 (0.220)	1.165 (0.097)	1.118 (0.094)	1.075 (0.091)	1.045 (0.088)
Medium-low family affluence		1.354*** (0.137)		1.278** (0.130)		1.234*** (0.050)		1.190*** (0.048)
Parents' high educational level			0.586*** (0.082)	0.599*** (0.084)			0.757*** (0.037)	0.768*** (0.038)
Parents' low educational level			1.277** (0.131)	1.250** (0.128)			1.194*** (0.050)	1.176*** (0.050)
Spanish parents	0.796** (0.088)	0.804** (0.089)	0.798** (0.089)	0.805 (0.089)	0.828*** (0.038)	0.833*** (0.038)	0.827*** (0.038)	0.832*** (0.038)
MOR (school)	1.51	1.49	1.47	1.46	1.31	1.30	1.29	1.28
Wald Chi2 test	142.2	152.6	171.2	177.7	412.8	440.8	477.8	496.5

Robust seeform in parentheses. \*\*\* p<0.01, \*\* p<0.05.

All models were adjusted for gender, age, region, number of siblings and year. Models 2 and 4 were also adjusted for the missing variables of the family's socioeconomic level. Models 3 and 4 were also adjusted for the missing variables of the parent's educational level. Only biparental families were considered.

## Publications

### Publications of this research:

#### **Chapter 1:**

**Title:** The Effect of the Economic Crisis on Adolescents' Perceived Health and Risk Behaviors: A Multilevel Analysis

**Authors:** Néboa Zozaya and Laura Vallejo.

**Journal reference:** Int J. Environ. Res. Public Health. 2020, 17(2), 643.

**DOI:** <https://doi.org/10.3390/ijerph17020643>

**Journal Impact factor:** 3.4

**Quartile and rank:** Q2 Environmental Sciences #81/306; Q2 Public, Environmental and Occupational Health #131/376 (Rank by Journal Citation Indicator)

#### **Chapter 2:**

**Title:** Association between maternal and paternal employment and their children's weight status and unhealthy behaviours: does it matter who the working parent is?

**Authors:** Néboa Zozaya, Juan Oliva-Moreno and Laura Vallejo.

**Journal reference:** BMC Public Health. 2022, 22, 1331.

**DOI:** <https://doi.org/10.1186/s12889-022-13735-3>

**Journal Impact factor:** 4.5

**Quartile and rank:** Q1 Public, Environmental & Occupational Health #78/400 (Rank by Journal Citation Indicator)

#### **Chapter 3:**

**Title:** Unravelling factors linked to the decrease of school bullying in Spain

**Authors:** Néboa Zozaya, Laura Vallejo-Torres, Juan Oliva-Moreno, and Inmaculada Sánchez-Queija

This article was submitted to the journal Social Science and Medicine in November 2023, for consideration for publication.

**Other publications (additional to those included in the thesis, published during the doctoral period)**

**Articles:**

- **Zozaya N**, Villaseca J, Abdalla F, Ancochea A, Málaga I, Trapero-Bertran M, Martín-Sobrino N, Delgado O, Ferré P, Hidalgo-Vega A (2023) *Strategic discussion on funding and access to therapies targeting rare diseases in Spain: an expert consensus paper*. Orphanet Journal of Rare Diseases 18:41. <https://doi.org/10.1186/s13023-023-02635-3>
- **Zozaya N**, Arrizubieta Basterrechea MA, Bollo E, Castellví I, Espín J, Ortego N, Poveda-Andrés JL, Rodríguez Portal JA, Rivero A, Marcos-Rodríguez JA, Verde L (2022) *A multi-criteria decision analysis on the value of nintedanib for interstitial lung diseases*. Int J Technol Assess Health Care 1;38(1):e64. doi: 10.1017/S0266462322000459.
- Redondo Margüello E, **Zozaya González N**, Martín Sánchez V, Villaseca Carmena J, López-Belmonte JL, Drago Manchón G, Jurío Font E, Hidalgo-Vega A y Grupo de Expertos Gripetool (2022) *Análisis de las estrategias dirigidas a aumentar la cobertura de vacunación antigripal en personas de 65 años y más*. Rev Esp Med Prev Salud Pub. 27(1): 8-16.
- **Zozaya N**, Abdalla F, Alfonso S, Balea J, Carrascosa JM, Delgado O, Dolz F, García-Ruiz A, Herranz P, Manfredi A, Martínez Olmos J, Morales de Los Ríos P, Puig L, Ros S, Hidalgo-Vega A (2022) *Assessing the value contribution of bimekizumab for the treatment of moderate-to-severe psoriasis using a multidisciplinary reflective multi-criteria decision analysis*. Expert Rev Pharmacoecon Outcomes Res Apr 11. doi: 10.1080/14737167.2022.2063842
- **Zozaya N**, Abdalla F, Casado Moreno I, et al. (2022) *The economic burden of pulmonary arterial hypertension in Spain*. BMC Pulm Med 22, 105 <https://doi.org/10.1186/s12890-022-01906-2>
- **Zozaya N**, Villoro R, Abdalla F, Alfonso Zamora S, Balea Filgueiras J, Carrascosa Carrillo JM, Delgado Sánchez O, et al. (2022) *Unmet Needs in the Management of Moderate-to-Severe Psoriasis in Spain: A Multidimensional Evaluation*. Acta Derm Venereol. 25;102:adv00678. doi: 10.2340/actadv.v102.583. PMID: 35312022.
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- **Zozaya N**, Capel M, Simón S, Soto, A (2019) *A systematic review of economic evaluations in non-insulin antidiabetic treatments for patients with type 2 diabetes mellitus.* *Global & Regional Health Technology Assessment: Italian; Northern Europe and Spanish.* September 30. <https://doi.org/10.1177/2284240319876574>
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### Books and reports:

- “*Proyecto ANETA. Análisis estratégico para la implementación de las terapias avanzadas en España*”. Fundación Weber, May 2023.
- “*PSoluciones: un decálogo de garantías en psoriasis, para la calidad de vida de las personas, la eficiencia y la equidad del SNS*”. Fundación Weber, April 2023.
- “*Libro blanco de la Tos Crónica en España*”. Fundación Weber, December 2022.

- *“El proceso de evaluación y financiación de los medicamentos en España: ¿dónde estamos y hacia dónde vamos?”* Zozaya N, Villaseca J, Abdalla F, Fernández I, Hidalgo-Vega A. Fundación Weber, June 2022.
- *“Reflexión estratégica sobre financiación y acceso a las terapias dirigidas a enfermedades raras en España”*. Zozaya N, Villaseca J, Abdalla F, Hidalgo-Vega A. Fundación Weber, January 2022.
- *“Libro Blanco de la adherencia en España”*. Grupo OAT y Fundación Weber. 2021.
- *“Vacunación frente a la COVID-19 en España: Encuestas en la farmacia comunitaria”*. Zozaya, N, Fernández, I, Blanes Jiménez, A, Varas Doval, R, Peiró Zorrilla T. Fundación Weber, December 2021.
- *“Gestión y mejora de la cobertura vacunal de la gripe en España. Proyecto Gripetool”*. N Zozaya, J Villaseca, A González, M Merino, E Redondo, A Hidalgo. Fundación Weber, June 2021.
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- *“Crisis económica y salud: lecciones aprendidas y recomendaciones para el futuro”*. Oliva J, Peña-Longobardo LM, González López-Valcárcel B, Barber Pérez P y Zozaya González N. Cuadernos Económicos ICE Número 96, 2018.
- *“Crisis económica y salud en España”*. Informes, estudios e investigación. Ministerio de Sanidad, Consumo y Bienestar Social, December 2018.
- *“Libro Blanco sobre la carga socioeconómica del Cáncer de Próstata”*. Fundación Weber, November 2018. ISBN: 978-84-947703-7-1

**Other relevant experiences in health economics during the doctoral period:**

- Member of the Board of Directors of the Asociación de Economía de la Salud (AES) (from July 2023)
- Member of the Experts Network “Los 100 de COTEC” (from December 2022)
- Member of the Editorial Advisory Board of the Revista Española de Economía de la Salud (from March 2020)
- Tutoring of final projects of the Master's Degree in Health Economics and Medicine of the Universitat Pompeu Fabra for national and international students (from December 2018)