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# The great decline in adolescent risk behaviours: Unitary trend, separate trends, or cascade?

Jude Ball<sup>a,\*</sup>, Richard Grucza<sup>b</sup>, Michael Livingston<sup>c,d</sup>, Tom ter Bogt<sup>e</sup>, Candace Currie<sup>f</sup>,  
Margaretha de Looze<sup>e</sup>

<sup>a</sup> University of Otago, Wellington, New Zealand

<sup>b</sup> Washington University School of Medicine, St Louis, USA

<sup>c</sup> National Drug Research Institute, Curtin University, Perth, Australia

<sup>d</sup> Centre for Alcohol Policy Research, La Trobe University, Melbourne, Australia

<sup>e</sup> Utrecht University, the Netherlands

<sup>f</sup> Glasgow Caledonian University, London, UK

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## ABSTRACT

In many high-income countries, the proportion of adolescents who smoke, drink, or engage in other risk behaviours has declined markedly over the past 25 years. We illustrate this behavioural shift by collating and presenting previously published data (1990–2019) on smoking, alcohol use, cannabis use, early sexual initiation and juvenile crime in Australia, England, the Netherlands, New Zealand, and the USA, also providing European averages where comparable data are available. Then we explore empirical evidence for and against hypothesised causes of these declines. Specifically, we explore whether the declines across risk behaviours can be considered 1) a ‘unitary trend’ caused by common underlying drivers; 2) separate trends with behaviour-specific causes; or 3) the result of a ‘cascade’ effect, with declines in one risk behaviour causing declines in others. We find the unitary trend hypothesis has theoretical and empirical support, and there is international evidence that decreasing unstructured face-to-face time with friends is a common underlying driver. Additionally, evidence suggests that behaviour-specific factors have played a role in the decline of tobacco smoking (e.g. decreasing adolescent approval of smoking, increasing strength of tobacco control policies) and drinking (e.g. more restrictive parental rules and attitudes toward adolescent drinking, decreasing ease of access to alcohol). Finally, declining tobacco and alcohol use may have suppressed adolescent cannabis use (and perhaps other risk behaviours), but evidence for such a cascade is equivocal. We conclude that the causal factors behind the great decline in adolescent risk behaviours are multiple. While broad contextual changes appear to have reduced the opportunities for risk behaviours in general, behaviour-specific factors have also played an important role in smoking and drinking declines, and ‘knock-on’ effect from these behavioural domains to others are possible. Many hypothesised explanations remain to be tested empirically.

## 1. Introduction

Throughout much of the developed world, adolescent smoking, drinking, underage sex, and juvenile crime declined dramatically between the late 1990s and around 2015 (Ball et al., 2018; Pape et al., 2018; Twenge, 2017), yet the reasons for this widespread and long-term trend are not well understood. Better understanding of what caused declines in risk behaviours is vital if we are to predict and influence future trends. Trends for some risk behaviours plateaued or even began to reverse in some countries in the 2015–2019 period, adding urgency to

the need to understand what drives teen trends and apply the lessons to preventive efforts.

In this narrative review we document this shift in adolescent behaviour and discuss evidence to date on possible causes. Potential causes are explored within three overarching hypotheses which are not mutually exclusive: 1) declines represent a ‘unitary trend’ with common underlying causes resulting in simultaneous declines in many risk behaviours; 2) declines in various risk behaviours are separate, caused by behaviour-specific factors; and 3) declines in certain risk behaviours have caused declines in others (the ‘cascade’ hypothesis).

\* Corresponding author. Department of Public Health University of Otago, PO Box 7343, Wellington South, 6242, New Zealand.

E-mail address: [jude.ball@otago.ac.nz](mailto:jude.ball@otago.ac.nz) (J. Ball).

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To contextualise the changes in risk behaviours it is important to consider how the lives of adolescents have changed over recent decades within the economic, social, cultural and technological spaces they inhabit. Contextual changes over time in the labour market, regulatory environment, school environment, parenting norms, youth culture, and information technology, for example, have undoubtedly shaped the experiences of young people as well as their worldviews, attitudes and behaviours. The idea that young people’s development and behaviour are influenced by the contexts in which they grow up has been termed the social ecological approach (Brofenbrenner, 1977; Sallis et al., 2008). This approach provides an overarching theoretical framework within which we explore the recent shift in adolescent behaviour and possible causes.

This review has two parts. In the first, we present an overview of recent international trends in substance use, sexual behaviour and juvenile crime, highlighting long-term changes. In the second we discuss the plausibility of selected causal hypotheses for the simultaneous decline in multiple risk behaviours, drawing on theory and empirical evidence to date.

## 2. Section 1: trends in adolescent risk behaviours

Here we describe trends in cigarette smoking, alcohol use, cannabis use, sexual behaviour and juvenile crime, with a primary focus on adolescents aged 12–16 years. Our indicator countries are Australia, England, the Netherlands, New Zealand (NZ), and USA and we provide European averages, where available. This overview is based on previously published repeat cross-sectional data from major cross-national and nationally representative surveys detailed in Supplementary Table 1. Consistent question wording in each of these surveys makes within-country comparisons across time valid. While the wording of questionnaire items and the age-range of survey participants differs between survey instruments, our purpose here is to examine international trends rather than make cross-national comparisons of prevalence

at any point in time.

### 2.1. Cigarette smoking

In most high-income countries, adolescent smoking prevalence rose in the 1990s, peaked in 1996–99, and declined rapidly thereafter (Fig. 1). By 2019 daily smoking had declined by over 80% and reached very low levels in all indicator countries. In Europe (based on a 30-country average) daily smoking in 15–16-year-olds declined from a peak of 26% in 1999 to 10% in 2019, with especially strong declines in Nordic countries (ESPAD Group, 2020).

### 2.2. Alcohol use

Almost all high-income countries observed declines in the prevalence and frequency of adolescent drinking between 2000 and 2015 (de Looze et al., 2015a; Kraus et al., 2018; Vashishtha et al., 2020). Declines in the prevalence of past month alcohol use are illustrated in Fig. 2. Notably, many countries have observed plateaux or increases from about 2014/15.

Declines in weekly drinking are even more marked than for past month drinking, suggesting that adolescents who do drink are doing so less frequently. For example, in England, prevalence of past week drinking in 11–15 year olds declined by two thirds from 25% in 2003 to a low of 8% in 2014 (NHS Digital, 2021). Similar declines have been observed in Australia (Guerin and White, 2020), the Netherlands (Inchley et al., 2020), and NZ (Adolescent Health Research Group, 2013).

Prevalence of heavy episodic drinking (HED) declined markedly from 2000 in the USA, with declines beginning a few years later in Australia, NZ and the Netherlands (Fig. 3). Declines ranged from around 40% in the Netherlands and NZ to approximately 55% in England and Australia, and 65% in the USA. Declines in HED have slowed or stalled in the period from 2014/15 (Fig. 3).

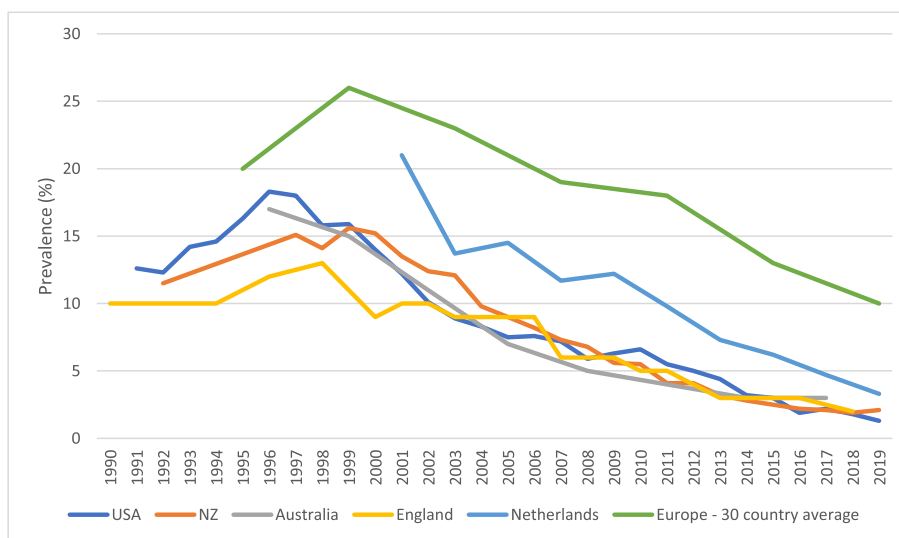
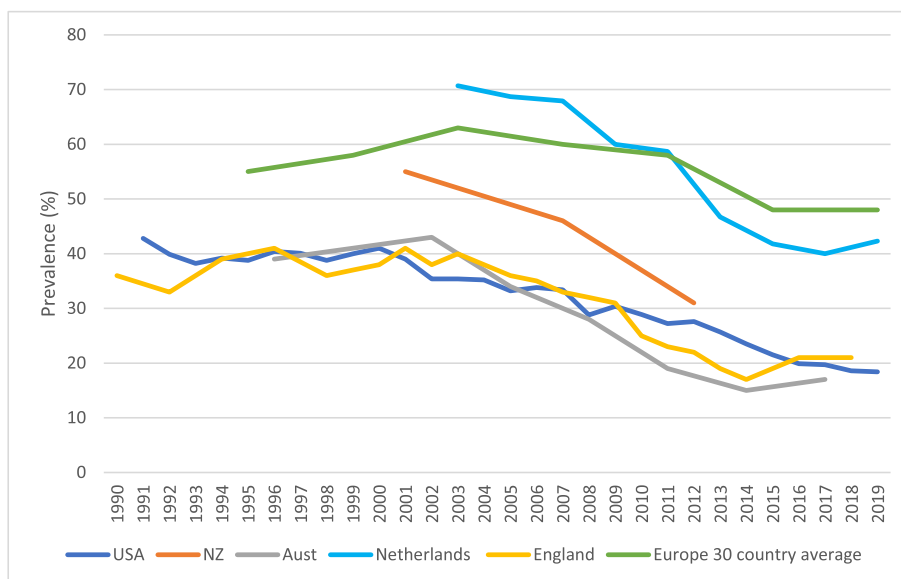
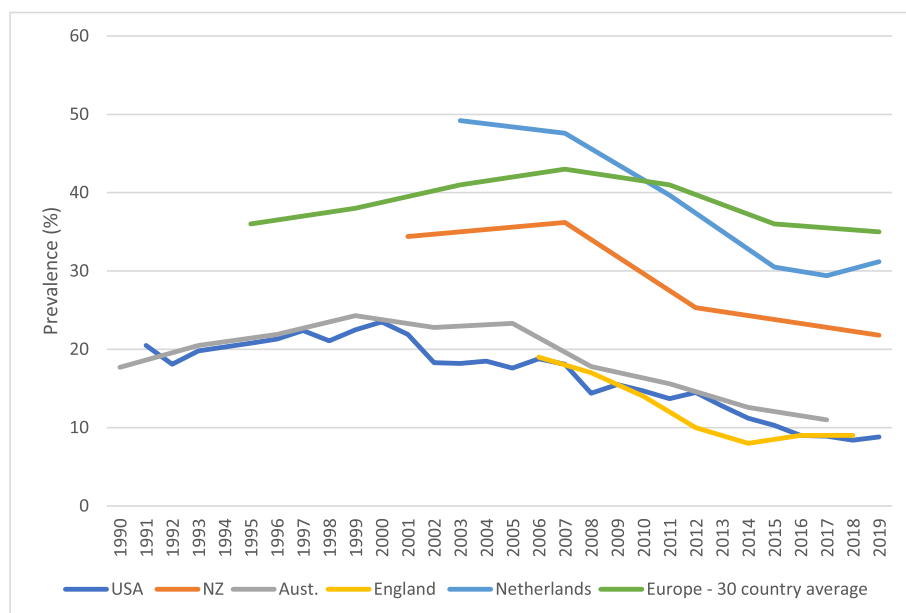


Fig. 1. Prevalence of daily/weekly cigarette smoking, 1990–2019. USA: MTF survey, 10th Grade, 15–16 years, daily smoking. NZ: ASH Year 10 Snapshot and precursor national surveys, 14–15 years, daily smoking. Australia: ASSAD survey: 12–15 years, past week smoking. England: SDD survey, 11–15 years, smoking weekly or more often. Netherlands: HBSC & ESPAD surveys, 15 years, daily smoking. Europe 30 country average: ESPAD survey, 15–16 years, daily smoking.



**Fig. 2.** Prevalence of past month alcohol use, 1990–2019. USA: MTF, Grade 10, 15–16 years, past 30 days. NZ: Youth 2000, 13–18 years, monthly or more often. Australia: ASSAD, 12–15 years, past month. England: SDD, 11–15 years, past month. Netherlands: HBSC & ESPAD surveys, 15 years, past month. Europe 30 country average: ESPAD survey, 15–16 years, past month.



**Fig. 3.** Prevalence of recent heavy episodic drinking, 1990–2019. USA: MTF, 10th grade, 15–16 years, ‘been drunk’ in past 30 days. NZ: Youth2000 13–18 years, binge drinking (5+ drinks) in last 4 weeks. Australia: ASAAD, 16–17 years, binge drinking (5+ drinks) in past 7 days. England: SDD, 11–15 years, been drunk in last four weeks. Netherlands: HBSC/ESPAD, 15 years, heavy episodic drinking in past 30 days. Europe 30 country average: ESPAD Survey, 15–16 years, heavy episodic drinking in past 30 days.

The decline in HED is less consistent internationally than the decline in drinking frequency, with HED increasing or remaining stable in parts of Eastern Europe and countries with historically low levels of adolescent HED (ESPAD Group, 2020). It should be noted that declines in HED may largely reflect changes in the prevalence and frequency of alcohol use rather than a change in the typical style of adolescent drinking. For example, in the Netherlands, HED in past month drinkers (as opposed to HED in the total 15 year old population, as shown in the graph above) has been relatively stable over the 2003–2019 period (Rombouts et al., 2019).

### 2.3. Cannabis use

Cannabis is the most used illicit drug among adolescents. Significant declines in use were observed from the late 1990s/early 2000s to 2008

in the USA, NZ, Australia and the Netherlands (Fig. 4). From 2008, cannabis trends have been inconsistent but remained below late-1990s levels in all indicator countries. Across Europe cannabis use has decreased in some countries but increased or fluctuated in others, such that the 30-country European average has remained relatively stable over the past two decades.

### 2.4. Sexual initiation

In the USA, NZ, England and the Netherlands, adolescents are starting their sex lives later than the teens of the 1990s, with a marked drop in the proportion of adolescents reporting lifetime experience of sexual intercourse (Fig. 5).

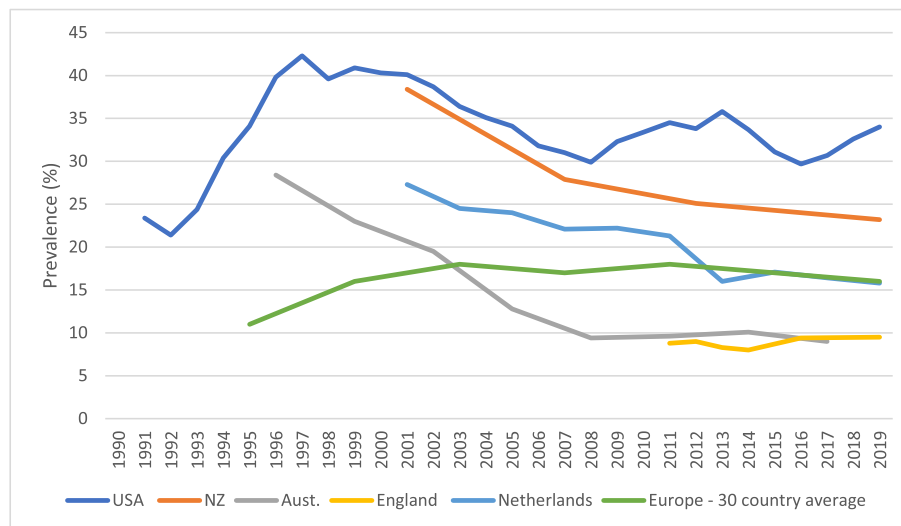


Fig. 4. Prevalence of lifetime cannabis use, 1990–2019. USA: MTF - 10th Grade (15–16 years), lifetime prevalence. Australia: ASAAD - 12–15 years, lifetime prevalence. NZ: Youth2000 13–18 years, lifetime prevalence. England: SDD - 11–15 years, lifetime prevalence. Netherlands: HBSC/ESPAD, 15 years, lifetime prevalence. Europe 30 country average: ESPAD, 15–16 years, lifetime prevalence.

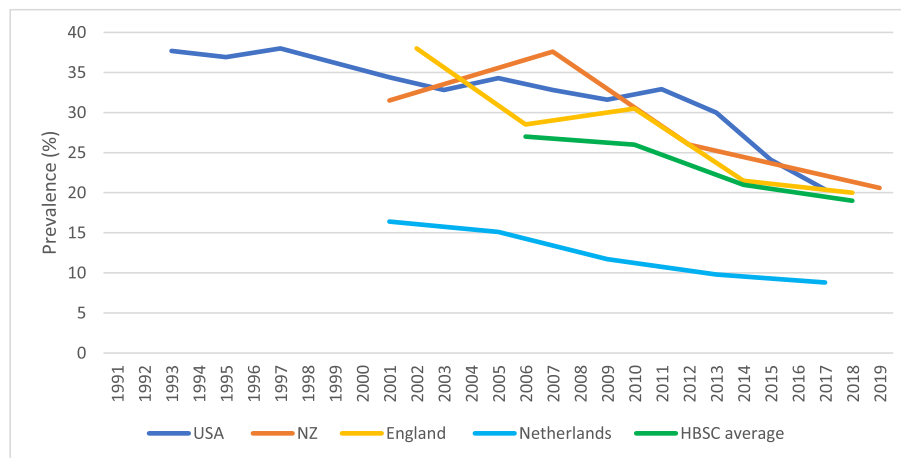


Fig. 5. Ever had sexual intercourse. USA: YRBS, 9th Grade, 14–15 years. NZ: Youth2000 13–18 years. England: HBSC, 15 years (average of boys and girls). Netherlands: HBSC, 15 years. Australia: Nationally representative trend data not available. HBSC average, 15 years.

2.5. Juvenile crime

Rates of juvenile offending have declined by between 40% and 80% from recent peaks in the USA (Puzzanchera, 2021), NZ (Ministry of Justice, 2020), Australia (Australian Bureau of Statistics, 2021), the Netherlands (Berghuis and Waard, 2017) and England (Bateman, 2020; Ministry of Justice, 2021). Most of these countries have recorded particularly steep decreases since about 2008.

2.6. Section 1 discussion: patterns and outliers

Across high income countries, declines in prevalence of smoking, alcohol use, and juvenile crime have been almost universal, whereas patterns for binge drinking and cannabis use are less consistent internationally. Behavioural shifts were most pronounced, and occurred earliest, in English-speaking and northern-European countries (e.g. USA, Australia, Iceland, Sweden). In much of Eastern Europe, declines lagged by 5–10 years (ESPAD Group, 2020). Some countries with historically low levels of adolescent binge drinking (e.g. Italy, Eastern Europe) or cannabis use (e.g. Eastern Europe) have seen increases, suggesting that an international convergence of youth lifestyles may be another

long-term global trend (Kuntsche et al., 2011; van der Wilk and Jansen, 2005).

Declines in risk behaviours were more pronounced among younger than older adolescents. This suggests the possibility of increasing age of initiation, rather than declines as such. This possibility is discussed further in Section 2.

Risk behaviours are often strongly patterned by gender, socioeconomic position, and ethnicity. A striking feature of recent declines is that they have occurred almost simultaneously across demographic groups (although not always evenly) (Johnston et al., 2018; Livingston, 2014; Matthews and Minton, 2018). Such a widespread decline is suggestive of underlying environmental change(s), rather than changes in social norms or risk perceptions which tend to ‘diffuse’ gradually from one group to another (Zapata-Moya et al., 2019).

Notably, trends for adolescents are distinct from adult trends. For example, decreases in adolescent drinking coincided with increases in hazardous drinking among middle-aged adults in the USA, Australia and elsewhere (Grucza et al., 2018; Livingston et al., 2016). Cannabis trends have also diverged between adults and adolescents in some countries including NZ and the USA, where adult use has increased markedly in recent years (Kerr et al., 2018; Ministry of Health, 2020). The overall

crime decline since the 1990s has been driven by steep declines in youth offending relative to adult offending (Matthews and Minton, 2018; Puzanchera, 2021), and crime participation has decreased in successive birth cohorts (Berghuis and Waard, 2017; Sivertsson et al., 2019).

E-cigarette use/vaping is a behaviour that bucks the general trend towards lower substance use in adolescents. Prevalence of vaping among adolescents has risen sharply since around 2016, particularly in minimally or belatedly regulated markets such as the USA and NZ (ASH (NZ), 2022; Cole et al., 2021; ESPAD Group, 2020; Johnston et al., 2020). This suggests that young people remain interested in novel substance use experiences, particularly when products are marketed to youth as ‘cool’ lifestyle accessories (Hoek and Freeman, 2019).

### 3. Section 2: possible causes of the decline in adolescent risk behaviours

This section provides an overview of empirical support for (and against) potential causes of the decline in adolescent risk behaviours, organised under three overarching hypotheses: the unitary trend hypothesis, the separate trend hypothesis, and the cascade hypothesis. Within each of these overarching hypotheses, the scientific literature has suggested a myriad of specific hypotheses explaining the decline in risk behaviours. This review includes only those specific hypotheses that have been tested empirically, or are deemed by the authors to be salient either because they are frequently mentioned in the literature on risk behaviour decline or because they are theoretically promising for

**Table 1**  
Direct empirical evidence for (✓) and against (×) unitary trend hypotheses for the decline in adolescent risk behaviour<sup>a,b</sup>.

Hypothesis	Cigarette smoking	Alcohol use	Cannabis use	Sexual initiation	Juvenile crime
Decline in a latent ‘externalising-like’ trait or general propensity to engage in risk behaviours	✓ Gruca et al., 2017 (USA); Borodovsky et al., 2019 (USA)	✓ Gruca et al., 2017 (USA); Borodovsky et al., 2019 (USA)	✓ Gruca et al., 2017 (USA); Borodovsky et al., 2019 (USA)	✓ Borodovsky et al., 2019 (USA)	✓ Gruca et al., 2017 (USA); Borodovsky et al., 2019 (USA)
Decreased unstructured face-to-face socialising with friends	✓ de Looze et al., 2019 (26 mainly European countries); Borodovsky et al., 2021 (USA) × Ball (2019) (NZ)	✓ de Looze et al., 2019 (Canada, Israel and 24 European countries); Borodovsky et al., 2021 (USA); Rossow et al., 2020 (Norway); Kim et al., 2019 (Sweden); Chomynová and Kázmér, 2019 (Czech Republic) × Ball, 2019 (NZ); Raitasalo et al., 2020 (Finland, Norway, Sweden)	✓ de Looze et al., 2019 (Canada, Israel and 24 European countries); Borodovsky et al., 2021 (USA) × Ball, 2019 (NZ)	× Ball, 2019 (NZ)	✓ Borodovsky et al., 2021 (USA)
Increased electronic communication/internet/computer use	× de Looze et al., 2019 (26 mainly European countries); Ball et al., 2021 (NZ)	× de Looze et al., 2019 (26 mainly European countries); Vashishtha et al., 2021 (33 European countries)	× de Looze et al., 2019 (26 mainly European countries)		
Increased computer gaming		× Halkjelsvik et al., 2021 (42 European countries)			
Increased parental monitoring/control	× Ball, 2019 (NZ)	× Toumbourou et al., 2018 (Australia); Larm et al., 2018 (Sweden); Ball et al., 2020 (NZ); Kim et al., 2019 (Sweden); Vashishtha et al., 2022 (30 European countries). ✓ Raitasalo et al., 2018 (Finland); Raitasalo et al., 2020 (Finland, Norway, Sweden).	× Ball, 2019 (NZ)	× Ball, 2019 (NZ)	
Increased family connectedness/support	× Ball, 2019 (NZ)	× Toumbourou et al., 2018 (Australia); Ball, 2019 (NZ); Vashishtha et al., 2022 (30 European countries)	× Ball, 2019 (NZ)	× Ball, 2019 (NZ)	
Changing age norms/later initiation of risk behaviours	✓ Keyes et al., 2018 (USA); Ball, 2019 (NZ); Livingston et al., 2020 (Australia)	✓ Keyes et al., 2018 (USA); Ball, 2019 (NZ); Livingston et al., 2020 (Australia)	✓ Keyes et al., 2018 (USA); Ball, 2019 (NZ); Livingston et al., 2020 (Australia)	✓ Finer and Philbin, 2014 (USA); Ball, 2019 (NZ)	
Increased school connectedness/engagement	× Ball, 2019 (NZ)	× Toumbourou et al., 2018 (Australia); Ball, 2019 (NZ); Stevely et al., 2022 (37 mainly European countries)✓ Rossow et al., 2020 (Norway)	× Ball, 2019 (NZ)	× Ball, 2019 (NZ)	
Increased schoolwork pressure		✓ Stevely et al., 2022 (37 mainly European countries)			
Decreased adolescent employment/income	× Ball, 2019 (NZ)	× Ball, 2019 (NZ)	× Ball, 2019 (NZ)	× Ball, 2019 (NZ)	

<sup>a</sup> The studies referred to in this table empirically tested the hypotheses stipulated. Descriptive studies, qualitative studies, and studies discussing hypotheses without empirically testing them are not included in the table; they are included in the main text.

<sup>b</sup> The country in which the research was undertaken is stated in parentheses.

**Table 2**  
Direct empirical evidence for (✓) and against (✗) behaviour-specific hypotheses for the decline in adolescent risk behaviours<sup>a,b,c</sup>.

Hypothesis	Cigarette smoking	Alcohol use	Cannabis use	Sexual initiation	Juvenile crime
<b>Strength of tobacco/alcohol control policies</b>	✓ White 2011 (Australia); White 2015 (Australia); Farrelly, 2013; Hawkins, 2016 (USA); De Looze et al., 2022 (36 mainly European countries)	✓ White, 2018 (Australia)			
<b>Decreased adolescent approval of smoking/drinking.</b>	✓ Ball, 2019 (NZ)	✓ Ball, 2020 (NZ)			
<b>Decreased ease of access</b>		✓ Raitasalo, 2018 (Finland); Toumbourou, 2018 (Australia)			
<b>More restrictive parental rules specific to alcohol use; increased parental disapproval of alcohol use.</b>		✓ de Looze, 2014 (Netherlands); de Looze, 2017 (Netherlands); Toumbourou, 2018 (Australia)			
<b>Decreased tobacco/alcohol use by parents</b>	✗ Ball, 2018 (NZ)	✗ Ball, 2019 (NZ); Rossow, 2020 (Norway)			

<sup>a</sup> The studies referred to in this table empirically tested the hypotheses stipulated. Descriptive studies and studies discussing hypotheses without empirically testing them are not included in the table; they are included in the main text

<sup>b</sup> Grey shading indicates that the hypothesis is not relevant to this behavioural domain

<sup>c</sup> The country in which the research was undertaken is stated in parentheses

explaining simultaneous declines in multiple risk behaviours. In collating evidence, we have focused primarily on recent quantitative, nationally representative studies specifically aimed at testing hypotheses for risk behaviour decline, presented in [Tables 1 and 2](#). These studies go beyond identifying a temporal coincidence of trends, and use rigorous methods to test associations between putative causes and declining trends. Since such studies are not numerous, we have also drawn on other evidence sources in the text (e.g. qualitative evidence, and studies that do not meet the inclusion criteria above) where these help to evaluate the plausibility of causal hypotheses.

### 3.1. Unitary trend hypothesis

The idea that observed declines in adolescent risk behaviours are linked and have common underlying causes – the unitary trend hypothesis – has both theoretical and empirical support. Studies that have empirically tested this hypothesis using rigorous quantitative methods are summarised in [Table 1](#) and discussed below.

In line with Problem Behaviour Theory ([Jessor, 1991](#)), two US studies demonstrated that various types of substance use, delinquent behaviours and sexual behaviours not only cluster; the observed declined over time in these behaviours are also linked ([Borodovsky et al., 2019](#); [Grucza et al., 2017](#)). As the clustering of risk behaviours is

partially due to underlying risk and protective factors that influence risk behaviours of all kinds ([de Looze et al., 2015b](#); [Jessor, 1991](#)) it follows that changes in these underlying factors may result in changes in the clustered risk behaviours. If the decline in risk behaviours is indeed a unitary trend, then what are the underlying drivers of that trend? Selected hypotheses are discussed below with reference to supporting (and opposing) evidence.

#### 3.1.1. Less unstructured in-person interaction with friends

Unstructured time with friends is strongly associated with substance use and delinquency ([Greene and Banerjee, 2009](#); [Osgood and Anderson, 2004](#)). If such unstructured in-person socialising decreases, opportunities for smoking, drinking, drug use, sexual activity and juvenile crime would also be expected to decrease.

There is clear empirical evidence of a decline in face-to-face time with friends since the 1990s in several countries, including unstructured socialising (e.g. parties). Although in-person socialising has declined in people of all ages ([Patulny and Seaman, 2016](#)), the decline has been most pronounced in children, adolescents, and young adults ([Twenge and Spitzberg, 2020](#); [Twenge et al., 2019](#); [Vilhelmson et al., 2017](#)). For example, nearly 80% of US 10th graders (15–16 years) reported going to parties at least once a month during the 1990s, but by 2017 this had fallen to about 57% ([Twenge et al., 2019](#)).

Declines in face-to-face socialising have been empirically linked to declines in adolescent risk behaviour in both North America and Europe. Using latent factor mediation analysis Borodovsky et al. (2021) found that adolescent risk behaviours and unstructured in-person socialising both fell by about 30% in the USA between 1999 and 2017, with declines in unstructured in-person socialising accounting for approximately 86% of declines in risk behaviours (Borodovsky et al., 2021). Several European studies and two cross-national studies have also empirically linked declines in face-to-face socialising with declining substance use (Chomynová and Kázmér, 2019; de Looze et al., 2019; Kim et al., 2019; Rossow et al., 2020).

While there appears to be strong evidence that a decline in unstructured in face-to-face socialising is an underlying factor in declines of risk behaviour, two studies suggest this explanation may not hold in Scandinavia or NZ, due to increases in face-to-face contact with friends and/or lack of association with substance use trends (Ball, 2019; Raitasalo et al., 2020). Moreover, the question of why young people are spending less unstructured time with their friends also remains unanswered. Other possible drivers of the unitary trend are discussed below and some help to answer this question.

### 3.1.2. Increasing internet use

A popular hypothesis for the decline in both face-to-face socialising and risk behaviour is displacement by electronic media communication, gaming, or internet use more generally (Kraus et al., 2019; Pennay et al., 2015). Online activities may have taken the place of 'traditional' risk behaviours, either in terms of fulfilling young people's desire for excitement (Berghuis and Waard, 2017; Halkjelsvik et al., 2021) or in terms of time use. Scholars have asked: "Are [adolescents] too busy with their many media pursuits to have time left over for substance use, unprotected sex, criminal activity, or risky driving?" (Arnett, 2018) p92.

If the displacement hypothesis (outlined above) was correct, then we would expect heavy internet users to be less engaged in risk behaviours than peers with more time on their hands. In fact, the opposite is true. Heavy internet users (particularly social media users) are *more* likely to smoke and drink than those who rarely use the internet (Ball et al., 2021; Brunborg and Burdzovic, 2019; de Looze et al., 2019; Iannotti et al., 2009; Koivusilta et al., 2005; Mu et al., 2015; Ng Fat et al., 2021; Vanucci et al., 2020; Vashishtha et al., 2021). Similarly, some studies have found a positive association between computer gaming and substance use (Halkjelsvik et al., 2021; Strizek et al., 2020; Van Rooij et al., 2014), although others have found no association (Ball et al., 2021; Kaur et al., 2020). One study investigated whether a rise in computer gaming was empirically linked to declining adolescent binge drinking in six Nordic countries, and found no association (Halkjelsvik et al., 2021).

Positive associations between internet use and risk behaviours challenge the idea that risk behaviours and internet use/gaming are competing behaviours, with one displacing the other at the individual level. Rather, there is evidence that digital communication typically facilitates or complements in-person socialising among young people (Kuntsche et al., 2009).

A further possibility is that displacement has occurred at the population rather than at the individual level. That is, the digital revolution may have changed youth culture and norms such that face-to-face gatherings of friends are less frequent (and thereby opportunities for risk behaviours have reduced) regardless of an individual's personal level of internet use. This possibility has been tested - and rejected - by two cross-national studies: one found no relationship between trends in electronic media communication and substance use at the population level in a study of 25 mainly European countries (M. de Looze et al., 2019); the other found no relationship between within-country changes in computer use and regular drinking 33 European countries (Vashishtha et al., 2021).

### 3.1.3. General parenting factors

It has been documented that parents are spending more time with

their children (Dotti Sani and Treas, 2016); there is decreasing use of corporal punishment (D'Souza et al., 2016; Finkelhor et al., 2019) and increasing parental monitoring (as perceived by adolescents) over the past 20 years (Collishaw et al., 2012; Kristjansson et al., 2016; Li et al., 2018; van der Laan et al., 2019). The demographic profile of parents has also changed markedly, with parents becoming older and better educated. Fathers are typically more involved with parenting, and in many countries the proportion of adolescents reporting they feel emotionally close to both parents has increased (Brooks et al., 2015; Dotti Sani and Treas, 2016). Qualitative research suggests that authoritarian parenting has become less common, and that parents typically discuss behavioural limits with their offspring rather than 'laying down the law' (Davids et al., 2017; Scheffels et al., 2020). These changes could plausibly result in adolescents spending more time with family (rather than friends) during the adolescent years, being less rebellious and more compliant with parental expectations, resulting in less risk behaviour (Davids et al., 2017).

This hypothesis has face validity and there is clear evidence of changing parenting norms. However, evidence for the impact of these parenting changes on adolescent risk behaviour is mixed. Many changes have been gradual, beginning well before 2000, and therefore they provide the background to the rise in risk behaviours observed in the 1990s (e.g. see Collishaw et al., 2012) as well as the dramatic declines seen over the past 20 years. There is evidence that parental monitoring has increased in many countries since 2000, but evidence is mixed about whether this has contributed to the decline in risk behaviour (Ball, 2019; Ball et al., 2020; Larm et al., 2018; Raitasalo et al., 2018, 2020; Toumbourou et al., 2018). Furthermore, increased family connectedness was not found to be a significant factor in risk behaviour decline in NZ and Australian studies (Ball, 2019; Toumbourou et al., 2018). A study of 30 European countries concluded that changes in parental control and support were not associated with declining adolescent drinking, within or between countries (Vashishtha et al., 2022).

### 3.1.4. Delayed initiation

Many of the markers of transition to adulthood (e.g. gaining a drivers licence, getting a job, leaving home, getting married) are occurring later in life for recent cohorts (OECD, 2016; Twenge, 2017). Some have suggested that initiation of substance use and sexual behaviour have shifted alongside other developmental milestones; in other words, adolescents are growing up slower (Twenge, 2017).

There is certainly evidence for delayed uptake of risk behaviours i.e. young people are drinking, smoking, using cannabis and having sex for the first time at an older age than teens of the 1990s (Ball, 2019; Finer and Philbin, 2014; Keyes et al., 2018; Livingston et al., 2020). Yet the question of why age of initiation has increased remains open. It is not inevitable that age of risk behaviour initiation will shift alongside other developmental milestones. After all, the extension of adolescence as a social-developmental stage began in the late 1980s and early 90s with young people staying in school longer, largely as a result of a collapse in the youth job market (France, 2016). At that time, delayed school leaving coincided with *increasing* substance use and sexual behaviour at younger ages (Degenhardt et al., 2000; Finer and Philbin, 2014), as predicted by Moffitt's 'maturity gap' theory (Moffitt, 2006). Moffitt proposes that the temporal gap between puberty and achievement of adult roles (e.g. paid work, parenthood) in late modernity leads to 'role-lessness' in young people, and a desire to assert autonomy via rule-breaking and 'adult-like' behaviours such as smoking, drinking and sex. Why then, with markers of adulthood occurring later and later in high income countries, are young people now delaying initiation into substance use and sexual activity? Twenge proposes that the symbolic meaning of adulthood may have changed, now representing to young people loss of security and 'the end of all fun' (p46), and hence adolescents are in less hurry to grow up (Twenge, 2017). Rising age of initiation since 2000 may also be linked to other changes discussed above (e.g. parenting changes) and below (e.g. increasing awareness of



health risks associated with alcohol and tobacco use), but further research is needed.

Research shows reduced propensity for risk behaviours is sustained into older adolescence and early adulthood in some countries but not in others. For example, Australia and Denmark have observed marked declines in young adult alcohol use in recent years. In contrast, in the Netherlands and USA young drinkers have largely 'caught up' with the drinking habits of previous generations by early adulthood (Callinan et al., 2020; Grucza et al., 2018; Livingston et al., 2022; Livingston and Vashishtha, 2019). The former pattern suggests an ongoing change in the social position of alcohol in younger generations, whereas the latter implies external constraints on young people (e.g. increased enforcement of minimum age laws, stricter parental controls) or a change in the age that drinking is seen as acceptable. Again, further research is needed.

### 3.1.5. Pressure to succeed, increased school engagement

During the 20th century, each generation was materially better off than their parents, but today's youth cannot take even basic economic wellbeing for granted (France, 2016; Tosun et al., 2018). Some scholars have suggested that growing intergenerational wealth inequality and the precarious job market have made young people more future-orientated and less carefree than previous generations (Janssen et al., 2018; Lessof et al., 2016). This may help to explain declining risk behaviours, since future orientation is associated with health promoting behaviour (Whitehead et al., 2015).

This hypothesis is supported by several strands of evidence. Qualitative research indicates some young people see drinking (and a 'party lifestyle' more generally) as incompatible with their academic, sporting or career ambitions (Caluzzi et al., 2021b; Scheffels et al., 2020; Törrönen et al., 2019). There is also evidence of an increase in schoolwork pressure in some European countries since about 2009 (Cosma et al., 2020; de Looze et al., 2020). This aligns with a US time use study that showed 15–17 year olds spent twice as much time on homework in 2019 than their mid-1990s counterparts (Livingston, 2019).

A recent study of 37 mainly European countries has demonstrated an empirical link between increasing schoolwork pressure and declining alcohol consumption (Stevely et al., 2022). Similarly, a Norwegian study found increased school conscientiousness (i.e. increased time spent on homework, decreased truancy, decreased school misconduct) helped to explain a decline in adolescent alcohol intoxication in that country (Rossow et al., 2020). In both studies, school factors were a minor contributor, explaining less than 20% of the decline in youth drinking overall. However, NZ and Australian studies found no significant association between school engagement and declining substance use (Ball, 2019; Toumbourou et al., 2018).

### 3.1.6. Decreased affordability of risk behaviours

It has been suggested that the collapse of the youth job market and, more recently, the global financial crisis (France, 2016) have reduced adolescents' disposable income. In combination with increasing prices, this may have reduced the affordability of cigarettes, alcohol, drugs and a risk-taking lifestyle more generally.

In countries where secondary school students have traditionally had part-time jobs (e.g. the USA and NZ) the proportion employed has indeed dropped markedly since 2000 (Adolescent Health Research Group, 2013; Twenge, 2017), and tax increases have made tobacco less affordable in most high-income countries (He et al., 2018). However, a NZ study found that declining employment had contributed little, if at all, to declining substance use and sexual activity in adolescents from 2001 to 2012 (Ball, 2019). A Finnish study also rejected this hypothesis, finding that the global financial crisis had not negatively impacted the disposable income of 14-year-olds (Lintonen and Nevalainen, 2017). Furthermore, the affordability of alcohol has actually increased in many countries over the study period (Blecher et al., 2018; Nelson, 2014). Therefore, an overall decline in affordability does not appear explain

linked trends in adolescent risk behaviours.

### 3.1.7. 'Healthy' is the new 'cool'

Some scholars have proposed that the decline in risk behaviours may be due to a shift in youth culture towards healthy lifestyles becoming fashionable (Kraus et al., 2019). This proposition is supported by qualitative research findings that identify a desire to be healthy as a key reason given by young people who abstain from drinking, or drink lightly (Caluzzi et al., 2021a; Pennay et al., 2019; Törrönen et al., 2019).

However, if increasing health consciousness was driving youth trends at the population level, we would also expect to see adolescent fruit and vegetable intake and physical activity increasing alongside changes in substance use. In fact, although consumption of carbonated drinks has decreased in most countries (OECD & European Union, 2000), most measures of nutrition and physical activity show little or no improvement since 2000. Adolescent obesity has increased or remained at high levels in most countries, and the proportion meeting fruit and vegetable recommendations has not improved (Ahluwalia et al., 2015; Lange et al., 2021; OECD & European Union, 2000). So, this explanation does not appear to explain population trends. Furthermore, the desire to be healthy and attractive does not explain decreasing sexual activity among young people, or a decline in juvenile crime.

### 3.1.8. Other possible causes for declines in risk behaviours of all kinds

Further ideas have been put forward as possible explanations for declining risk behaviours in general. A selection of promising, but largely untested, ideas are mentioned briefly below.

### 3.1.9. Greater risk awareness

Today's teenagers have grown up in a risk-averse society (Beck, 1992; Gill, 2007), with safety admonitions part of their childhoods. "Activities and experiences that previous generations of children enjoyed without a second thought [e.g. walking to school unaccompanied, playing outdoors in the local neighbourhood] have been relabelled as troubling or dangerous, while adults who still permit them are branded as irresponsible" (Gill, 2007). An increasingly risk-averse society, combined with scientific breakthroughs about the impact of alcohol and other drugs on adolescent brain development (Winters and Arria, 2011), could help to explain changes in parenting norms (e.g. increased monitoring), less unstructured time with friends in early adolescence, and later initiation of risk behaviours due to delayed independence. However, links between these factors and trends in risk behaviours have not been explored.

### 3.1.10. Reduced childhood trauma/maltreatment

Experience of childhood trauma or maltreatment is a key risk factor for poor outcomes in adolescence including substance misuse, sexual risk taking, and juvenile crime (Proctor et al., 2017; Shonkoff et al., 2012). There is international evidence of declining rates of child physical and sexual abuse from the early 1990s (Clark et al., 2013; Degli Esposti et al., 2019; Rezey, 2017) which could plausibly help to explain lower rates of risk behaviour in subsequent years. This is an area for future research.

### 3.1.11. Exclusion of young people from public space

In the late 20th century, gatherings of adolescents (especially those too young to go to pubs or bars) often occurred in public places such as streets, parks, and beaches. In some countries including the US, UK, Australia and NZ, such gatherings have been seen as a threat to public order, and policy and urban design measures have increasingly been used to deter young people from congregating in public. Such measures include 'anti-social behaviour orders' introduced in England and Wales in 2003, the Mosquito (an ultrasonic device emitting an aversive noise that can only be heard by young people), liquor bans and youth curfews for example (Crawford, 2009; Little, 2015; Webb et al., 2004; R. White, 1998). Such measures may have contributed to a decline in unstructured

socialising among teens and thus a decline in adolescent risk behaviours, however, this hypothesis remains to be tested.

### 3.1.12. Pharmacological treatment for childhood behavioural disorders

Another hypothesis is that increasing use of stimulant medication (e.g. Ritalin) has reduced risk behaviours by reducing behavioural problems in children and adolescents (Finkelhor and Johnson, 2017; Grucza et al., 2017). There is evidence for a causal relationship between stimulant medication and reduced disruptive and aggressive behaviours at the individual level (Pringsheim et al., 2015), though whether this factor could help to account for population-level trends in risk behaviours is not clear.

### 3.1.13. Summary: evidence for and against the unitary trend hypothesis

Both theory and empirical evidence support the idea that declines in risk behaviours are linked. For various reasons, young people in most high-income countries socialise in person less frequently than they did 20 years ago, and this has reduced opportunities to engage in risk behaviours of all types. Contributing factors such as changes in parenting norms, greater economic insecurity, increased school pressure, and greater risk awareness are plausible, but further research is needed to understand the inter-relationships between and relative importance of these factors.

Convincing as it is, the Unitary Trend hypothesis does not appear to tell the whole story. For example, in the USA, declines in cannabis use are slightly lower, and declines in tobacco use slightly higher, than would be expected based on the general decline in risk behaviours (Borodovsky et al., 2019). Furthermore, although the declines in various risk behaviours were almost simultaneous in the USA, other countries show more variation, e.g. the peak and subsequent decline in adolescent smoking occurred 4–6 years before the peak in binge drinking in England, NZ and Australia. This lag is suggestive of separate behaviour-specific triggers rather than (or as well as) common drivers acting simultaneously on all behaviours. While the overall tendency to engage in risk behaviours may have declined, behaviour-specific influences may govern the magnitude and timing of trends in specific behaviours. Such influences are explored in the following section.

## 3.2. Behaviour-specific factors influencing risk behaviours

In this section, we review possible causes of declines that are specific to particular behaviours. Table 2 summarises studies that have empirically tested the impact of behaviour-specific factors on youth trends.

### 3.2.1. Cigarette smoking

3.2.1.1. *Stricter tobacco control policies and anti-smoking campaigns.* Following the rise in youth smoking in the 1990s, most governments have been active in smoking prevention. There is evidence that tobacco control action can successfully influence youth smoking at the population level. For example, studies show tobacco taxation, smoke-free air laws, and mass media campaigns have contributed to declining adolescent smoking in the USA (Carpenter and Cook, 2008; Farrelly et al., 2005, 2013; Hawkins et al., 2016) where the Master Settlement Agreement of 1998 resulted in significant investments in tobacco control in some states (Jones and Silvestri, 2010). Australian studies have also found that cigarette price increases, stronger implementation of clean indoor air policies, greater per capita tobacco control spending (White et al., 2011), and sufficiently frequent and intense anti-tobacco advertising (White et al., 2015) all contributed to declining smoking prevalence among adolescents. In addition, a European study including 36 countries found that smoke-free policies and warning labels in particular were associated with declines in adolescent smoking (de Looze et al., 2020).

3.2.1.2. *Cultural shift in acceptability of smoking among adolescents.* Denormalization of smoking in recent decades has resulted in a change in the social meaning of smoking (Chapman and Freeman, 2008). Once associated with glamour and freedom, smoking is now increasingly associated with poverty and stigma (Castaldelli-Maia et al., 2016; Robert et al., 2020).

Adolescent approval (or disapproval) of smoking can be seen as an individual-level measure of denormalization. The US MTF survey found the proportion of 10th graders who strongly disapproved of smoking increased from 72% in 1996 to 88% in 2019, and perceived harmfulness, particularly of 'light' smoking, also increased over time (Johnston et al., 2020). A NZ study found that the proportion of 13–15 year olds who reported it was OK for people their age to smoke fell from 32% in 2001 to 8% in 2012; this attitude shift was by far the most important contributing factor to the decline in smoking over that period (Ball, 2019). It is likely that anti-smoking attitudes in society and increasingly stringent tobacco control measures have reinforced each other over time to create an anti-smoking normative climate.

3.2.1.3. *Decreased tobacco use by parents.* The hypothesis that declining parental smoking contributed to the decline in adolescent smoking was tested and rejected in a NZ study. The authors found that parental smoking and adolescent exposure to second-hand smoke at home declined modestly between 2002 and 2015, but these factors were not significantly associated with the decline in adolescent smoking (Ball et al., 2018).

3.2.1.4. *Displacement by e-cigarettes.* Most of the decline in adolescent tobacco use occurred before e-cigarettes became widely available. Whether the recent rise of e-cigarette use has contributed to or hindered the ongoing decline in adolescent tobacco use is a matter of ongoing debate, and evidence is mixed (Hallingberg et al., 2020; Selya and Foxon, 2021). At the population level, there does not appear to have been an acceleration in smoking decline since e-cigarettes emerged (Fig. 1), and in most countries the rise in e-cigarette use has been substantially larger than the fall in cigarette smoking over the same period, resulting in a net increase in adolescent nicotine users (ESPAD Group, 2020).

3.2.1.5. *Summary: behaviour-specific factors for the decline in cigarette smoking.* Although it appears likely that stricter national tobacco policies have contributed significantly to the decline in adolescent smoking, it is notable that preventive strategies were broadly similar in the early 1990s (when tobacco use increased sharply among adolescents) as in the late 1990s and early 2000s (when smoking decreased sharply). Although tobacco control intensified, there was no major new preventive intervention introduced globally in the mid-to-late 1990s that could have provided the common trigger for almost simultaneous international smoking declines in countries with markedly different tobacco control settings. This suggests that changes in the social acceptability of smoking (mutually reinforced by tobacco control measures) may have been at least as important as direct policy effects (Chapman and Freeman, 2008). It seems likely that the broader factors thought to underlie declines in risk behaviours in general have reinforced and supported tobacco-specific factors, resulting in dramatic and widespread declines in youth smoking.

### 3.2.2. Alcohol use

3.2.2.1. *Stricter national alcohol policies.* Unlike tobacco, there has not been a marked increase in stringency of alcohol control policies over the past 20–25 years, internationally, (Lintonen et al., 2013; Pennay et al., 2015). Although some countries - notably countries of the former Soviet Union - have implemented evidence-based alcohol controls in recent years (World Health Organization, 2021), other populations have

experienced alcohol liberalisation. Examples include a decrease in the minimum purchase age from 20 to 18 years in NZ (implemented in 1999), reduced alcohol excise tax in Finland (2003–05) and the USA (2017), and longer opening hours for licensed premises in England and Wales (2005).

Where alcohol-control policies have been introduced or strengthened in the early 21st century, evidence suggests that impacts on adolescent drinking have been minimal, at best (Vashishtha et al., 2019). The only evidence we found in support of this hypothesis was an Australian study demonstrating that increasingly stringent alcohol control policies were associated with a decline in adolescent drinking (White et al., 2018). However, the effect size was small, and the results may reflect changing social concern about drinking (plausibly leading to both stricter policies and decreased adolescent drinking) rather than direct policy effects. The low impact detected and the similarity of youth drinking trends in countries with markedly different policy environments suggests that policy changes have not been a major driver of youth drinking decline, internationally.

**3.2.2.2. Decreased adolescent approval of drinking.** There is growing international evidence of a normalization of non-drinking among adolescents, and decreased approval of drinking. For example, in a qualitative study of 15 to 16-year-olds in Norway, students described non-drinking as the norm in their age group, and many held negative perceptions about alcohol use (Scheffels et al., 2020). In the USA the proportion of Grade 10 students (15–16 years) who disapproved of regular binge drinking increased from 68% in 2000 to 81% in 2019 (Johnston et al., 2020). Australian research found peer pressure was one of the reasons reported by 14 to 17-year-olds for reducing or ceasing alcohol use (Pennay et al., 2019). A NZ study that tested various possible contributors to the decline in adolescent binge drinking between 2001 and 2012 found decreased adolescent approval of drinking was the strongest contributing factor (Ball et al., 2020).

**3.2.2.3. Stricter alcohol-specific parenting.** In line with changing public attitudes, there is consistent evidence that alcohol-specific parenting factors have contributed to the decline in adolescent drinking. Alcohol-specific rule-setting, alcohol-specific communication between parents and children, and parental disapproval of adolescent drinking are associated with lower levels of adolescent alcohol use, and studies demonstrate increases in such factors over time (de Looze et al., 2014, 2017; Toumbourou et al., 2018). Two studies found that stricter alcohol-specific parenting partially explained declines in adolescent drinking in the Netherlands (de Looze et al., 2017) and Australia (Toumbourou et al., 2018) respectively. These findings align with Australian research showing parental supply of alcohol declined significantly between 2004 and 2013 (Kelly et al., 2016).

**3.2.2.4. Decreased ease of access.** Several studies show that the ease of obtaining alcohol (as perceived by adolescents) has decreased since 2000 (Johnston et al., 2020; Raitasalo et al., 2018; Toumbourou et al., 2018), with Finish and Australian studies empirically linking this shift to the decline in adolescent drinking (Raitasalo et al., 2018; Toumbourou et al., 2018). As parents are a major source of alcohol, decreased parental supply (discussed above) has likely contributed to decreased ease of access.

**3.2.2.5. Decreased alcohol use by parents.** It has been hypothesised that decreased modelling of drinking behaviour might explain decreasing alcohol use among adolescents (Osaki et al., 2009). This hypothesis was tested and rejected in Norwegian and NZ studies, the former finding no significant change in parental drinking (Rossow et al., 2020), and the latter finding a decline in parental drinking but no significant association with the decline in adolescent binge drinking (Ball et al., 2020).

**3.2.2.6. Increased immigration.** It has been proposed that increasing immigration from non-drinking (or low-drinking) cultures may have contributed to declining adolescent drinking in the UK and Europe (Bhattacharya, 2016). However, empirical testing in Sweden shows this is not the case (Svensson and Andersson, 2016). In a Norwegian study, an increase in the proportion of adolescents with an immigrant background was related to a reduction in HED among Norwegian adolescents, but it could only explain one-fifth of the reduction (Rogne et al., 2019). Furthermore, alcohol declines have been similar in countries with a long history of immigration and multiculturalism (e.g. Australia, NZ and the USA), providing evidence against a causal role of immigration for the international decline in adolescent alcohol use since 2000.

**3.2.2.7. Summary: behaviour-specific factors for the decline in alcohol use.** Evidence suggests changes in alcohol-specific parenting (e.g. more disapproval of adolescent drinking, less parental supply of alcohol) has been a significant driver of drinking decline among adolescents in several countries, and this may be linked to decreased ease of access to alcohol. There also appears to have been a shift in the social position of alcohol, with drinking occupying a less central role in contemporary adolescent social life, compared with twenty years ago, and adolescents increasingly disapproving of drinking.

### 3.2.3. Cannabis use

We did not identify any cannabis-specific factors that might help to explain declining use among young people. On the contrary, social attitudes to cannabis use have softened over the past 20 years, with legalisation or decriminalisation of cannabis introduced in many jurisdictions since 2000 (Chiu et al., 2022). Young people (at least in the USA) increasingly see cannabis use as harmless and socially acceptable (Miech et al., 2017). Given these changes, use of cannabis in young people would be expected to have increased.

### 3.2.4. Sexual initiation

To our knowledge there are no sexuality-specific factors that have been tested for their contribution to delayed sexual initiation in recent cohorts, however there are two untested hypotheses to mention.

Declining rates of sexual abuse victimisation (discussed in Section 2.1) could help to explain observed delays in sexual initiation since many surveys do not distinguish between consensual and non-consensual sex when asking about sexual experience. Therefore, declining prevalence of ‘ever had sexual intercourse’ may reflect declining sexual abuse/coercion in a direct way.

The emergence of online dating and ‘hookup’ apps (e.g. Tinder) and easy access to online pornography would be expected increase rather than decrease sexual activity among young people (Owens et al., 2012). However, a qualitative Dutch study suggests that the rise of digital flirting may have made young people increasingly shy and awkward about meeting potential romantic partners in real life, and could potentially help to explain delayed sexual initiation in recent cohorts (Cense, 2018).

### 3.2.5. Juvenile crime

It seems unlikely that local or national policing or justice policies could explain a decline in juvenile crime that is almost universal. A more plausible possibility is that the perception of constant visibility due to increasing electronic surveillance (e.g. CCTV cameras) and digital data collection could have reduced opportunistic criminal behaviour in adolescents (Galić et al., 2016; Kingsley, 2008). However, studies that empirically test this possibility are lacking.

A hypothesis that does have some empirical support, is the idea that societal norms around committing crime have become less permissive. A Dutch study by Berghuis and Waard (2017) reported a more punitive moral climate towards crime, along with a greater conformity to conventional social norms, with less room for unaccepted behaviour. In

addition, van der Laan et al. (2019) found that changing social-cultural attitudes toward risk behaviours over time offered an explanation for the juvenile crime drop between 2007 and 2015 in the Netherlands.

### 3.3. Cascade hypothesis

The cascade hypothesis proposes that declines in certain risk behaviours have led to declines in others due to direct or mediated causal relationships. Developmental cascade theory (Masten and Cicchetti, 2010) and the ‘gateway’ theory of causal relationships between substance use domains (Kandel, 2002) provide theoretical support for this hypothesis.

Although differences between countries exist, the decline in risk behaviours typically started with a decline in tobacco use. Tobacco may function as a gateway to using cannabis, since tobacco use typically comes first, the mode of use is similar (i.e., inhaling smoke from a cigarette/joint) and cannabis and tobacco are often used simultaneously (Belanger et al., 2011). So, it is plausible that the tobacco-specific factors discussed above may have contributed to declining cannabis use (or stable cannabis use, in the context of increasing acceptability and perceived harmlessness) via declining tobacco use. Empirical evidence shows that tobacco and cannabis use are indeed strongly associated at the individual level (Agrawal et al., 2012; Lemyre et al., 2019) and population-level trends are linked (Hublet et al., 2015).

Simultaneous use of alcohol and cannabis is also common (Yurasek et al., 2017). Therefore declining frequency of drinking occasions may also have contributed to the suppression of cannabis use by reducing opportunities for use. Relatedly, a Norwegian study (Burdzovic and Bretteville-Jensen, 2017) found that teens’ willingness to try cannabis increased substantially between 2007 and 2015, yet cannabis use opportunities (e.g. being offered cannabis) decreased, resulting in stability in lifetime cannabis use over the study period.

The hypothesis that drinking and smoking declines explain the decline in cannabis use has been tested in two US and one NZ study with consistent findings: logistic regression showed declines in cannabis use were largely or fully explained (in statistical terms) by declines in smoking and alcohol use (Ball, 2019; Fleming et al., 2016; Miech et al., 2017). However, it is important to note that these findings are also consistent with the unitary trend hypothesis (i.e. a third factor causing declines in tobacco, alcohol and cannabis use simultaneously).

Alcohol intoxication has a disinhibiting effect and is associated with criminal behaviour and sexual risk taking (Hammerton et al., 2017; Ritchwood et al., 2015). Furthermore, many young people report trying cigarettes for the first time and/or smoking more when under the influence of alcohol (Marsh et al., 2016). Therefore, we would expect a decline in alcohol use to trigger, or reinforce, declines in juvenile crime, sexual activity and tobacco use as well as cannabis use in adolescents. Longitudinal evidence shows that a decline in adolescent alcohol use can indeed result in reduced tobacco and cannabis use (Koning et al., 2020). At the population level, a NZ study used logistic regression to show that the decline in binge drinking helped to account for the decline in tobacco use during the 2007–2012 period (Ball, 2019). The same study found declines in both binge drinking and cannabis use were associated with declines in sexual activity in 13–16 year olds, whereas the decline in tobacco use was not associated with trends in sexual behaviour. Although replication in other settings is needed, and causality cannot be definitively proved, these findings are suggestive of a ‘cascade’ effect from declining alcohol and cannabis intoxication to declining sexual activity. Surprisingly, the contribution of declining drinking and drug use to declines in juvenile crime does not appear to have been tested. This is an area for future research.

In summary, although the evidence base is very limited, there is some empirical support for the cascade hypothesis with evidence that declining tobacco and alcohol use may have suppressed cannabis use, and declines in alcohol and cannabis use may have contributed to decreased sexual behaviour in adolescents. However, non-causal

explanations for the observed associations are also possible, and further evidence is needed.

## 4. Section 3: implications and unanswered questions

There have been major and unprecedented declines in the prevalence of adolescent smoking, alcohol use, and other ‘traditional’ risk behaviours in many high-income countries since the late 1990s. Reasons for this behavioural shift are not fully understood, but the causes appear to be multiple. We found considerable supporting evidence for the unitary trend theory, with growing international evidence that decreasing unstructured in-person socialising with friends is a common underlying driver. It is possible that social changes such as increasing risk aversion, changing parenting norms, and delayed independence of young people may have contributed to adolescents spending less unsupervised time with their peers in recent years. Evidence suggests that behaviour-specific factors have also played an important role in the decline of smoking and drinking among adolescents e.g. tobacco control initiatives and changing parental attitudes towards adolescent alcohol use. It is plausible that declines in smoking and drinking have led to declines in the use of other drugs, and that declines in substance use may have contributed to declines in early sexual debut and juvenile crime, however further research is needed.

The world has changed in complex and interconnected ways over the past few decades, likely influencing adolescent worldviews and behavioural norms. This review suggests there is no simple answer to the question of why prevalence of adolescent risk behaviours have declined dramatically since the late 1990s. Broad sociocultural shifts – e.g. an increasingly risk-averse and individualistic society, increasing economic inequality and precarity in the workforce, and related changes to the symbolic meaning of risk behaviours and/or adulthood – may have played a role, but such changes and their impact are difficult to measure empirically. Rigorous empirical testing to date has focused on proximal, measurable factors and has revealed sometimes surprising findings. For example, a popular hypothesis – that the advent of social media (or an increase in digital media use more broadly) has displaced risk behaviours – has been tested and rejected in numerous studies. Many plausible hypotheses remain untested, and there are inherent methodological limits to the tests used. Our review helps to answer some questions but raises many more.

For example, could declining risk behaviours be a positive side-effect of a world that is increasingly antithetical to healthy youth development more broadly? We found the factor most strongly associated with the general decline in risk behaviours was a decline in unstructured in-person socialising with friends. This change appears to be independent of changes in electronic media use and is likely to be rooted in some of the broad socio-cultural shifts mentioned above, such as increasing risk aversion and changing parenting norms. Research shows that free play and outdoor activity in childhood are essential to healthy development (Brussoni et al., 2012) and that such play has declined dramatically in recent decades. Some argue that over-protection has robbed the current generation of opportunities to develop independence, social skills, and a sense of competence (Brussoni et al., 2012; Dodd and Lester, 2021; Gill, 2007; Harris, 2017). Could decreasing unstructured time with friends (in childhood as well as adolescence) underlie both the decline in adolescent risk behaviours and the rise in anxiety, depression and loneliness in the current generation (Collishaw and Sellers, 2020; Fleming et al., 2020; Patalay and Gage, 2019; Twenge et al., 2019)? Jessor proposed that risk behaviours were functional – they helped young people individuate from their families, bond with peers and develop independence (Jessor, 1991). Does the decline in risk behaviours mean young people now have fewer opportunities to achieve the developmental tasks of adolescence? If so, how can we provide such opportunities without fuelling a resurgence of risk behaviours and associated problems (Hall et al., 2016)?

‘Traditional’ risk behaviours have certainly declined in most high-

income countries, but does this truly represent a decline in propensity to engage in risky behaviour, or is this propensity merely directed to new types of behaviour that didn't exist 25 years ago – e.g. vaping, sexting, online gaming and social media 'addictions'? These modern risk behaviours may be less deadly than those of the past, reflected in decreasing adolescent mortality since 2000 (Liu et al., 2022), but there is considerable parental and social concern about these new behaviours. How harmful they are from a public health perspective remains unclear. A greater focus on monitoring *harm* associated with risk behaviours (traditional and modern) is needed if we are to take an informed public health approach to these issues.

Despite declines, absolute levels of some risk behaviours (e.g. binge drinking, cannabis use and unprotected sex) remain high in many countries, and substance use remains a leading cause of morbidity and mortality in young people (Hall et al., 2016). Furthermore, inequities remain stark, reflecting greater exposure to risk factors (e.g. trauma, poverty, discrimination) in structurally disadvantaged demographic groups. Therefore, despite positive trends, risk behaviour prevention and harm reduction remain important public health priorities. The public health evidence base for what works is now well-developed and is congruent with the ecological model. That is, changes in adolescent behaviour will follow from comprehensive changes in the environment that surrounds young people e.g. the social acceptability, affordability and availability of alcohol and other drugs, and the pro-social opportunities and life chances available to young people. Without comprehensive attention to environmental factors, educational approaches to prevention are doomed to fail.

This review is well grounded in theory and empirical evidence, drawing a range of disciplines, yet its limitations must be acknowledged. Although our review acknowledges differences between countries and demographic groups, such a 'broad brush' overview cannot do justice to important sub-group or geographical differences. Due to its broad scope, systematic review methods were not feasible, and therefore omissions or biases in the selected hypotheses and/or collated evidence are possible. Although we reviewed a wide range of possible explanations, there may be other factors (not covered in this review) that also played a causal role. In making judgements about the plausibility of possible causes, we have drawn on a wide range of theory and evidence, including qualitative and longitudinal research, and rigorous tests of hypotheses using regression modelling. Such tests, based on cross-sectional data, can determine whether a factor contributed to risk behaviour declines in mathematical terms but cannot definitively prove causality. Furthermore, regression models are not well suited to dealing with complexity, for example multiple interacting causes, reciprocal causal relationships and feedback loops that characterise the real world. Qualitative approaches are better suited to exploring a complex causal web, but as a means of understanding why risk behaviours have declined, such studies are limited by a lack of baseline comparison and the fact that humans have limited understanding of what influences their own behaviour. Scant research on the reasons for risk behaviour decline and the inherent difficulty of attributing causality in complex real-world settings means that conclusions remain uncertain. Finally, the data and evidence collated here pre-date the Covid 19 pandemic. Monitoring the Future's 2021 findings show large pandemic-related declines in adolescent substance use in the US (Johnston et al., 2022) whereas a study in the Netherlands found a stagnation in the decline of adolescent smoking and drinking (Boer et al., 2022). Ongoing investment is needed to support positive youth development in the Covid and post-Covid era.

## 5. Conclusion

The 20 years from 1999 to 2019 saw a major international decline in adolescent risk behaviours particularly cigarette smoking, alcohol use and juvenile crime, but also including cannabis use and sexual initiation. Emerging evidence suggests that common underlying drivers (e.g. less unstructured in-person socialising) have played an important role in this

behavioural shift. Behaviour-specific factors also contributed to declines in tobacco and alcohol use. Knock-on effects from tobacco and alcohol to other behavioural domains are highly plausible, but definitive evidence is lacking. The complexity of the interplay of factors in the social context and in youth lifestyles suggests that a systemic and ecological approach is needed to fully understand the decline in risk behaviour among young people.

## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Data availability

The authors do not have permission to share data.

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## Appendix A. Supplementary data

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