

## **Routines and rest: the sleep behaviours of 12 to 15 year olds**

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### **ABSTRACT**

There has been considerable emphasis on the role of parenting behaviours on children's educational and cognitive development in recent years. This has culminated in policies that are designed to intervene in the way children are being parented. This emphasis, we argue, has been propagated by the availability of relatively large-scale and very detailed longitudinal data. Analysis of the Millennium Cohort Study, for example, has been used to show significant relationships between the quality of the home learning environment, 'concerted cultivation' by parents and the application of rules and routines on educational achievement, particularly in the early years of a child's life. Similarly, there has been growing interest in the role of sleep on the wellbeing and educational achievement of children, particularly amongst older teenagers. Recent international analysis of TIMMS and PIRLS showed that sleep deprivation amongst 13 and 14 year olds was associated with lower levels of achievement in reading, maths and science. As a result there have been calls for later school start times to mitigate the impact of sleep deprivation.

In this paper we attempt to examine such patterns of routines and rest in more detail amongst two longitudinal cohorts of children – first the Millennium Cohort Study of children born across the UK in 2000/01 and the using a longitudinal multi-cohort of over 1,000 children in Wales. This shows that at age five years, more children than at any other age have a regular bedtime. But after the age of five this begins to decline almost exponentially as children get older. However, our analysis also suggests that having a regular bedtime during adolescence is perhaps not as important as it is during early childhood. Instead, having a regular morning routine seems to be more associated with how often young people go to school feeling tired. We also find that over a fifth of 12-13 *and* 14-15 year olds report always waking up at night to contact friends using social media. This is also shown to be an important predictor of whether adolescents go to school feeling tired. The paper finally goes on to examine the relationship between rest and routines on levels of adolescents' self-reported wellbeing. We find that young people who go to school less often feeling tired are, on average, happier with themselves and their school life.

# Routines and rest: the sleep behaviours of 12 to 15 year olds

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## INTRODUCTION

There has been considerable emphasis on the role of parenting behaviours on children's educational and cognitive development in recent years (Sullivan *et al.* 2013). This has culminated in policies that are designed to intervene in the way children are being parented. This emphasis, we argue, has been propagated by the availability of relatively large-scale and very detailed longitudinal data. Analysis of the Millennium Cohort Study, for example, has been used to show significant relationships between the quality of the home learning environment, 'concerted cultivation' by parents and the application of rules and routines on educational achievement, particularly in the early years of a child's life (Kelly *et al.* 2012, Kelly *et al.* 2013). Similarly, there has been growing interest in the role of sleep on the wellbeing and educational achievement of children, particularly amongst older teenagers. Recent international analysis of TIMMS and PIRLS showed that sleep deprivation amongst 13 and 14 year olds was associated with lower levels of achievement in reading, maths and science. As a result there have been calls for later school start times to mitigate the impact of sleep deprivation (Boergers *et al.* 2014).

In this paper we attempt to examine such patterns of routines and rest in more detail amongst two longitudinal cohorts of children – first the Millennium Cohort Study of children born across the UK in 2000/01 and the using a longitudinal multi-cohort of over 1,000 children in Wales. This shows that at age five years, more children than at any other age have a regular bedtime. But after the age of five this begins to decline almost exponentially as children get older. However, our analysis also suggests that having a regular bedtime during adolescence is perhaps not as important as it is during early childhood. Instead, having a regular morning routine seems to be more associated with how often young people go to school feeling tired. We also find that over a fifth of 12-13 and 14-15 year olds report always waking up at night to contact friends using social media. This is also shown to be an important predictor of whether adolescents go to school feeling tired. The paper finally goes on to examine the relationship between rest and routines on levels of adolescents' self-reported wellbeing. We find that young people who go to school less often feeling tired are, on average, happier with themselves and their school life.

## Routines

Alcock, S. (2007) Playing with rules around routines: children making mealtimes meaningful and enjoyable, *Early Years: An International Research Journal*, 27, 3, 281-293. DOI:10.1080/09575140701594426

Role of rules - Vygotsky, 1978 – "In re-creating and adapting rules in play children also learn self-control" (2007:282).

High, P., Hopmann, M., LaGasse, L. and Linn, H. (1998) Evaluation of a Clinic-Based Program to Promote Book Sharing and Bedtime Routines Among Low-Income Urban Families With Young Children, *Arch Pediatr Adolesc Med*, 152, 5, 459-465. doi:10.1001/archpedi.152.5.459

Routines (e.g. bedtime routines) are often combined with focussed learning. Here it is used alongside bedtime reading. Intervention to promote routine bedtime reading was found to be effective in promoting child-centred literacy activities (e.g. children enjoyed reading more, sharing books, etc) amongst disadvantaged groups.

Spagnola, M. ad Fiese, B. (2007) Family Routines and Rituals: A Context for Development in the Lives of Young Children, *Infants & Young Children*, 20, 4, 284-299. doi: 10.1097/01.IYC.0000290352.32170.5a

Naturally occurring family routines and early childhood. These provide predictable structure for children. In turn guides behaviour and emotional climate that supports early development. These naturally occurring routines are connected to family rituals (and associated with variations in other social and educational skills and practices within the family).

Authors suggest that absence/presence of routines probably not direct cause of developmental outcomes, but that it is closely linked to other mechanisms of developmental processes (e.g. parental efficacy, behaviour monitoring, family relationships).

Correlational\* relationships from existing research: language development (e.g. through regular mealtimes), academic skill development (e.g. through reading routines), social skill development (e.g. through providing “a structure for the socialisation of culturally acceptable behaviour in young children” 2007:287)

= routine gatherings (within family) and interaction between parent and child

3 mechanisms of effect: (1) parental efficacy (e.g. Sprunger, Boyce and Gaines (1985) – mothers felt more competent with their parenting role if they also reported regular household routines); (2) behaviour monitoring (e.g. Furstenberg et al (1999) – “parents who monitor child’s whereabouts and involved in routines at home are less likely to engage in risky behaviours” [is this the parent or the child?]); and (3) symbolic nature of family rituals (e.g. Dickstein et al (1999) – gatherings create representations that depict relationships as trustworthy and reliable, thereby more positive interactions)

Acknowledged benefits of routines amongst particular groups of children (usually with some developmental impediment). E.g. children with autism (Kashinath 2006), obesity (Haines et al., 2013)

Kashinath, S. (2006) Enhancing Generalized Teaching Strategy Use in Daily Routines by Parents of Children With Autism, *Journal of Speech, Language, and Hearing Research*, 49, 466-485. doi:10.1044/1092-4388(2006/036)

Haines, J., McDonald, J., O’Brien, A., et al. (2013) Healthy Habits, Happy Homes: Randomized Trial to Improve Household Routines for Obesity Prevention Among Preschool-Aged Children, *JAMA Pediatrics*, 167, 11, 1072-1079. doi:10.1001/jamapediatrics.2013.2356

Role of routines in education, e.g.:

Fulliigni, A., Howes, C., Hunag, Y., Hong, S. and Lara-Cinisomo, S. (2012) Activity settings and daily routines in preschool classrooms: Diverse experiences in early learning settings for low-income children, *Early Childhood Research Quarterly*, 27, 2, 198-209. doi:10.1016/j.ecresq.2011.10.001

2 daily routine profiles identified in range of early years settings: High Free-Choice pattern and Structured-Balanced pattern. Children in S-B classrooms associated with higher vocabulary scores but not maths reasoning or socio-emotional behaviour. Also associated with “more scaffolded interactions with their teachers” (2012:207)

#### Adolescence:

Levin, K., Kirby, J. and Currie, C. (2012) Adolescent risk behaviours and mealtime routines: does family meal frequency alter the association between family structure and risk behaviour? *Health Education Research*, 27, 1, 24-35. doi: 10.1093/her/cyr084

Uses Health Behaviour in School-Aged Children survey (HBSC) from 2006.

Frequency of eating family meal associated with reduced likelihood of all risk behaviours (e.g. smoking, drinking, cannabis use, bullying, fighting, having sex) among girls and most risk behaviours amongst boys (except fighting and having sex) (NB limitations of cross-sectional study)

Roche, K. and Ghazarian, S. (2012) The Value of Family Routines for the Academic Success of Vulnerable Adolescents, *Journal of Family Issues*, 33, 7, 874-897. doi: 10.1177/0192513X11428569

3 city study of 1147 low-income urban young people (aged 11yrs to 20yrs over time)

Family routines (at approx. age 12 years) were associated with better academic success at Time 2 (at approx. age 14 years). In turn higher academic success at Time 2 was associated with better academic success at Time 3 (at approx. 17 years). T1 routines associated with better academic success at T2 and T3 but more salient at T2 (i.e. from early to middle adolescence) rather than at T2 (later adolescence).

#### Predictors of bedtime routines (amongst pre-schoolers)

Hale, L., Berger, L., LeBourgeois, M. and Brooks-Gunn, J. (2009) Social and demographic predictors of preschoolers' bedtime routines, *Journal of developmental and behavioral paediatrics*, 30, 5, 394-402. doi: 10.1097/DBP.0b013e3181ba0e64

Fragile Families and Child Wellbeing Study (3,217 3 year old children born between 1998 and 2000 in 20 US cities; longitudinal study)

“Low maternal education, increased household size and poverty associated with lower use of parent-child interactive and hygiene-related bedtime routines”. “Children from disadvantaged households less likely to have consistent bedtime routines than advantaged counterparts”. Authors suggest that this may lead to “later disparities in sleep quality, duration and timing, and factors associated with adverse behavioural, cognitive and health outcomes.”

#### Sleep

Sleep important for health and wellbeing of children (Matricciani et al 2013) – lack of sleep = poor concentration (e.g. Steenari et al 2003), lower academic achievement (e.g. Gruber et al 2010), increased risk of obesity (e.g. Cappuccio et al 2008), depression and injuries (e.g. Koulouglioti et al 2008)

Steenari, M., Vuontela, V., Paavonen, J., Carlson, S., Fjällberg, M. and Aronen, E. (2003) Working memory and sleep in 6-to 13-year-old schoolchildren, *Journal of the American Academy of Child and Adolescent Psychiatry*, 42, 1, 85-92. PMID: 12500080

Gruber, R., Laviolette, R., Deluca, P., Monson, E., Cornish, K. and Carrier, J. (2010) Short sleep duration is associated with poor performance on IQ measures in healthy school-age children, *Sleep Medicine*, 11, 3, 289-294. doi: 10.1016/j.sleep.2009.09.007

Cappuccio, F., Taggart, F., Kandala, N., Currie, A., Peile, S., Stranges, S. and Miller, M. (2008) Meta-analysis of short sleep duration and obesity in children and adults, *Sleep*, 31, 5, 619-626. PMID: 18517032

Koulouglioti, C., Cole, R. and Kitzman, H. (2008) Inadequate sleep and unintentional injuries in young children, *Public Health Nursing*, 25, 2, 106-114. doi: 10.1111/j.1525-1446.2008.00687.x.

Matricciani, L., Blunden, S., Rigney, G., Williams, M. and Olds, T. (2013) Children's Sleep Needs: Is There Sufficient Evidence to Recommend Optimal Sleep for Children?, *Sleep*, 36, 4, 527-534. doi:10.5665/sleep.2538.

The past century has seen rapid declines in children's sleep duration (Matricciani, Olds and Pekkov, 2012)

Insufficient and poor quality sleep seen as consequence of 'modern life' (Matricciani et al, 2012)

Habekothe and Den Wittenboer (2001) – 43% of children had difficulty rising in the morning; 15% had sleep problems; 25% did not feel rested at school; quality of sleep, feeling rested and flexible bed times – all related to school functioning

Wolfson and Carskadon (2003) – shortened sleep times, flexible sleep and wake times, late bed and early rise times, poor quality of sleep all negatively associated with school performance

Parent-set bedtime has a positive impact on duration of sleep, wakefulness in the daytime, and fatigue (Short et al, 2011)

Screen time has negative impact on sleep duration (Hale and Guan, 2014)

## **METHODS AND DATA**

This analysis of rest and routines utilises two data sources. The first is the Millennium Cohort Study, otherwise known as the MCS – a major birth cohort study of over 10,000 children born across the UK in the academic year 2000/01. This study collects information from the children and their parents at regular intervals as the cohort have grown up. The main 'sweeps' of data collection for the MCS have been when the children were aged 9 months (MCS1), 3 years (MCS2), 5 years (MCS3), 7 years (MCS4) and 11 years (MCS5). In this paper we utilise data from MCS2, MCS3, MCS4 and MCS5 when the children were aged 3, 5, 7 and 11 years.

The MCS sample is based on where they were born, both at a national level (so children born in Scotland, Wales and Northern Ireland are over-represented) and at a local level (so children born in areas of high socio-economic disadvantage are over-represented). Despite the complex sample design of the MCS it is

possible to statistically weight for any biases in the sample design to ensure that the results of any analysis are as representative of the population of children born at the same time<sup>1</sup>.

Data collection for the MCS involves an interviewer visiting the home of the cohort member (i.e. the child) and interviewing the main parent, the other parent (if applicable) and the child, using a combination of computer-assisted personal interviewing (CAPI) (i.e. questions asked by the interviewer) and computer-assisted self-interviewing (CASI) (i.e. questions that the interviewee answers by themselves).

The other main dataset used in this paper is from the WISERDEducation Multi-Cohort Study. This is a longitudinal multi-cohort study that has collected data from children living in Wales every year over a three year period. The study contains four cohorts of children who entered the study at various ages during the academic year 2012/13 (Sweep 1): 300 Year 1 pupils (aged 5-6 years) (Cohort A), 345 Year 6 pupils (aged 10-11 years) (Cohort B), 412 Year 8 pupils (aged 12-13 years) (Cohort C) and 436 Year 10 pupils (aged 14-15 years) (Cohort D). Sweep 2 was conducted in the following year, during the academic year 2013/14. The sample design for the WISERDEducation Multi-Cohort Study is based on a form of clustered sampling. This involved the random selection of a number of secondary schools across all four regions of Wales. Then in each school two form/tutor groups of children were selected (to be as representative of the school population as possible) to participate in the study, one from Year 8 and one from Year 10. For the younger cohorts at least one primary school was randomly selected that was deemed a feeder school to each of the already selected secondary schools. Again, two classes of children were selected to participate in the study from each primary school, one from Year 2 and one from Year 6.

Data collection for the WISERDEducation Multi-Cohort Study involves researchers visiting the young people in their schools, usually during the Spring Term in each academic year, and asking them to complete a questionnaire on a Tablet PC or via an online survey tool. Responses are securely saved on the Tablet PCs until the research team transfer data to a secure online database. This ensures that the collection of data is as safe and anonymous as possible.

## **REST AND ROUTINES IN EARLY CHILDHOOD**

We begin the analysis of rest and routines by focussing on the prevalence of regular bedtimes during early childhood. Findings from the Millennium Cohort Study show that around half of young children in the UK always have a regular bedtime (Table 1). Furthermore, the majority of other children *usually* have a regular bedtime. However, just over 1 in 10 children do not have a regular bedtime.

There is also considerable consistency in this – 71.8% of children with a regular bedtime at age 3 years still have a regular bedtime at age 7 years (Table 2). In addition, a considerable proportion of children with less regular bedtimes at age 3 years appear to start to have more regular bedtimes at age 7 years. However, Table 2 also shows that the less likely a child has a regular bedtime at age 3 the less likely they have regular bedtime at age 7 years.

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<sup>1</sup> It is also possible to statistically weight the MCS sample for attrition bias. However, since in this paper we are not making statistical comparisons of children at different 'sweeps' of data collection these additional weights are not required.



**Table 1. Regular bedtimes during early childhood (UK Millennium Cohort Study<sup>1</sup>)**

	MCS2 (3 years)	MCS3 (5 years) *	MCS4 (7 years) *	MCS5 (11 years)*
No, never or almost never	6.1%	4.3%	3.4%	3.5%
Yes, sometimes	12.1%	4.6%	5.0%	7.1%
Yes, usually	38.6%	27.3%	32.1%	33.0%
Yes always	42.7%	63.8%	59.4%	56.4%
<i>n</i>	13,194	13,699	14,215	13,362

<sup>1</sup> weighted for sample bias (except at MCS5)

\* Term-time week-day

**Table 2. Consistency in regular bedtimes as children grow up (UK Millennium Cohort Study<sup>1</sup>)**

MCS2 (3 years)	MCS4 (7 years)				Total
	No, never or almost never	Yes, sometimes	Yes, usually	Yes, always	
No, never or almost never	14.7%	8.6%	28.4%	48.3%	100.0%
Yes, sometimes	7.1%	9.8%	36.3%	46.9%	100.0%
Yes, usually	2.6%	4.9%	39.5%	52.9%	100.0%
Yes, always	1.0%	2.8%	24.8%	71.3%	100.0%

<sup>1</sup> weighted for sample bias

Although there is consistency in the use of a bedtime routine amongst children in the UK the time that children go to bed does change considerably as they grow up. Table 3 shows that 57.2% of children at 5 years go to bed before 8pm. 93.9% of these children go to bed before 9pm. However, by age 7 years only 32.3% of children go to bed before 8pm, and by 11 years this has declined to just 2.3%.

It appears that by age 7 years the majority of children go to bed between 7pm and 8pm and by age 11 years the majority of children go to bed between 8pm and 9pm. There is also a relationship between having a bedtime routine and the time a child goes to bed. Table 4 shows that children with more regular bedtimes tend to go to bed early. In contrast, those children with less regular bedtimes tend to go to bed at a later time. For example, nearly a third of 7-year-olds who *sometimes* have a regular bedtime go to bed after 8pm compared to just 10% of those who *always* have a regular bedtime.

**Table 3. Time of bedtime\* during early childhood (UK Millennium Cohort Study<sup>1</sup>)**

	MCS3 (5 years)		MCS4 (7 years)		MCS5 (11 years)	
	%	Cumulative	%	Cumulative	%	Cumulative
Around 6pm	2.6	2.6	0.6	0.6	0.1	0.1
Around 7 pm	54.6	57.2	31.7	32.3	2.2	2.3
Around 8pm	36.7	93.9	52.4	84.6	32.4	34.7
Around 9pm	5.7	99.7	10.9	95.6	57.6	92.3
Around 10pm	0.3	100.0	0.5	96.1	7.5	99.8
Around 11pm	0.0	100.0	0.0	96.1	0.2	100.0
Later	0.0	100.0	3.9	100.0	0.0	100.0

\* Term-time week-day

<sup>1</sup> weighted for sample bias

**Table 4. Bedtimes and routines\* at age 7 years (UK Millennium Cohort Study<sup>1</sup>)**

	Regular bedtime			
	Never or almost never	Yes, sometimes	Yes, usually	Yes, always
Around 6pm	0.0%	0.3%	0.4%	0.7%
Around 7 pm	0.0%	17.4%	25.3%	38.4%
Around 8pm	0.0%	52.0%	61.0%	51.1%
Around 9pm	0.0%	27.2%	12.7%	9.4%
Around 10pm	0.0%	2.9%	0.5%	0.4%
Around 11pm	0.0%	0.0%	0.0%	0.0%
Later	100.0%	0.1%	0.0%	0.0%
<i>n</i>	492	717	4,556	8,451

\* Term-time week-day

<sup>1</sup> weighted for sample bias

Previous analysis of the MCS (Taylor *et al.* 2015) has shown that there is a significant statistical association between having a regular bedtime at age 3 years and a child's word reading and maths ability at age 7 years. This relationship persists even after controlling for other factors commonly found to be associated with a child's cognitive ability, such as the parent's education, social class and income, the child's gender and season of birth, and other measures of the home learning environment. Taylor *et al.* 2015 also demonstrate that having a regular bedtime remains a strong predictor of a child's word reading and maths ability after also controlling for the effects of schools on a child's measure of academic ability.

## REST AND ROUTINES IN ADOLESCENCE

In this section of the paper we continue to examine the prevalence of regular bedtimes and the time children go to sleep as they go through adolescence. Here we draw upon data from two cohorts of the WISERDEducation Multi-Cohort Study (WMCS) – Cohorts C and D. This dataset contains similar information about bedtime routines as provided in the MCS. However, in contrast to the MCS where parents are asked these questions about their children, the WMCS asks the adolescent children questions about their routines. It is also important to note that the WMCS is a much smaller sample than the MCS and are only of children living in Wales.

There is a marked decline in the reported prevalence of having a regular bedtime amongst adolescents when compared to the findings from of the MCS cohort (with children up to age 11 years). Findings from the MCS suggested that just over half of children at age 11 years *always* had a regular bedtime (and according to their parents) (Table 1). According to the WMCS only 17.4% of 12-13 year olds said they *always* had a regular bedtime (Table 5). At age 11 only 3.5% of parents said their children never had a regular bedtime (Table 1). By the age of 12-13 years this figure was just over a quarter of all children surveyed (25.8%) (Table 5).

Table 5 shows that 14-15 year olds also reported having irregular bedtime routines, with even fewer saying that they *always* had a regular bedtime (15.9%).



**Table 5. Regular bedtimes\* during adolescence (WISERDEducation Multi-Cohort Study, Sweep 1)**

	Cohort C <sup>1</sup> (12-13 years)	Cohort D <sup>1</sup> (14-15 years)
No, never or almost never	25.8%	18.6%
Rarely	19.2%	17.0%
Yes, usually	37.6%	48.5%
Yes, always	17.4%	15.9%
<i>n</i>	486	480

\* On a school night

<sup>1</sup> Data collected during Sweep 1 of the WMCS

Not only are adolescent children more likely to report not having a regular bedtime they also go to bed at a much later time. So, data from the MCS suggested children at a third of 11 year olds went to bed before 9pm or earlier and the majority of other children went to bed between 10pm. According to data from the WMCS only 22.7% of 12-13 year olds and just 5.2% of 14-15 year olds went to bed before 10pm (Table 6). The majority of 12-13 year olds said they go to bed between 10pm and 11pm. A large proportion of 14-15 year olds also said they go to bed between 10pm and 11pm, but a significant number of older adolescents said they went to bed around or after midnight (28.0% in total).

**Table 6. Time of bedtime\* during adolescence (WISERDEducation Multi-Cohort Study, Sweep 1)**

	Cohort C <sup>1</sup> (12-13 years)		Cohort D <sup>1</sup> (14-15 years)	
	%	Cumulative	%	Cumulative
Around 7pm or earlier	0.4	0.4	0.2	0.2
Around 8pm	2.0	2.4	0.2	0.4
Around 9pm	20.3	22.7	4.8	5.2
Around 10pm	35.5	58.2	28.7	33.9
Around 11pm	24.3	82.5	38.1	72.0
Around midnight	8.1	90.6	15.6	87.6
Around 1am	3.2	93.8	4.8	92.4
Later than 1am	6.1	100.0	7.6	100.0
<i>n</i>	408		436	

\* On a school night

<sup>1</sup> Data collected during Sweep 1 of the WMCS

As with younger children, there is a relationship between having a regular bedtime and the bed times of adolescents (Table 7). For example, half of 14-15 year olds who *always* have a regular bedtime say they go to bed before 11pm. This contrasts with only 12.2% of those that *rarely* have a regular bedtime and just 11.1% of those that *never* have a regular bedtime. Conversely, those with irregular bedtimes are much more likely to go to bed at or after midnight.

**Table 7. Bedtimes and routines at age 14-15 years (WISERDEducation Multi-Cohort Study, Cohort D Sweep 1)**

Time of bedtime*	Regular bedtime*			
	Never or almost never	Rarely	Yes, usually	Yes, always
Around 7pm or earlier	0.0%	0.0%	0.5%	0.0%
Around 8pm	0.0%	0.0%	0.0%	1.4%
Around 9pm	2.5%	0.0%	5.7%	10.1%
Around 10pm	8.6%	12.2%	36.5%	46.4%
Around 11pm	28.4%	44.6%	42.2%	30.4%
Around midnight	24.7%	28.4%	10.4%	7.2%
Around 1am	13.6%	2.7%	3.3%	1.4%
Later than 1am	22.2%	12.2%	1.4%	2.9%
<i>n</i>	492	717	4,556	8,451

\* On a school night

The WMCS also asked adolescent children about their morning routines. Table 8 shows that the majority of 12-13 and 14-15 year olds say they always get up at a regular time on a school day. Only 12.4% of 12-13 year olds and 8.8% of 14-15 year olds say they never or rarely get up at a regular time on a school day. Table 9 shows that the vast majority of adolescents get up at 7am. Nearly 90% of 12-13 year olds (89.3%) get up before 8am. This is slightly lower for 14-15 year olds where just over a fifth (21.6%) get up at 8am or later.

Both the regularity of getting up at the same time on a school day and the common time at which most adolescents get up might not be surprising given that the school day usually starts at the same time for all children. However, this only reinforces the importance of the regularity and times that adolescent children go to bed on a school night.

**Table 8. Regular getting up\* during adolescence (WISERDEducation Multi-Cohort Study, Sweep 1)**

	Cohort C <sup>1</sup> (12-13 years)	Cohort D <sup>1</sup> (14-15 years)
No, never or almost never	7.3%	3.5%
Rarely	5.1%	5.3%
Yes, usually	29.3%	31.4%
Yes, always	58.2%	59.8%
<i>N</i>	468	433

\* On a school day

1 - Data collected during Sweep 1 of the WMCS

**Table 9. Time of getting up\* during adolescence (WISERDEducation Multi-Cohort Study, Sweep 1)**

	Cohort C <sup>1</sup> (12-13 years)		Cohort D <sup>1</sup> (14-15 years)	
	%	Cumulative	%	Cumulative
Before 5am	1.9	1.9	0.9	0.9
Around 5am	0.7	2.6	0.9	1.8
Around 6am	17.8	20.4	11.8	13.6
Around 7am	68.9	89.3	64.7	78.3
Around 8am	9.5	98.8	15.4	93.7
Later than 8am	1.2	100.0	6.2	99.9
<i>n</i>	411		434	

\* On a school day

1 - Data collected during Sweep 1 of the WMCS

The most common bedtime pattern amongst 14-15 year olds is to go to bed at around 11pm and get up at around 7am (25.3% of all 14-15 year olds) (Table 10a). This followed by 20.5% of 14-15 year olds who go to bed an hour earlier (at around 10pm) and also get up at around 7am. Perhaps of most interest, however, are the getting up times of those 14-15 year olds who go to bed at relatively late times. The later these older adolescents go to bed the less likely that they get up at or before 7am and the more likely they get up later than 8am (Table 10b).

**Table 10a. The times 14-15 year olds go to bed and get up, on school night/day (WISERDEducation Multi-Cohort Study, Cohort C Sweep 1) (as a percentage of all cohort members)**

Time go to bed	Time get up (percentage of all cohort members)						Total
	Before 5am	Around 5am	Around 6am	Around 7am	Around 8am	Later than 8am	
Around 7pm or earlier	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%
Around 8pm	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.2%
Around 9pm	0.0%	0.0%	1.2%	3.2%	0.2%	0.2%	4.8%
Around 10pm	0.0%	0.2%	3.7%	20.5%	3.0%	0.9%	28.3%
Around 11pm	0.2%	0.2%	4.4%	25.3%	5.8%	2.3%	38.2%
Around 12am	0.0%	0.2%	1.6%	8.5%	3.9%	1.4%	15.7%
Around 1am	0.0%	0.0%	0.2%	3.2%	0.9%	0.5%	4.8%
Later than 1am	0.5%	0.2%	0.7%	3.7%	1.6%	0.9%	7.6%
<i>Total</i>	0.5%	0.7%	11.1%	61.1%	13.8%	5.3%	100.0%

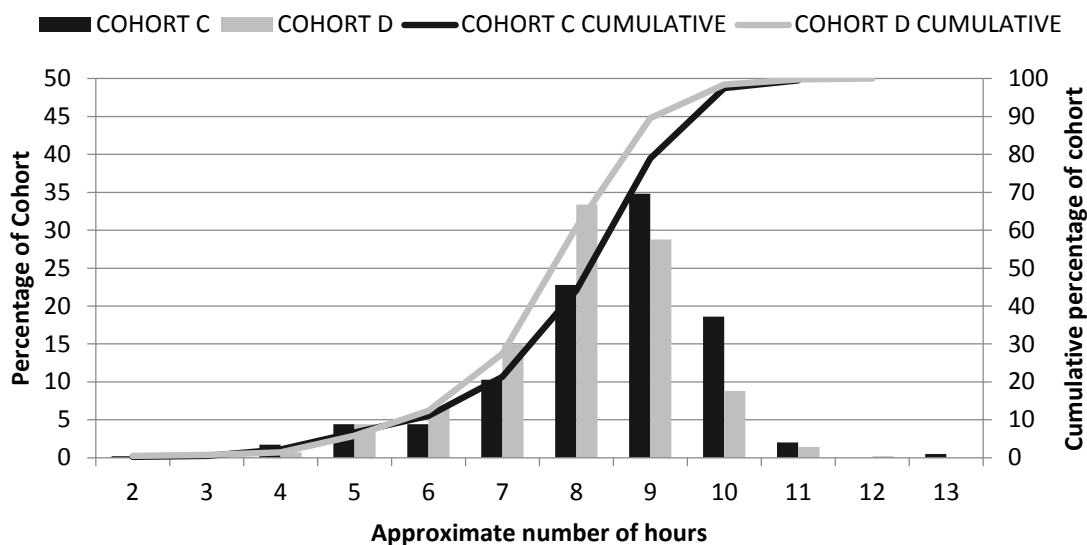
**Table 10b. The times 14-15 year olds go to bed and get up, on school night/day (WISERDEducation Multi-Cohort Study, Cohort D Sweep 1) (percentage, by time go to bed)**

Time go to bed	Time get up (percentage, by time go to bed)						Total
	Before 5am	Around 5am	Around 6am	Around 7am	Around 8am	Later than 8am	
Around 7pm or earlier	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Around 8pm	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	100.0%
Around 9pm	0.0%	0.0%	23.8%	66.7%	4.8%	4.8%	100.0%
Around 10pm	0.0%	0.8%	13.0%	72.4%	10.6%	3.3%	100.0%
Around 11pm	0.6%	0.6%	11.4%	66.3%	15.1%	6.0%	100.0%
Around 12am	0.0%	1.5%	10.3%	54.4%	25.0%	8.8%	100.0%
Around 1am	0.0%	0.0%	4.8%	66.7%	19.0%	9.5%	100.0%
Later than 1am	6.1%	3.0%	9.1%	48.5%	21.2%	12.1%	100.0%
<i>Total</i>	0.5%	0.7%	11.1%	61.1%	13.8%	5.3%	100.0%

Using these responses to the time the adolescent children go to bed and the time they get up it is possible to calculate an approximate length of time they are asleep for. These can only be approximate, since (a) the questions asked were about the time they go to bed and get up, not specifically the time they fall asleep or the time they actually wake from sleeping, and (b) the times provided for going to bed and getting up were only approximate and aggregated (usually to the nearest hour, although some children did give very precise times).

Figure 1 shows that the majority of adolescent children were in bed for eight or nine hours. It also shows that the slightly older cohort of 14-15 year olds spent slightly less time, on average, in bed than the younger cohort of 12-13 year olds. We can also see that over a fifth of young adolescents and over a quarter of older adolescents were in bed for less than eight hours – 21.2% of 12-13 year olds and 27.5% of 14-15 year olds. Indeed one in ten adolescent children (of 12-13 and 14-15 year olds) appear to have spent six hours or less in bed.

**Figure 1. Approximate number of hours in bed, on school night (WISERDEducation Multi-Cohort Study, Sweep 1)**



The young people in the WMCS were then asked whether they went to school tired. Around a third of all children said that they almost always go to school feeling tired (Table 11). A further third said that they go to school feeling tired at least once a week. It can also be seen from Table 11 that older adolescents are slightly more likely to go to school feeling tired than younger adolescents.

**Table 11. How often adolescent children go to school feeling tired (WISERDEducation Multi-Cohort Study, Sweep 1)**

	Cohort C <sup>1</sup> (12-13 years)	Cohort D <sup>1</sup> (14-15 years)
Almost always	31.8%	38.9%
At least once a week	34.2%	36.6%
At least once a month	12.5%	12.0%
Less often than once a month	10.0%	7.1%
Never	11.5%	5.5%
<i>n</i>	409	435

It is possible with this data to test the relationship between how often adolescents go to school feeling tired and how long they spent in bed. For both young (Table 12) and older (Table 13) adolescents there is a clear trend between the number of hours in bed and how often they feel tired in the morning. For example, more than half of 12-13 year olds that appear to be in bed for only 2-5 hours during the night almost always feel tired when they go to school. In contrast less than a quarter of those that spend 9 or more hours in bed almost always feel tired when they go to school. Conversely, those 12-13 year olds who spend more time in bed are more likely to say that they rarely or never feel tired when they go to school.

Although similar trends can be observed for 14-15 year olds the relationship between feeling tired and how long they spend in bed is not as strong as it was for the younger adolescents. Well over a third of 14-15 year olds who spent 9 or more hours in bed still said they went to school almost always feeling tired.

**Table 12. Relationship between how often 12-13 year olds go to school feeling tired and length of time in bed (WISERDEducation Multi-Cohort Study, Cohort C Sweep 1)**

No. of hours in bed	How often 12-13 year olds feel tired			<i>n</i>
	Almost always	At least once a week	Less often or never	
2-5 hours	55.6%	22.2%	22.2%	27
6-7 hours	50.8%	23.7%	25.4%	59
8 hours	37.6%	35.5%	26.9%	93
9 hours	24.8%	39.0%	36.2%	141
10+ hours	16.3%	37.2%	46.5%	86
<i>n</i>	129	140	137	406

**Table 13. Relationship between how often 14-15 year olds go to school feeling tired and length of time in bed (WISERDEducation Multi-Cohort Study, Cohort D Sweep 1)**

No. of hours in bed	How often 14-15 year olds feel tired			<i>n</i>
	Almost always	At least once a week	Less often or never	
2-5 hours	56.0%	20.0%	24.0%	25
6-7 hours	45.7%	24.5%	29.8%	94
8 hours	31.0%	42.8%	26.2%	145
9 hours	37.1%	41.1%	21.8%	124
10+ hours	42.2%	40.0%	17.8%	45
<i>n</i>	167	159	107	433

Another possible contributory factor in making adolescent children tired when they go to school is the growing use of social media during the night. In the WMCS young people were asked how often they wake up during the night to contact friends or check messages on a computer, tablet, or phone. Although nearly half of all adolescents said they never did this a substantial proportion said they did on a regular basis (Table 14). Indeed 21.6% of 12-13 year olds and 22.5% of 14-15 year olds reported that they almost always wake up during the night to use social media. A further 13.5% and 15.1%, respectively, said they did this at least once a week – over a third of young people appear to be waking up during the night to send or check messages via social media.

**Table 14. How often adolescent children wake up at night to use social media (WISERDEducation Multi-Cohort Study, Sweep 1)**

	<b>Cohort C<sup>1</sup> (12-13 years)</b>	<b>Cohort D<sup>1</sup> (14-15 years)</b>
Almost always	21.6%	22.5%
At least once a week	13.5%	15.1%
At least once a month	7.8%	7.6%
Less often than once a month	7.4%	8.9%
Never	49.8%	45.9%
<i>n</i>	408	436

The use of social media during the night also appears to be associated with how often adolescents feel tired when they go to school. For example, 58.0% of 12-13 year olds (Table 15) and 54.1% of 14-15 year olds (Table 16) who say they almost always use social media during the night say they almost always go to school feeling tired. This compares to just 20.9% of 12-13 year olds and 33.7% of 14-15 year olds who say they never use social media during the night. This would suggest that adolescents who wake up during the night to use social media are more than two times more likely to go to school feeling tired compared to adolescents who do not wake up during the night.

**Table 15. Relationship between how often 12-13 year olds go to school feeling tired and how often they use social media during the night (WISERDEducation Multi-Cohort Study, Cohort C Sweep 1)**

<b>How often use social media</b>	<b>How often 12-13 year olds feel tired</b>			<i>n</i>
	<b>Almost always</b>	<b>At least once a week</b>	<b>Less often or never</b>	
Almost always	58.0%	22.7%	19.3%	88
At least once a week	41.8%	43.6%	14.5%	55
Less often	21.0%	43.5%	11.3%	62
Never	20.9%	34.3%	44.8%	201
<i>n</i>	129	140	137	406

**Table 16. Relationship between how often 14-15 year olds go to school feeling tired and how often they use social media during the night (WISERDEducation Multi-Cohort Study, Cohort D Sweep 1)**

<b>How often use social media</b>	<b>How often 14-15 year olds feel tired</b>			<i>n</i>
	<b>Almost always</b>	<b>At least once a week</b>	<b>Less often or never</b>	
Almost always	54.1%	26.5%	19.4%	98
At least once a week	43.9%	43.9%	12.1%	66
Less often	32.3%	51.6%	19.4%	72
Never	33.7%	36.2%	30.2%	199
<i>n</i>	169	159	107	435



In all the comparisons made above it is interesting to note that, in the main, older adolescents are more likely to say they are almost always tired when they go to school than their younger counterparts when controlling for how long they are in bed for and how often they wake up during the night to use social media. This would suggest there may be other factors that account for their tiredness in the mornings that are not considered here. In order to examine the relative influence of these factors on how often adolescent children go to school feeling tired we next undertake binary logistic regression using all these variables to try and predict whether a young person always feels tired when they go to school. The results of this are presented in Table 17 – one binary logistic regression model for 12-13 year olds and one for 14-15 year olds.

These statistical models provide one way of attempting to distinguish between the relative importance of each of the characteristics associated with rest and routines amongst adolescent children. In both examples the dependent variable the models are trying to predict is whether a young person reports that they almost always tired when they go to school. By including all the variables in these models we can begin to see how each factor is related to the dependent variable whilst controlling for the other characteristics – an important procedure given how they are all inter-related. Indeed, these results should be treated with considerable caution, since the data they are based upon is not a reliable (i.e. random) sample and nor does it consider other possible explanations for why a young person might always feel tired when they go to school (such as gender, diet, attitudes towards school). Furthermore, it should be remembered that responses to these questions are highly context dependent.

Nevertheless, the results presented in Table 17 begin to provide some insight into the relationships between rest and routine and how often adolescents feel tired when they go to school. For example, this shows that 12-13 year olds who never having a regular waketime are 3 times more likely to say they almost always feel tired for school compared to 12-13 year olds who always have a regular wake time. Similarly, 12-13 year olds who regularly wake up in the night to use social media are three times more likely to say they almost always feel tired for school compare to 12-13 year olds who never use social media during the night. Similar trends, albeit weak associations, can also be observed for 12-13 year olds having a regular bedtime and the time they go to bed – the less regular their bedtime and the later they go to bed, the more likely that they say they are always tired when they go to school. Interestingly for these younger adolescents there is no obvious relationship between their wake time and how long they are in bed for and whether they are always tired when they go to school.

For the older adolescents, aged 14-15 years old, the trends are slightly different. Again we see that never having a regular waketime is strongly associated with a greater probability that they say they are always tired when they go to school (four times more likely compared to other older adolescents who have a regular wake time). And also for this group waking up during the night to use social media is a strong predictor for whether they always feel tired when they go to school (although not as large a potential impact as it is for 12-13 year olds). But in contrast with younger adolescents the shorter the time they are in bed the more likely they say they are tired when they go to school. For example, 14-15 year olds who appear to be in bed for just two to five hours are nearly six times more likely to say they are always tired when they go to school that other 14-15 year olds who spend ten or more hours in bed. Also, the later 14-15 year olds wake up in the morning the more likely they are always tired when they go to school. Another important observation for 14-15 year olds is the relationship between their bedtime and how often they feel tired when they go to school. Here we see that older adolescents who go to bed at 10pm are actually significantly less likely to say they are always tired when they go to school than 14-15 year olds who go to bed earlier, at 9pm or earlier.

**Table 17. Binary logistic regression model results to predict whether adolescents say they almost always feel tired when they go to school**

		12-13 year olds			14-15 year olds		
n		400			428		
-2 Log likelihood		427.95			531.90		
Cox & Snell R <sup>2</sup>		0.168			0.085		
		Exp(B)	95% CI		Exp(B)	95% CI	
			Lower	Upper		Lower	Upper
Regular bedtime	<i>Almost always</i>						
	Never	1.41	0.63	3.16	1.28	0.59	2.79
	Rarely	1.52	0.68	3.39	0.95	0.43	2.08
Regular waketime	<i>Almost always</i>						
	Never	3.03*	1.14	8.05	4.09*	0.99	16.98
	Rarely	0.87	0.30	2.48	1.70	0.64	4.53
Bedtime	<i>Almost always</i>						
	Usually	0.64	0.31	1.34	0.83	0.45	1.55
	9pm or earlier						
Waketime	<i>Almost always</i>						
	Never	3.03*	1.14	8.05	4.09*	0.99	16.98
	Rarely	0.87	0.30	2.48	1.70	0.64	4.53
Time in bed	<i>Almost always</i>						
	Usually	1.35	0.79	2.31	1.38	0.86	2.22
	12 am or later	2.16	0.18	25.59	0.17	0.02	1.42
Use social media during night	<i>Almost always</i>						
	Never	3.06***	1.63	5.77	1.91**	1.11	3.29
	Around 11pm	1.60	0.27	9.49	0.22*	0.05	1.03
Time in bed	<i>Almost always</i>						
	Usually	1.35	0.79	2.31	1.38	0.86	2.22
	Around 10pm	0.97	0.31	3.02	0.26**	0.08	0.87
Time in bed	<i>Almost always</i>						
	Usually	1.35	0.79	2.31	1.38	0.86	2.22
	6am or earlier						
Time in bed	<i>Almost always</i>						
	Usually	1.35	0.79	2.31	1.38	0.86	2.22
	8am or later	0.71	0.29	1.76	2.79	0.71	10.95
Time in bed	<i>Almost always</i>						
	Usually	1.35	0.79	2.31	1.38	0.86	2.22
	Around 7am	1.14	0.22	5.82	1.75	0.77	3.97
Time in bed	<i>Almost always</i>						
	Usually	1.35	0.79	2.31	1.38	0.86	2.22
	10 or more hours						
Time in bed	<i>Almost always</i>						
	Usually	1.35	0.79	2.31	1.38	0.86	2.22
	2-5 hours	1.06	0.06	19.62	5.92	0.55	63.90
Time in bed	<i>Almost always</i>						
	Usually	1.35	0.79	2.31	1.38	0.86	2.22
	6-7 hours	1.09	0.09	12.87	3.94	0.55	28.19
Time in bed	<i>Almost always</i>						
	Usually	1.35	0.79	2.31	1.38	0.86	2.22
	8 hours	1.21	0.19	7.59	1.85	0.44	7.87
Time in bed	<i>Almost always</i>						
	Usually	1.35	0.79	2.31	1.38	0.86	2.22
	9 hours	1.37	0.42	4.45	2.04	0.74	5.62
Time in bed	<i>Almost always</i>						
	Usually	1.35	0.79	2.31	1.38	0.86	2.22
	Sometimes	1.37	0.78	2.41	0.94	0.57	1.54

\* p<0.10; \*\* p<0.05; \*\*\* p<0.01

As has already been noted these results should be treated with considerable caution due to the limitations of the sample and the nature of the variables included in the models. It is also possible that the relationships between these characteristics and feeling tired are not linear – e.g. young people who go to bed early may be those that feel tired during the day, and those that go to bed later may lack the sleep to prevent them from being tired the next day.

Despite these limitations there are a number of conclusions that can be drawn from this analysis. The main conclusions are that having a regular waketime and using social media during the night appear to be more important in determining whether a young person is always tired during the day than the time they go to bed, how long they spend in bed and whether they have a regular bedtime. This is important since analyses of regular bedtimes on children's development may be overlooking the related but just as important (if not more important) impact of having a regular morning routine. For the education sector this could be a very significant observation, since delaying the start times for schools/lessons, frequently mooted for older adolescents, may only exacerbate the issue by removing an important component of a regular morning routine.

The other conclusion to draw from this analysis is that there is no suggestion that adolescents would benefit from a prescribed amount of sleep that they should have. Although on average, older adolescents appear to benefit from spending longer in bed there are nearly just as many older adolescents who still feel tired after a long time in bed. However, this may not be that surprising when we consider the final key conclusion from this analysis. Any potential benefits of going to bed at a regular time, going to bed at a reasonable time and ensuring adolescents spend a sensible amount of time in bed appear to be entirely expunged if young people are then waking up during the night to use social media. These results suggest there are significant and serious implications of this on whether young people feel tired when they go to school or not. Disruptions to rest and routines would appear to be just as important, if not more so, than the actual rest and routines that young people experience.

## THE IMPACT OF REST AND ROUTINES ON SCHOOL LIFE

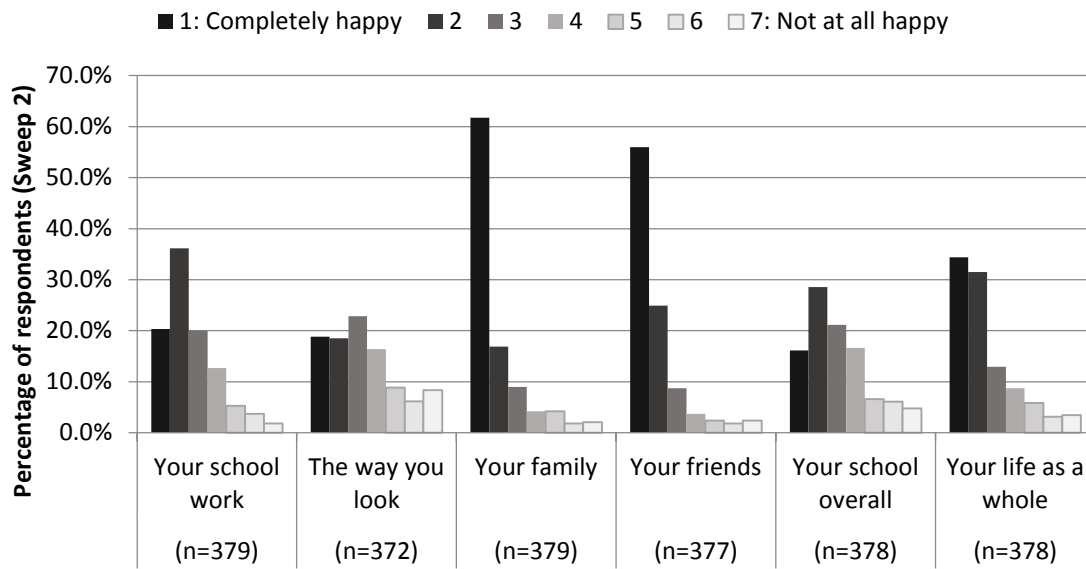
In this final section of the paper we consider the impact of feeling tired when going to school on other aspects of adolescents' lives. In particular, we consider what impact, if any, this has on their subjective wellbeing in a number of domains. These measures of subjective wellbeing were collected in the second sweep of the WMCS, one year after data was collected about their rest and routines. Cohort members were asked to rate their happiness on a scale of 1 to 7 on six domains of their lives: their school work, their school, the way they look, their family, their friends and their life as a whole.

Figures 2 and 3 generally show that adolescent children are relatively happier with their family and friends than they are with the way they look, their school work and their school. The more positive attitudes towards social wellbeing (compared to personal wellbeing) seem to be more important in determining their satisfaction with their life as a whole. Comparing Figure 2 with Figure 3 also shows that older adolescents are, in the main, less happy with their lives than younger adolescents, particularly in relation to their education. Given both cohorts attend the same schools it is possible to suggest that this might reflect the stage they are in their education, with the older cohort in their final year of Key Stage 4 (and undertaking their GCSEs).

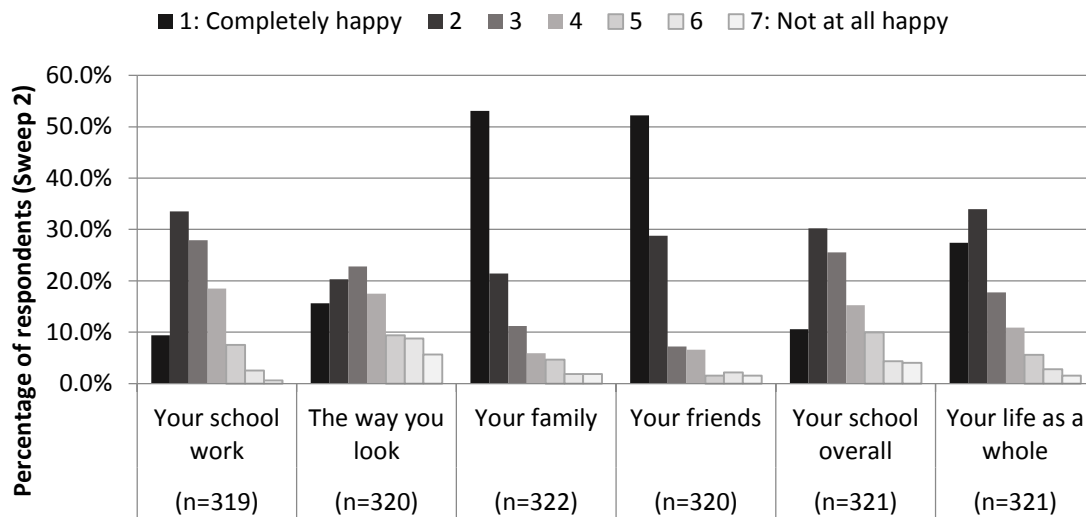
We are interested in this paper whether these measures of subjective wellbeing (as measured in the second sweep of the study) are related to patterns of rest and routine (as measured in the first sweep of the study). We know from previous studies of children that their subjective wellbeing is terribly difficult to predict (e.g. Taylor *et al.* 2015) and that self-reported wellbeing is heavily influenced by discrete and contextual experiences such as bullying or parental separation (e.g. Bradshaw and Rees *forthcoming*).

In order to look at the relationship between rest and routines and subjective wellbeing we compare the mean wellbeing scores of adolescents who say they are almost always tired when they go to school with other adolescents. The results of this for Cohort C, aged 12-13 years when asked about their rest and routines and aged 13-14 when asked about their subjective wellbeing, are presented in Table 18. This shows that in nearly all domains of subjective wellbeing considered here there are statistically significant differences between young adolescents according to whether they always feel tired when they go to school. These differences are particularly large for their happiness with their life as a whole, their happiness with their family and their happiness with their school and their school work. In all of these domains young adolescents who say they are almost always tired when they go to school go on to also report lower levels of happiness. The only exception to this is with regard their attitudes towards their friends.

**Figure 2. Subjective wellbeing amongst 13-14 year olds (WISERDEducation Multi-Cohort Study, Cohort C Sweep 2)**



**Figure 3. Subjective wellbeing amongst 15-16 year olds (WISERDEducation Multi-Cohort Study, Cohort D Sweep 2)**



**Table 18. Comparison of subjective wellbeing amongst young adolescents (WISERDEducation Multi-Cohort Study, Cohort C Sweep 1 and 2)**

	Mean score <sup>1</sup>		Independent t statistic	Significance
	Not always tired	Always tired		
Your school work	2.38	2.99	3.92	0.000
Your school overall	2.72	3.46	3.98	0.000
The way you look	3.11	3.72	2.86	0.005
Your family	1.57	2.28	4.42	0.000
Your friends	1.76	1.95	1.20	0.230
Your life as a whole	2.72	3.46	5.32	0.000
<i>n</i>	221	100		

<sup>1</sup> Wellbeing is measured here on a scale of 1 to 7, where 1 is completely happy and 7 is not happy at all.

In contrast, the results for older adolescents are slightly different. Table 19 compares the mean subjective wellbeing scores for Cohort D members (aged 14-15 when asked about rest and routines and aged 15-16 when asked about their subjective wellbeing). On average, those that go to school almost always feeling tired tend to have lower levels of happiness in these wellbeing domains. However, for older adolescents we see a marked difference in levels of happiness in relation to their friends and the way they look. In turn, they also report a significant difference in their happiness in their life as a whole according to whether they are always tired or not. If these results are a reliable indicator of older adolescents' subjective wellbeing then this would suggest that rest and routines become more intertwined with peer-related aspects of wellbeing.

**Table 19. Comparison of subjective wellbeing amongst young adolescents (WISERDEducation Multi-Cohort Study, Cohort D Sweep 1 and 2)**

	Mean score <sup>1</sup>		Independent t statistic	Significance
	Not always tired	Always tired		
Your school work	2.73	2.79	1.60	0.110
Your school overall	2.91	3.24	1.77	0.077
The way you look	3.06	3.65	2.78	0.006
Your family	1.86	2.12	1.50	0.136
Your friends	1.63	2.12	3.24	0.001
Your life as a whole	2.20	2.71	3.03	0.003
<i>n</i>	184	91		

<sup>1</sup> Wellbeing is measured here on a scale of 1 to 7, where 1 is completely happy and 7 is not happy at all.

## CONCLUSIONS

In this paper we have attempted to explore the patterns of rest and routines amongst children at various ages. We see, for example, that children at age five years are more likely than at any other time of their development to have regular bedtimes – nearly two-thirds of 5-year-olds always have a regular bedtime. After the age of five increasingly fewer children have a regular bedtime, such that by age 11 this figure is closer to 50%, then by 12-13 years less than a fifth and by age 14-15 just 15.9%.

So if having a regular bedtime during early child development is found to be associated with improved behaviour and cognitive development what impact does having increasingly irregular bedtimes have on

children as they enter and through adolescence? The problem with this is that sleep behaviours are far more complex than just having a regular bedtime. The analysis presented in this paper demonstrates that there are many other factors to consider, such as the time of going to bed, having a regular wakeup time, the time they get up and how long they spend in bed. We also demonstrate that other factors, such as the use of social media during the night, can lead to significant disruption to the rest and routines of many adolescents.

We have also demonstrated that many of these factors appear to be related to whether adolescent children go to school tired or not. However, of the factors considered here, having a regular morning routine and waking up during the night to use social media appear to be the most important predictors of always going to school feeling tired. Furthermore, we were also able to demonstrate that going to school feeling tired is strongly associated with different aspects of adolescents' subjective wellbeing. The less often they feel tired when going to school the happier the young people appear to be.

Of course, there are a number of limitations to this analysis, not least our ability to consider other factors that may impact on sleep behaviours and subjective wellbeing, such as gender and socio-economic circumstances. Nevertheless, the findings presented here do raise questions about current discourses around rest and routines. For example, it shows that having a regular bedtime may not be as important to adolescents as they appear to be for younger children. It also questions proposals to delay the start time of school and lessons in the UK. Having a regular morning routine may actually prove to be a very important feature in helping adolescents concentrate and enjoy their learning, something that may actually be undermined by changes to the school day. Critically it seems more important to discourage adolescents from using social media during the night. No amount of effort to develop regular bedtimes or to lengthen the time in bed would seem to be able to compensate for the disruption that this can cause.

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